VISIX ANPR CAMERAS

Installation and Setup

Solutions Guide - v1.0.0

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COMPLIANCE

E467564

CAN ICES-3 (A) / NMB-3(A)

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions
    i. This device may not cause harmful interference.
    ii. This device must accept any interference received, including interference that may cause undesired operation.

    Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
2. This device complies with CAN ICES-3 (A)/NMB-3(A)
3. This device is UL and ULC E467574 (Safety) cerfied
4. This device complies with CE 2014/30/EU – EMC Direcve, 2015/863/EU RoHS3 as part of 2011/65/EU RoHS.
5. This device complies with UKCA Electromagnec Compability Regulaons 2016 and UKCA Restricon of the of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
6. This device complies with WEEE- Do not discard this product along with other household waste, it must be collected and treated separately. See *Discard Old Appliance* section o this document for information on proper disposal.

Notice: This product is covered by one or more claims of the HEVC Patents listed at patentlist.accessadvance.com

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1 INTRODUCTION

Welcome to the solutions guide for the installation and integration of 3xLOGIC's new VISIX ANPR (Automatic Number Plate Recognition) cameras: the **VX-5M622-MB-RIAW-X-ANPR** and the **VX-5M650-B-RIAW-X-ANPR**. These cameras offer full integration with VIGIL, 3xLOGIC's powerful Video Management System (VMS), enabling seamless operation and efficient management of your ANPR solution. This guide is designed to provide you with installation best practices and guidelines, ensuring optimal setup and capture performance.

Whether you are deploying the camera in a parking facility, on a security checkpoint, or at any location requiring automated vehicle plate recognition, this guide will walk you through the essential steps to ensure a smooth and effective installation process. We'll also cover the configuration of advanced ANPR settings via the camera's browser interface and MMC plugin.

Note: This guide assumes the reader is familiar with VISIX Gen III cameras and their browser-based interface, the 3xLOGIC VIGIL VMS (specifically VIGIL Server and VIGIL Client) and a that the reader maintains a general understanding of network cameras and common image settings.

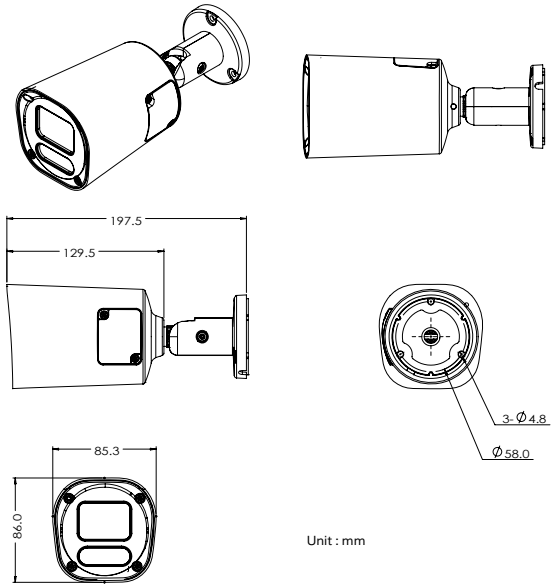
1.1 WHAT IS ANPR?

Automatic Number Plate Recognition (ANPR), often referred to as LPC(License Plate Capture) or ALPR (Automatic License Plate Recognition) technology is rapidly becoming an essential tool for modern security and access control systems. With its ability to automatically capture and read vehicle license plates, ANPR offers a wide range of benefits that improve both security and operational efficiency.

- **Enhanced Security:** ANPR provides a powerful layer of surveillance by enabling real-time vehicle identification. This allows for automatic alerts when unauthorized or suspicious vehicles are detected, helping to prevent potential security breaches or unauthorized access.
- **Improved Efficiency:** By automating vehicle identification, ANPR reduces the need for manual checks or human intervention. This leads to faster, more accurate entries and exits, ideal for managing busy environments like parking lots, toll booths, or gated facilities.
- **Seamless Integration with VIGIL VMS**: When paired with 3xLOGIC's VIGIL VMS, the ANPR camera seamlessly integrates into existing security systems, allowing for a centralized, easy-to-manage solution. This integration ensures that license plate data can be linked to other video surveillance footage, enhancing investigative capabilities and providing more comprehensive insights.
- **Data Collection and Reporting**: ANPR systems collect valuable data that can be used for reporting, analysis, and tracking vehicle movement patterns. This data can be used for a variety of purposes, including monitoring traffic flow, verifying authorized vehicles, or supporting law enforcement efforts.
- **Scalability**: Whether you're managing a single location or a large multi-site operation, ANPR technology is scalable, allowing you to add more cameras and expand your system as needed to meet growing security demands.

In short, ANPR enhances security, streamlines operations, and offers valuable data insights, making it a crucial addition to any modern security infrastructure.

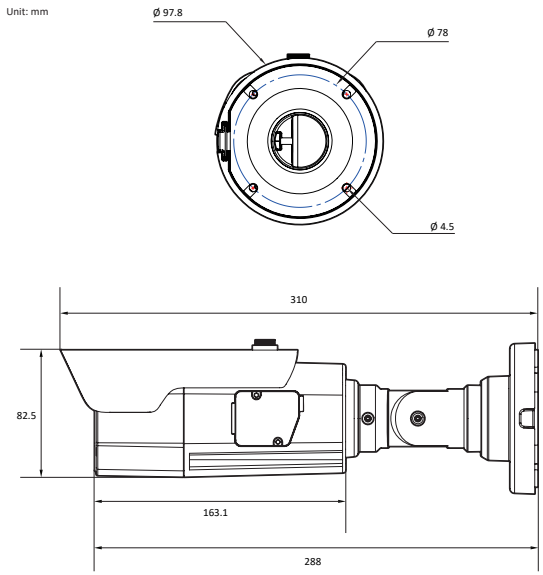
1.2 VX-5M622-MB-RIAW-X-ANPR TECHNICAL SUMMARY



Hardware			
Image Sensor	1/2.8" 5.17M(STV2) CMOS	**Sensor Max Resolution**	2592(H) X 1944(V)
Lens	6~22mm	**Frame Rate**	30fps
Aperture	F1.6	**Operating Temperature / Cold Start?**	-20°~ 50° / No
Lens Type	Motorized	**Operating Humidity**	10-90% RH (Non-Condensing)
Angle of View	D:20.7°~49.6°, H:16.5°~39.2°, V:12.4°~29.2°	**Impact Protection**	IK10
MIN. Illumination	0.05Lux, 0Lux with IR (F1.6)	**IP Rating**	IP67
S/N Ratio	50db	**Scanning Mode**	Progressive Scan
IR Distance	37m (120 ft)	**Pan / Tilt / Zoom**	Zoom: x3.6 Optical
IR LEDs	H3IR	**Material**	Aluminum-Die Casting
Shutter Speed	Auto / Manual (1/15 ~ 1/32000) Anti-Flicker Slow Shutter (1/2,1/3,1/5,1/6,1/7.5, 1/10)	**Dimensions (W x D x H)**	197.5mm x 86mm
Day & Night	TDN (True Day & Night)	**Weight**	0.97kg
Wide Dynamic Range (WDR)	120dB, WDR (2x)	**Storage**	microSD/SDHC/SDXC : 1TB max.
Certifications	FCC Part 15, Subpart B, Class A CAN ICES-3 (A)/NMB-3(A) UL and ULC Safety CE NDAA Compliant	**Power supply**	DC12V (Adapter is not included) PoE IEEE 802.3af Class3
Ethernet	RJ45 (10/100Base-T)	**Power consumption**	
Internal Mic	No	**Alarm In / Out**	1/1 Bare Wire
Audio In / Out	1[1.0Vms, 3K ohm]/1	**Audio Compression**	G.711 ulaw
Video Output	1 [CVBS 1.0V p-p (75Ω)	**Two-way Audio / Audio Talk**	Yes

Software			
Video Compression	H.265 H.264 MJPEG	**Security**	HTTPS(SSL) IP filtering 802.1x
Video BitRate	100Kbps ~ 10Mbps	**Protocols**	TCP/IP UDP AutoIP RTP(UDP/TCP) RTSP NTP HTTP HTTPS SSL DNS DDNS DHCP FTP SMTP ICMP SNMPv1/v2/v3(MIB-2) ONVIF
Video Streams	2592x1944p30 + 480p30 with H.264,H265 + MJPEG	**Digital Noise Reduction**	3D DNR
Auto Gain Control	Auto	**Sys. Compatibility**	CGI API ONVIF Profile S
Event Trigger	Motion Alarm, Network Disconnection, Temperature Critical, Illegal Login, Schedule, Sensor Detection.	**Supported Analytics Rules (EBDL)**	Intrusion Detection, Zones & Lines, Tamper Detection, Appear Filter, Disappear Filter, Dwell Filter, Enter Filter, Exit Filter, Stopped Filter, Counting, Counting Lines, Object Color, Direction Filter, Logical Rules, Tailgating Filter, DL People Tracker, DL Object Tracker, Metadata
Event Notification	FTP, Email, Alarm Out, SD Card	**ANPR / LPC**	Optional ANPR Functionality - Full Integration with VIGIL v13.0 ANPR Functionality for Search, Notification, and Access Control (via DIO) by License Plate. Includes MMCR (Make, Model, Color) as Secondary Search Criteria.

1.3 VX-5M650-B-RIAW-X-ANPR TECHNICAL SUMMARY



Hardware			
Image Sensor	1/2.8" 5.14M CMOS	**Sensor Max Resolution**	2592(H) X 1944(V)
Lens	6~50mm	**Frame Rate**	30fps
Aperture	F1.6	**Operating Temperature**	-20°~ 50°
Lens Type	Motorized	**Operating Humidity**	10-90% RH (Non-Condensing)
Angle of View	D:8.6°~52°, H:6.9°~40.8°, V:5.2°~30.2°	**Impact Protection**	IK10
MIN. Illumination	0.08Lux 0Lux with IR (F1.6)	**IP Rating**	IP67
IR Distance	40m (164 ft)	**Material**	Aluminum-Die Casting
IR LEDs	H6IR	**Dimensions (W x D x H)**	310mm x 97mm
Shutter Speed	Auto / Manual (1/15 ~ 1/32000) Anti-Flicker Slow Shutter (1/2,1/3,1/5,1/6,1/7.5, 1/10)	**Weight**	1.2kg
Day & Night	TDN (True Day & Night)	**Storage**	microSD/SDHC/SDXC : 1TB max. VIGIL CLOUD 256GB max.
Wide Dynamic Range (WDR)	120dB	**Power supply**	DC12V (Adapter is not included) PoE IEEE 802.3at Class4
Certifications	FCC Part 15, Subpart B, Class A CAN ICES-3 (A)/NMB-3(A) UL and ULC Safety CE NDAA Compliant	**Power consumption**	DC12V Max 13.2W PoE Max 14.4W
Ethernet	RJ45 (10/100Base-T)	**Alarm In / Out**	1/1 Bare Wire
Internal Mic	Yes	**Audio Compression**	G.711
Audio In / Out	1[1.0Vms, 3K ohm]/1	**SIP/VoIP Support**	SIP VoIP

Software			
Video Compression	H.265 H.264 MJPEG	**Security**	HTTPS(SSL) IP filtering 802.1x
Video BitRate	100Kbps ~ 10Mbps	**Protocols**	TCP/IP UDP AutoIP RTP(UDP/TCP) RTSP NTP HTTP HTTPS SSL DNS DDNS DHCP FTP SMTP ICMP SNMPv1/v2/v3(MIB-2) ONVIF
Video Streams	2592x1944p30 + 480p30 with H.264,H265 + MJPEG	**Digital Noise Reduction**	3D DNR
Auto Gain Control	Auto	**Sys. Compatibility**	CGI API ONVIF Profile S
Event Trigger	Motion Alarm, Network Disconnection, Temperature Critical, Illegal Login, Schedule, Sensor Detection.	**Supported Analytics Rules (EBDL)**	Intrusion Detection, Zones & Lines, Tamper Detection, Appear Filter, Disappear Filter, Dwell Filter, Enter Filter, Exit Filter, Stopped Filter, Counting, Counting Lines, Object Color, Direction Filter, Logical Rules, Tailgating Filter, DL People Tracker, DL Object Tracker, Metadata
Event Notification	FTP, Email, Alarm Out, SD Card	**ANPR / LPC**	Optional ANPR Functionality - Full Integration with VIGIL v13.0 ANPR Functionality for Search, Notification, and Access Control (via DIO) by License Plate. Includes MMCR (Make, Model, Color) as Secondary Search Criteria.

2 REQUIREMENTS FOR PLATE IMAGES

The most important factor in successful plate capture is also the obvious; a clear image of the target license plates.

The following examples show two images (daytime and night-time conditions) ideal for successful plate number recognition:

Figure 2-1: Ideal License Plate Images - Day (Left) and Night (Right).

The plates are legible with all characters visible. Recognizing license plates is more challenging if the images have any of the following characteristics or artifacts:

- Overexposure
- Blurring
- Distortion
- Uneven Lighting
- Low contrast
- Bad weather conditions

Figure 2-2: Undesirable License Plate Images

As a general guide, if a person has difficulty reading a plate its likely the software will also struggle to successfully capture the plate numbers.

3 CAMERA INSTALLATION - BEST PRACTICES

Utilize the guidelines laid out in the proceeding sections of this solutions guide to ensure optimal installation specifications of your camera. This, in-turn, will help support efforts by the camera's on-board ANPR engine to obtain the clearest possible images of the target vehicles and successful recognition / capture of their license plates.

3.1 DETECTABLE RANGE

The objective of an ANPR system is to capture an image with a good clear plate. In order to achieve this, the characters on the plate should have a height between 25-35 pixels for North American–style plates which are physically smaller and have a narrow character stroke width in many states. For larger plate formats (e.g. EU 50cm plates), a height of 20-30 pixels may be necessary.

Certain Middle East and Arabic plates are smaller still and will need an even greater character pixel height (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 set up so that the combination of the distance, the lens's focal length, depth of field and the camera's resolution provide an image that can be accurately analyzed by the recognition engine.

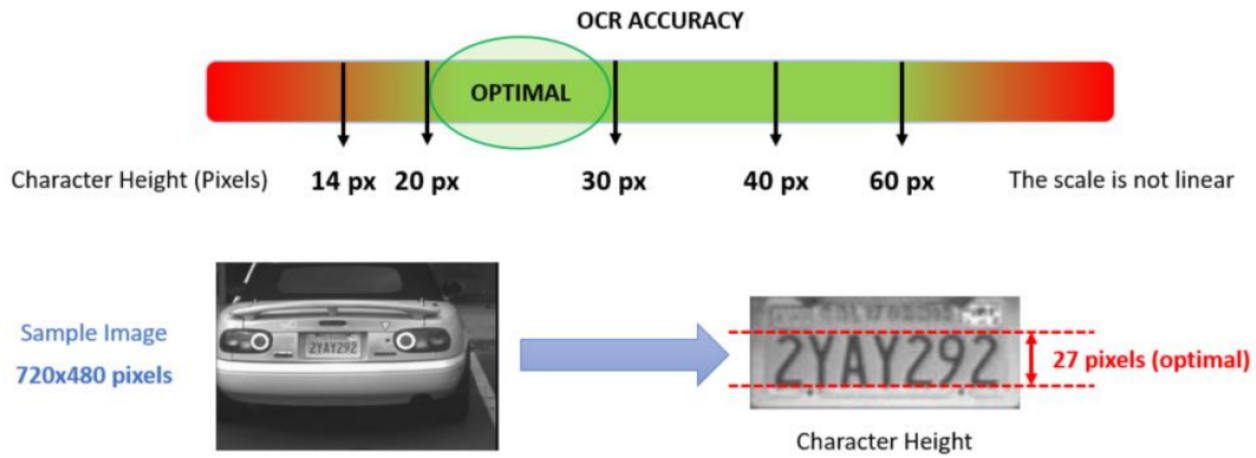


Figure 3-1: Optimal Plate Character Height (in Pixels)

Note: 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.

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. As both VISIX ANRR cameras have adjustable zoom, both the minimum and maximum focal lengths are stated.

Model	Focal Length	Recommended Distance
VX-5M622-MB-RIAW-X-ANPR	6-22mm	~23-45ft (7-14m)
VX-5M650-B-RIAW-X-ANPR	6-50mm	~23-98.4ft (7-30m)

Maximum Forward Distance depends on lens zoom, however, should not exceed the effective IR range to ensure successful capture in low-light conditions.

3.2 VERTICAL ANGLE

Speed	Max Vertical Angle (Degrees)
25MPH (40KM/H)	30°
45MPH (70KM/H)	25°
75MPH (120KM/H)	15°

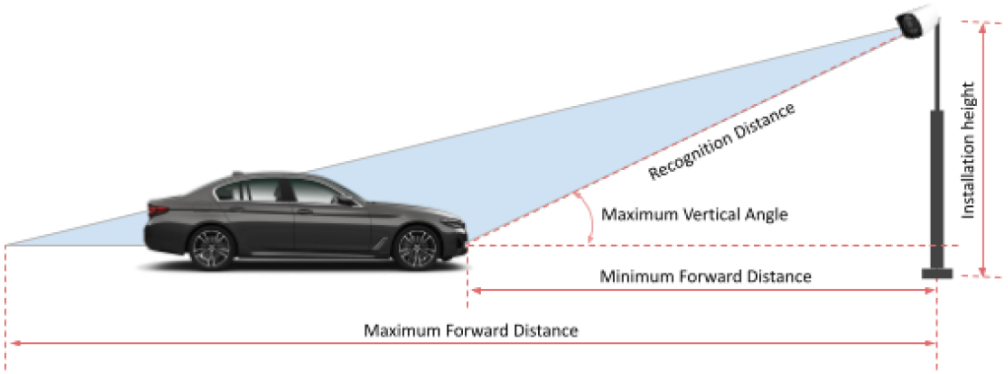


Figure 3-2: Vertical Angle - Side View

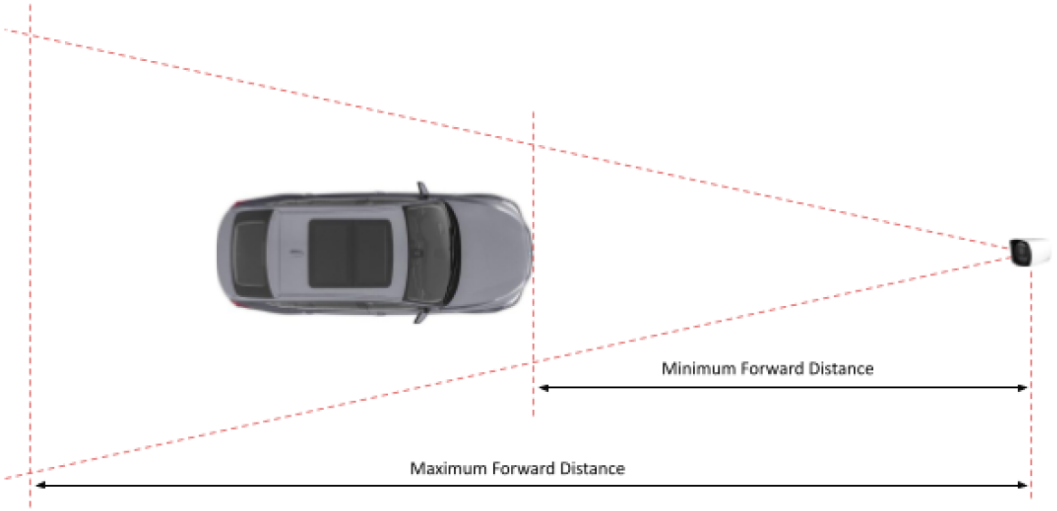


Figure 3-3: Vertical Angle - Top View

3.3 DEPTH OF FIELD

The depth of field determines the range around the focal plane where the image is still acceptably sharp

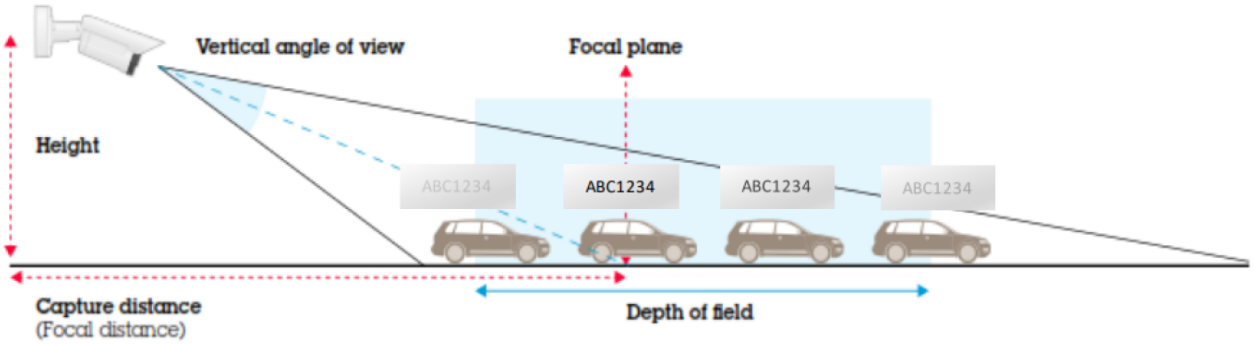


Figure 3-4: Understanding Depth of Field

The camera needs to be well focused for the license plates to be sharp and readable. The image is, however, sharp not only at one specific distance, but in a range of distances around the focal plane, as illustrated in figure above. The size of this range is called the depth of field (DOF). The DOF is normally larger for a longer capture distance.

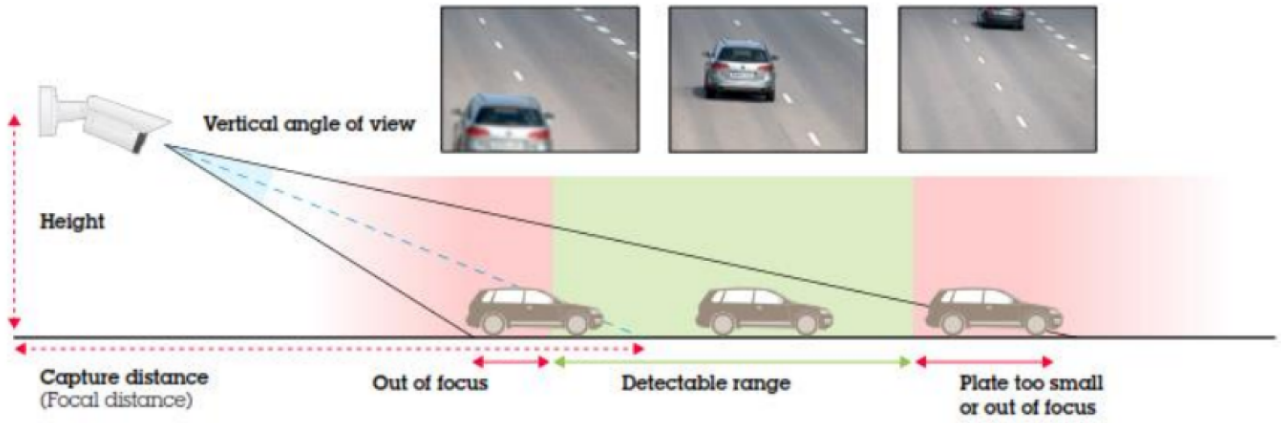


Figure 3-5: Depth of Field - How DoF Effects Detectable Range

The detectable range is the range of distances along the road where the license plate is visible and readable (green in the above image). Ideally the detectable range is the full field of view of the camera, but this is not always the case. The detectable range can be limited by the depth of field of the camera, and vehicles that are far away are sometimes too small to be resolved well by the image sensor.

3.4 HORIZONTAL ANGLE

Maximum Horizontal Angle for recognition: 25 degrees or below

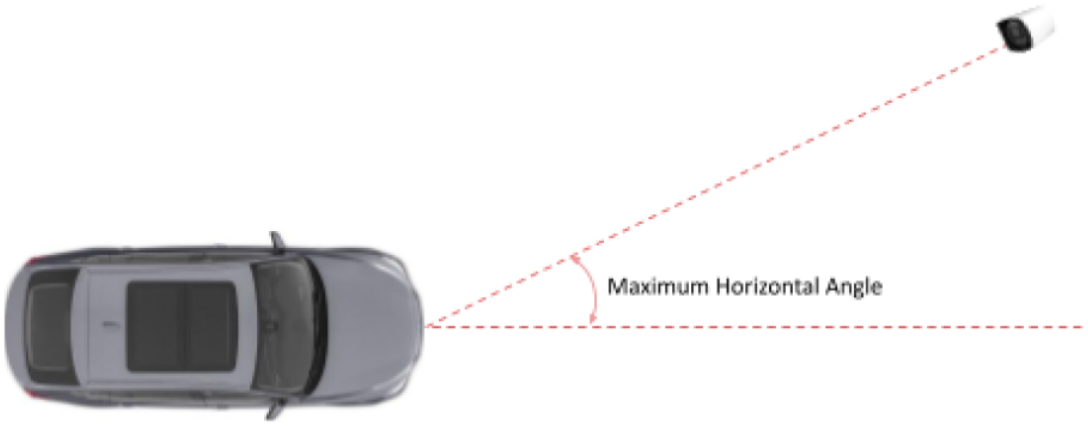


Figure 3-6: Horizontal Angle

3.5 ROLL (SLOPE) ANGLE

For the best results, check the angle of your plate compared to the horizontal angle and rotate the camera to less than 25° as shown below.

Figure 3-7: Roll (Slope) Angle

3.6 RECOGNITION ZONE

Typically, setting up a large inner ROI to offset some margins and guarantee that once the license plate is read for rear view or frontal view the whole vehicle is in the view.

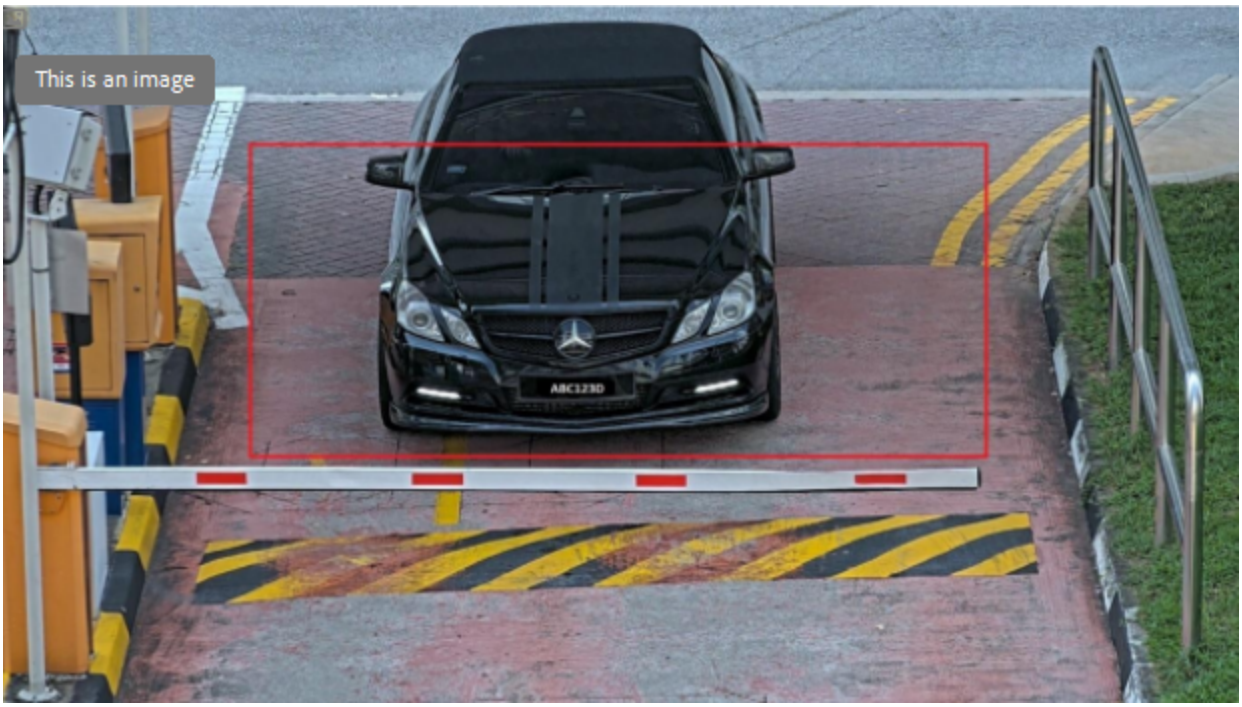


Figure 3-8: Recognition Zone

4 CAMERA SETTINGS

For best image capture results, please check and configure (if necessary) the following camera settings via the camera's browser UI:

1. Set to camera to *autofocus*. If the number plate is still not in focus, fine-tune using manual focus.
2. Turn off WDR (Wide Dynamic Range).
3. Select **Auto** for Day & Night mode.
4. Set **Max** value of the *Shutter Limit* depending on the application
    a. Gate or Parking Maximum (10m) exposure time 1/480 (2 milliseconds)
    b. Road or Street Maximum (30m) exposure time 1/960 (1 milliseconds)
5. Set *Gain Limit* to **24 dB** to optimize the blur and noise trade-off in most scenes. If the license plate gets overexposed, adjust the max gain to **9 dB**.
6. Set *Auto Exposure* to **On**.
7. Set the input video resolution of the ALPR plugin depending on the application
    a. Gate or Parking (3-10m): 1280 x 720 pixels or higher
    b. Road or Street (15-30m): 1920 x 1080 pixels

Note: Please refer to the ANPR (MMC Plugin) Video settings section for more information on input video resolution of the ANPR plugin.

- The *Exposure Settings in Night* setting, located in the advanced ALPR Settings (SETUP > ALPR > Advanced) automatically adjusts the exposure settings above to allow for plate capture in night mode, overriding exposure settings (SETUP > CAMERA > EXPOSURE SETTINGS). Once you activate the ALPR plugin, *Exposure Settings in Night* is enabled.

Test the above settings by running through the scenario with a vehicle. For best results, test the settings in the darkest lighting conditions to ensure adequate image capture quality in both ideal and low-light conditions.

5 ALPR MMC PLUGIN

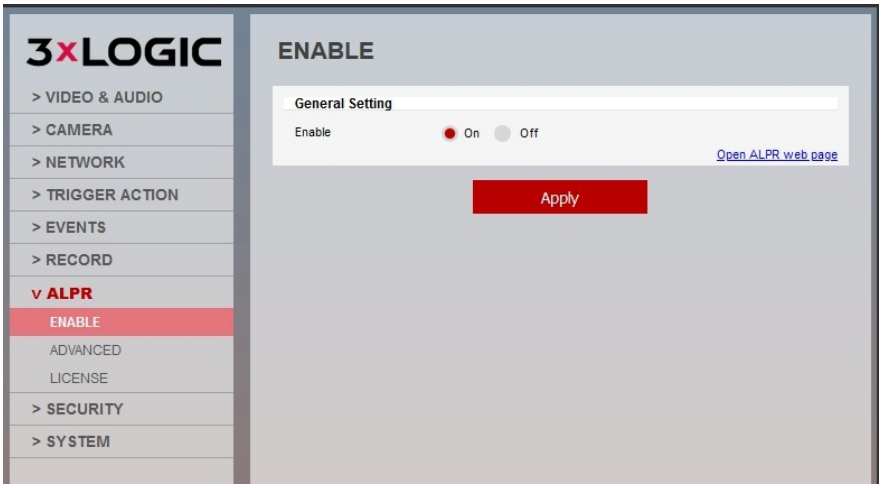
Although a basic ANPR toolset exists within the VIGIL suite, advanced settings and advanced ANPR (ALPR) configuration can be performed via the camera's on-board MMC ALPR plugin.

Please consider that though the content of this section details many options for altering configuration and behavior of the ALPR plugin, 3xLOGIC has preconfigured many of the required default settings out of the box.With this in mind, several common reasons you may need to enter the plugin WebUI are:

- Changing/Adding countries (by default, the plugin is configured out-of-the-box for use in Canada and the US).
- Creating specific ROI's. (by default the ROI is the entire FOV).
- Adjusting Min/Max OCR Character height, depending on the cameras FOV and the corresponding plate size.
- Troubleshooting missed plate reads.

Continue through this section of information on configuration of the ALPR MMC plugin.

5.1 ACCESSING ALPR PLUGIN



To access the ALPR plugin settings and monitoring page:

a. Click the **Open ALPR web page** link on the *SETUP* > *ALPR* > *ENABLE* page, or

b. Enter **http://<camera IP address>/cgi-bin/admin/alpr.cgi** directly into your browser.

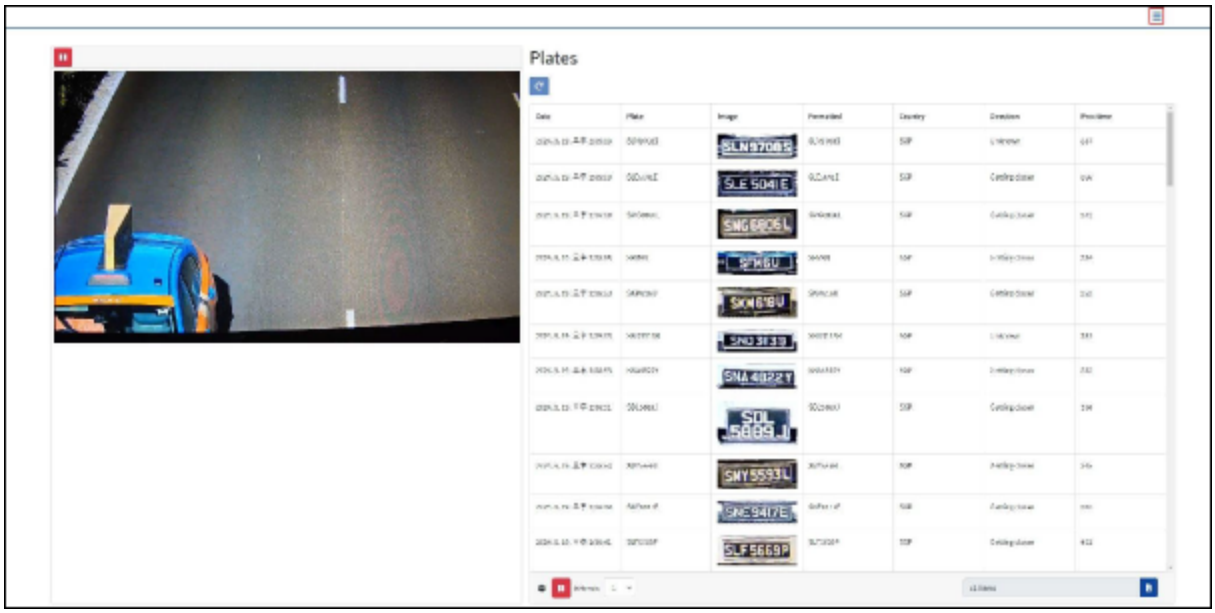
Once the plugin page deploys, the icon in the top right corner will reveal the following menu optios::

- **Plates:** To display a live feed of all the most recent plates read (if configured)
- **Settings**: To configure VaxALPR On Camera software
- **Region of Interest (ROI)**: To add/edit ROIs to include or exclude in the OCR analysis.
- **Reporting:** To configure reporting options for VaxALPR On Camera.
- **Blacklist**: To manage a Blacklist (e.g. to sound alarms).

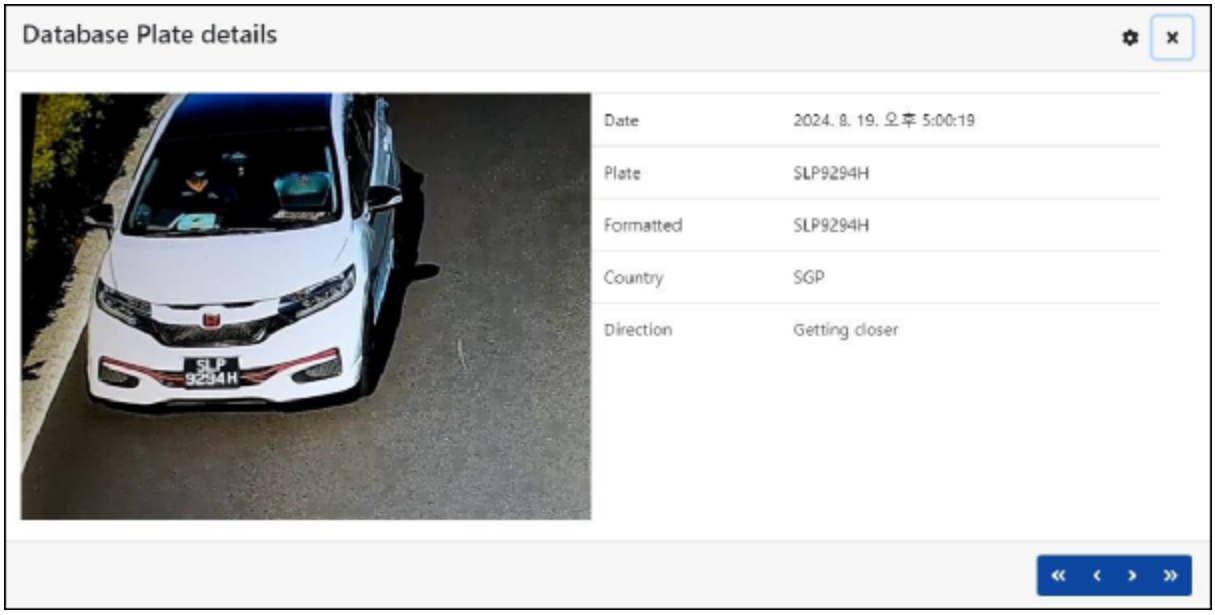
- **Whitelist**: To manage a Whitelist (e.g. to activate a relay) (These appear if they have been enabled in Settings)
- **Database:** To review and search the list of recorded plates (If configured)
- **Download Config**: To export the VaxALPR On Camera settings to an XML file. The export will not include the black/whitelists or the recorded log file of plates.
- **Upload Config**: To import the VaxALPR On Camera settings from an XML file
- **Download license**: To download the activated license.
- **Reset to default**: To reset the settings as the factory default settings.
  - **Logfile**: To display the latest System Log for debugging purposes

5.2 ALPR PLUGIN - PLATES

The 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. 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 a plate to view the plate read details:



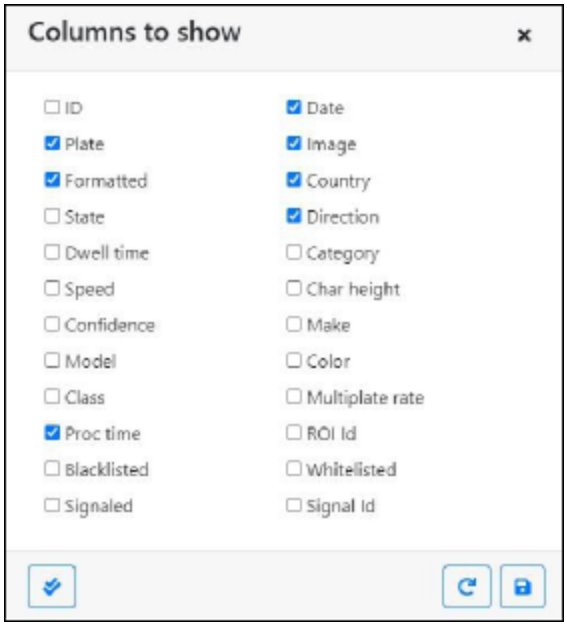
5.3 Live Video Button

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 Blue Play icon to start the live video.

If you do not need to see live video then press the Red Pause icon.

Note: 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 for which you may be charged for.

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



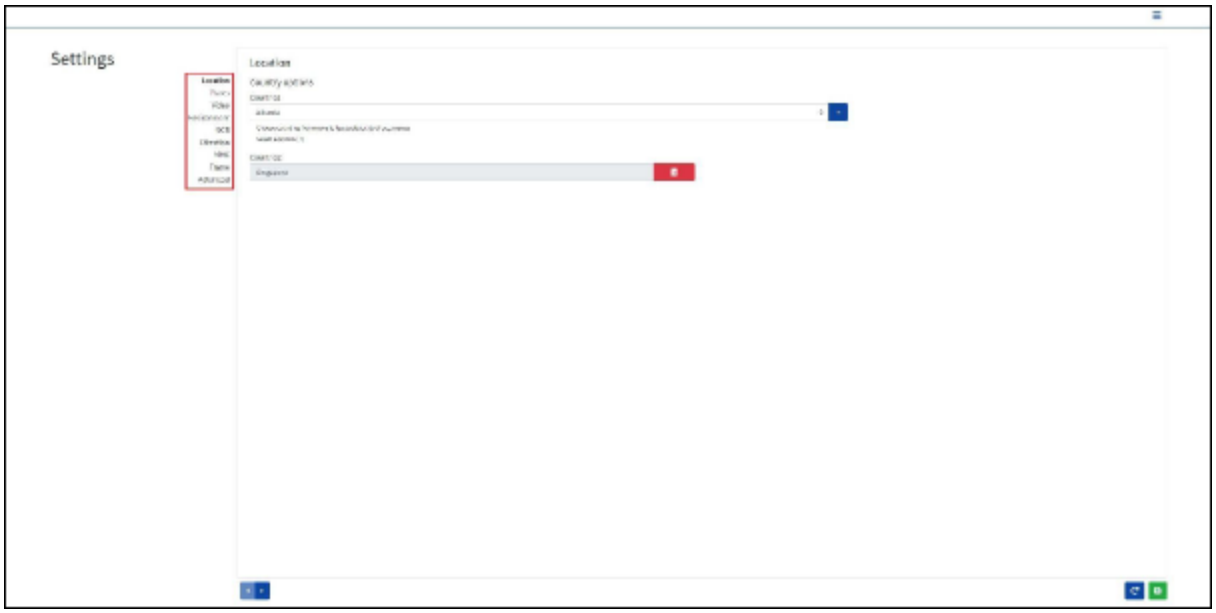
Note that you can get a more comprehensive view of the vehicle from the Database settings described.

5.4 (OCR) Processing Time

Note that if you do not enable the database service, you can look at the logfile to see the OCR processing time. When you view the OCR processing time you will see the multiplate rate alongside it. So if the multiplate rate is say 5 and the OCR processing time shows as 150ms, – then that means that ONE of the 5 reads (the one used to display the actual read being examined) took 150ms.

5.5 ALPR SETTINGS

The Settings page allows you to configure all of the LPR parameters. The settings are divided into different sections.



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:

You can abandon your edits and reload the currently saved configuration file by clicking the Reload symbol, bottom right:

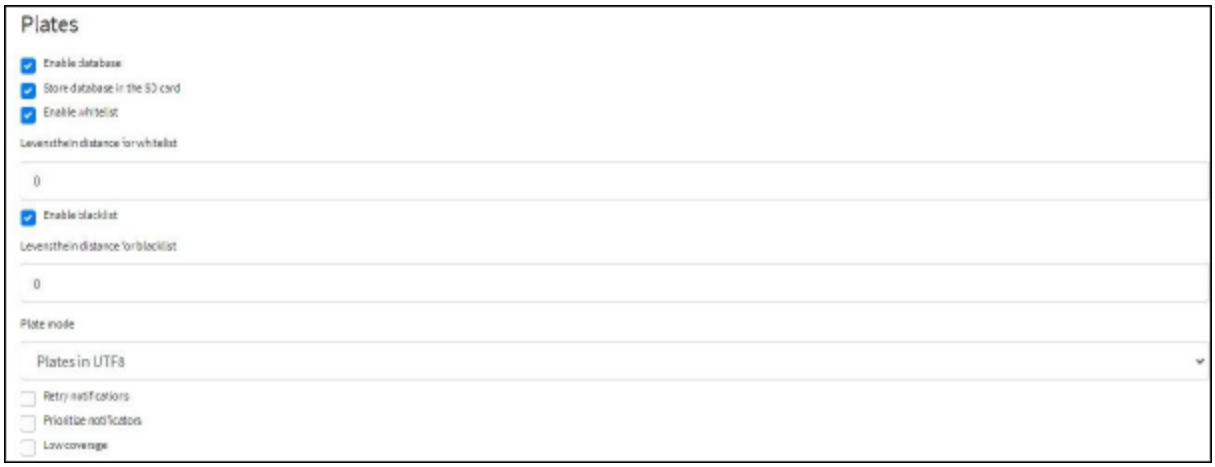
You can also save the current settings at any time by clicking on the disk symbol, bottom right:

5.5.1 Location Settings

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.)

5.5.2 Plate Settings



- **Enable database** - To generate an on-board database (log file) of detected plates, select the 'Enable Database' checkbox. The database is created on the flash memory of the camera, the number plates are stored up to 500 records. But fewer records may be stored depending on the size of each image depending upon image complexity, resolution etc.
- **Store database in the SD card** - If the SD memory is installed at the camera and this option is enabled, it creates the database on the SD card memory instead of the flash memory of the camera. It can store up to 100,000 records.

> **IMPORTANT**: when you enable or disable the "Store database in the SD card" option, the current contents of the database will not be preserved. A 32GB MicroSD is included with the camera and "Store Database in SD card" is enabled by default."

Database

IMPORTANT: The application only checks for available space on the flash memory of the camera or microSD card when launched and if it becomes full then no new plate reads will be added to the database. There is a default maximum size of the records and when this limit is reached the oldest records will be overwritten.

Note: If you are using a small microSD card then the card may become full before this circular buffer limit is reached and so no new reads will be written to the card and so you should reduce this buffer size accordingly. There is no definite standard record size as this depends on video resolution, the complexity of the image, the jpeg compression factor used etc. As a rough guide a 32GB microSD card would store approximately 80,000 reads at 1920h.

- **Enable whitelist** - Select this checkbox to enable plate checking against a predefined Whitelist.
- **Enable blacklist** - Select this checkbox to enable plate checking against a predefined Blacklist. Please refer to the whitelists and blacklists section for more detailed information.

> **Note:** VIGIL Server maintains its own internal Allow/Deny lists for triggering events. The internal whitelist and blacklist should only need to be configured for standalone usage or with 3rd party systems..

Plate mode

- **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 from 1 to 60 seconds.
- **Prioritize notifications** - *See low coverage mode below*. Select this checkbox for a hybrid method of sending plates after a communication or back office failure. This mode causes the plate to be read and sent to the various endpoints (your reporting options) before anything else. i.e. before displaying the plate on the GUI, before storing it on the microSD card, etc.
  If the network / communications are working well then new reads are sent in real time. If not then they are added to a queue to send. You may want to then decrease the retry time to say 0 seconds to catch up.

Low coverage mode (FIFO) - Select this checkbox if your camera is remote and the communication links (WiFi or 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 trying.
With Low Coverage Mode selected, reads are retransmitted after a longer interval reducing the chance of an ever-increasing backlog.
Accordingly, 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

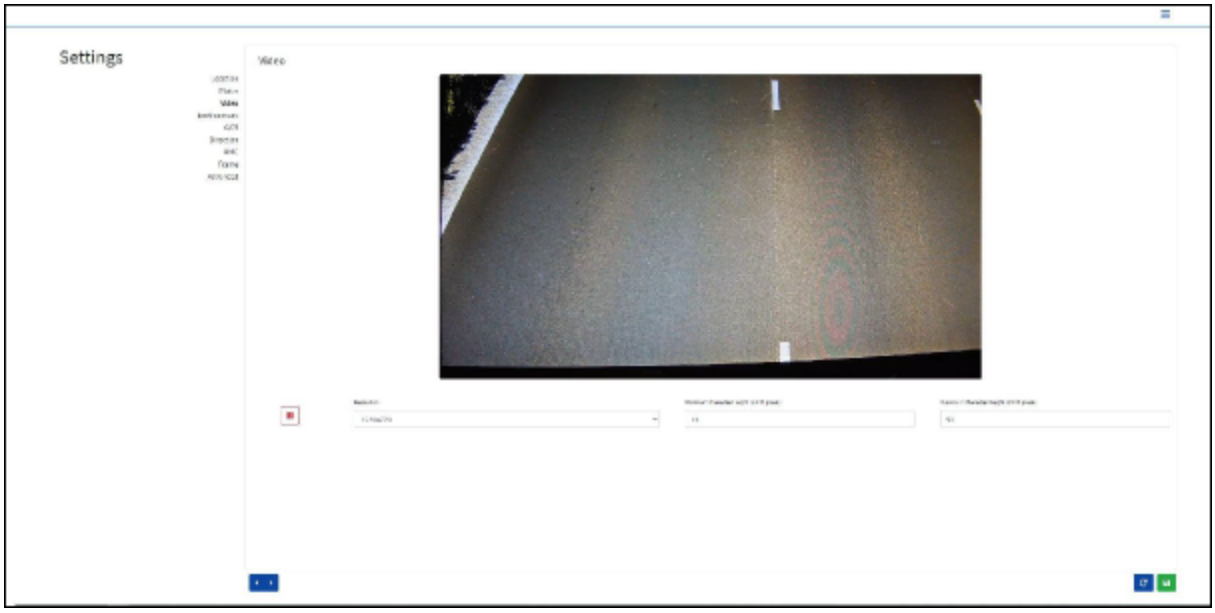
Normally the transfer process takes approximately 100ms without image, and 300ms with image. If the response from the server takes more than 5 seconds, you will get a timeout error on the camera, BUT this does not mean the data hasn't arrived at the endpoint.

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.

5.5.3 Videos Settings

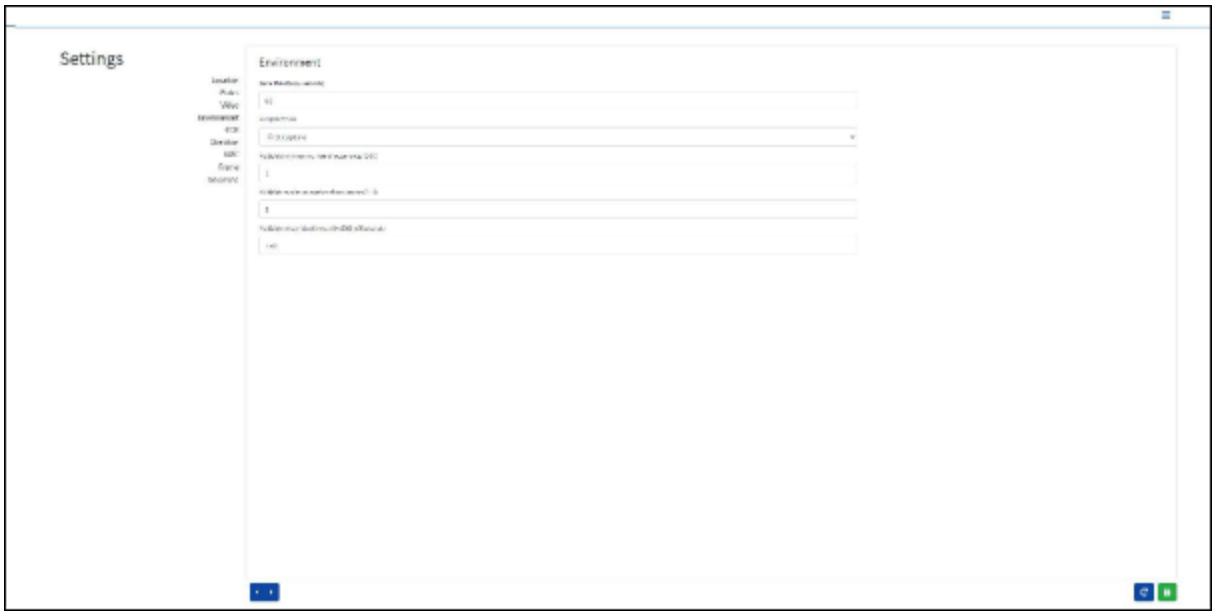
This section displays real-time video based on the current settings.



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 at the bottom of the image.
- **Resolution** - Select the desired Resolution from the drop-down list. Any changes will immediately be shown on the live display. Some cameras have a limited choice of available resolutions.
  NOTE: when the camera is installed to read plates in a single lane then a resolution of 1280x720 is recommended. When the camera is installed to read plates in wide or multiple lanes, a resolution of 1920x1080 is recommended.
- **Minimum Character Height (14-70 pixels)** - This is the minimum height for license plate characters to be readable. With proper camera zoom adjustment, plate characters should be 20-30 pixels high in the intended reading area of the field of view. Setting this value too low may cause misreads due to excessively small plate images.
  Note: 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)** - This is the maximum height for license plate characters before they become too large to process effectively. If the camera's zoom ratio is set correctly, plate characters should not exceed 50-60 pixels in height within the intended reading area of the field of view. Setting this value too high may lead to processing errors or missed detections, as oversized characters can obscure important details or extend beyond the recognition algorithms' optimal range.
  NOTE: The recommended difference between the min and max heights is about 10-20 pixels.
- **Verifying the Character Height configuration** - To verify that the height settings are correct, click over the live video to show two rectangles which represent the minimum and maximum thresholds. The height of characters on the plate should fall within these two rectangles. You can drag these rectangles around the screen to where your target plates are.

5.5.4 Environment Settings



- **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
- **Multiplate frame 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.

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

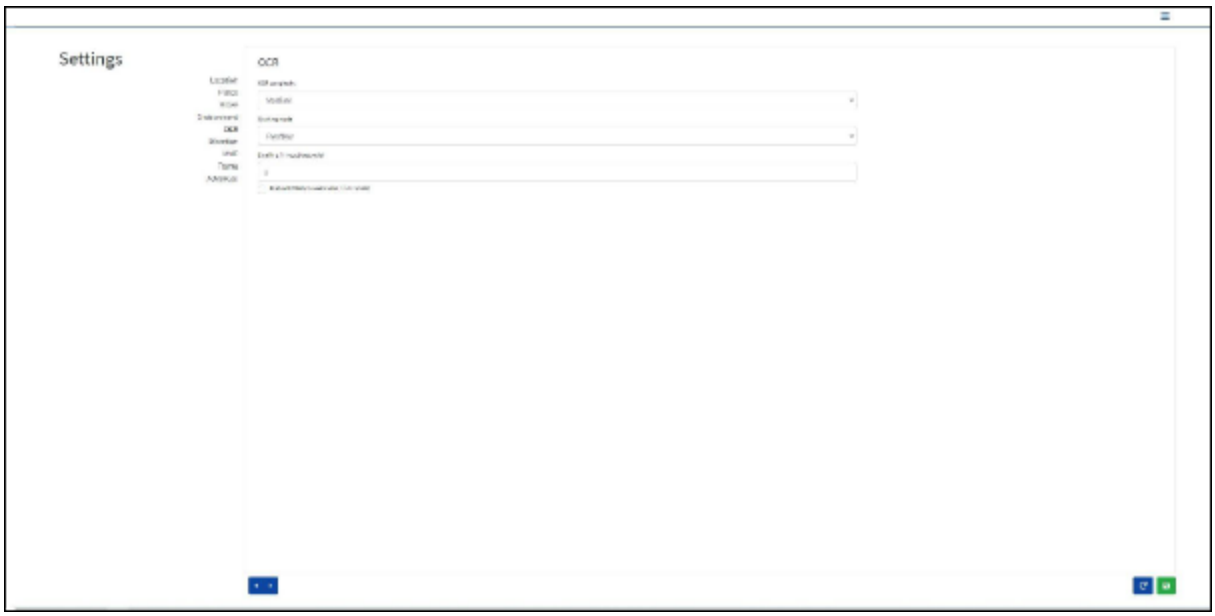
In free-flow mode the engine continuously analyzes video frames and reads and reports plates. It makes a final decision on the plate read after an interval of time - the maximum recognition timeout period. There is a dedicated time counter for every plate which starts counting after the first read.

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 second) 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.

5.5.5 OCR Settings



- **OCR 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 be signaled (triggered.)

    NOTE: Higher complexities give more accurate reading but make the ALPR engine run slower.
- **Working mode** - Select the appropriate option from the drop-down list. There are two 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. - 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 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.

- **Enable IR Mode (discard color information)** - Enable this mode to only analyze plates in monochrome (from the green channel). - This speeds up the OCR processing time as less data has to be manipulated but all saved and transmitted images are subsequently in monochrome.

5.5.6 Direction Settings

- **Vehicle 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 four options for normal usage.

5.5.7 MMC Settings

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 ALPR plugin recognizes approximately 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.

If the camera is installed 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 ALPR plugin will report vehicle types including: motorcycle (if it has a plate), car, pickup, van, truck and bus.

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

5.5.8 Frame Settings

This section allows the user to control the image compression and define a watermark for the saved / transmitted images.

- **JPEG Compression Quality (1-100)** - 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. A setting of 80 is a good compromise.
- **Image Patch JPEG Compression (1-100)** - Select the required compression for the plate patch as above. This is the small image of just the vehicle plate that is saved or transmitted.
- **Crop Images** - When a smaller image file size is needed you can use the 'Crop images' setting. This crops an area around the license plate to apply the compression to. This is better than over-compressing the whole image which will result in a very low-quality result. When selected, a dialogue box opens allowing you to specify a width and height of the cropped image to be saved/transmitted.
  In this case a landscape image of 1280x480 will be saved:

- **Watermark** - When still images are saved and/or transmitted to another back office device using one of the other reporting options then the Watermark feature may be used to 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 Dynamic Text Replacement Reserved Words.
  You may then specify the font size to be used from a drop-down list and also select one of four preset positions for the watermark to be overlayed.

In this example the Date, time in UTC format, plate details & MMC have been specified:

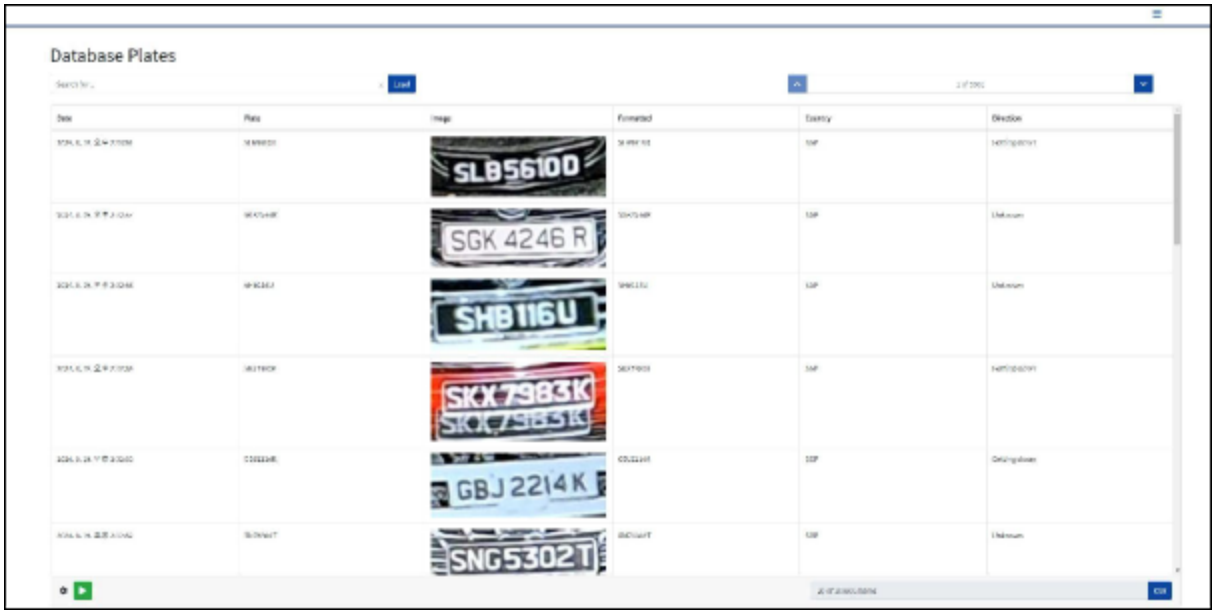
5.5.9 Advanced Settings

The Advanced dropdown enables creation of a log file to be created with differeing levels of complexity to aid with identifying problems such as communication errors Etc.

5.6 PLATES DATABASE

If you activate the database service, you can store up to 500 license plate numbers in a local database. If an SD memory card is installed in the camera and the "Store database in the SD card" option is enabled, you can store up to 100,000 license plate numbers. Once this limit is reached, new plate reads will replace the oldest ones. However if the microSD card becomes full before the limit you set is reached then data will no longer be able to be saved.

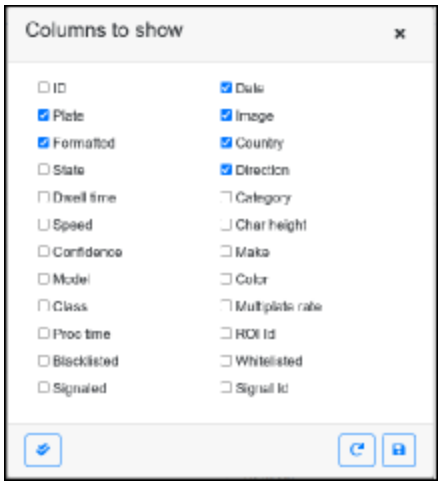
For more information, please refer to the Plate settings.



LOADING AND NAVIGATING THE NUMBER PLATES IN DATABASE

When the database page is opened, it automatically reads and lists the records stored up to that point. The list can be refreshed by pressing the Load button(Load). When the Play button(▶) is activated, the list can be periodically updated if there are new recordings.

You can add the column the information you want to see for each plate using the settings icon(⚙) in the bottom left corner.



Note: 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.

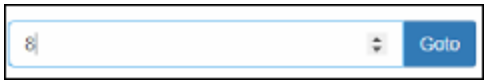
When setting up a system the most useful to display include the Height (average character height), OCR (processing time), Confidence, Multiplate (how many reads were processed) etc.

If there are more than 20 plate records in the database, the results are paginated. You can view the previous or next page using the up/down buttons, and you can also directly enter a target page number to navigate to that specific page.

For example, the current view shows page 2 of 11 total pages of plate records in the screenshot below.

To jump directly to page 8,

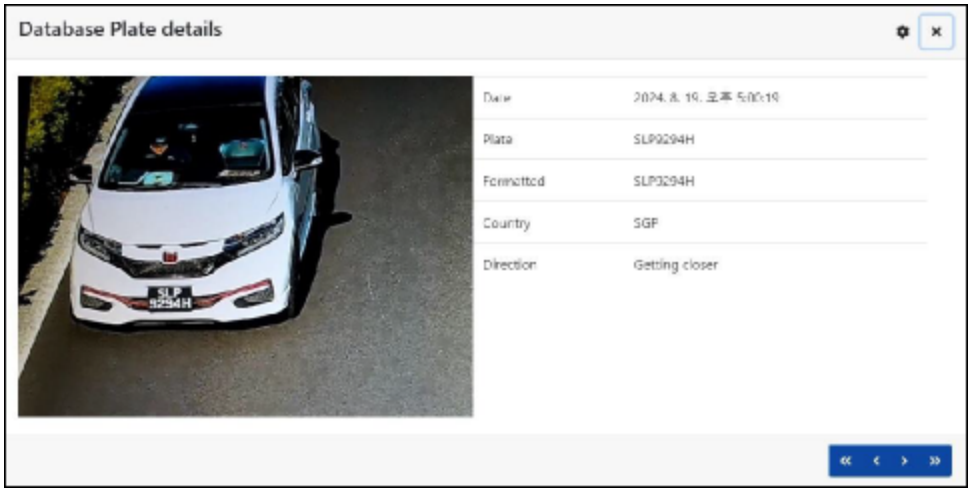
1. Click on the 2/11 display in the pagination control,
2. This should open an input field where you can type the desired page number.
3. Enter "8" into this field.
4. Click the "Go" button or press Enter.



When each record is clicked, more detailed information about the license plate can be viewed.

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 or last record in the database.

SEARCHING THE NUMBER PLATES

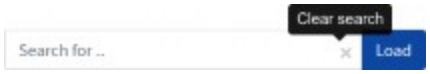
To search for a specific plate or partial plate stored in the camera, enter the plate number in the Search box and click the button. In this case, only license plates that exactly match the entered characters will be searched.

To search using only a part of the license plate number, you can use % as a wildcard character. For example:

- To search for license plates starting with A20: A20%
- To search for license plates containing A20: %A20%
- To search for license plates ending with A20: %A20

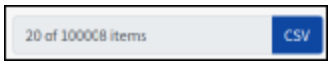
It allows for more flexible searching, enabling users to find plates that start with, contain, or end with specific characters.

If you want to clear the search criteria, click the x button inside the search window zone, and then click the Load button.



EXPORTING THE NUMBER PLATES

To export the current list of license plates, simply click the CSV button.



This will save a .csv file containing the list to your downloads folder.

IMPORTANT: while this method works well for small lists (like the example of 8 items), downloading the full database requires a different approach. Due to system limitations, you'll need to download the database in chunks of 20 records at a time. To do this:

1. Pause the live reads
2. Select each page of records individually
3. Download each page separately

For comprehensive access to all camera records, we recommend sending the plate records in real-time to a dedicated VMS such as VIGIL Server. This software offers a wide range of reporting protocols and methods, providing more efficient data management. For more details on this, please refer to the Reporting section of our documentation.

5.7 WHITELISTS / BLACKLISTS

ALPR plugin offers powerful functionality to match captured license plates against customizable blacklists or whitelists. This feature generates events for further processing, enhancing your vehicle monitoring and access control capabilities.

LIST STORAGE AND CAPACITY

The plugin stores these lists either in the camera or microSD card:

1. If a microSD card is installed in the camera, lists are stored there, with a capacity of up to 1,000,000 plates (depending on available space).

2. Without a microSD card, lists are stored in the camera's internal memory, which has a limited capacity of 200 plates maximum.

ENABLING WHITELIST / BLACKLISTS

Before using blacklists or whitelists, ensure that you've enabled the checking feature in the Plate settings. Refer to the earlier sections of this manual for detailed instructions on how to do this.

Managing Whitelists / Blacklists

LOADING WHITELISTS / BLACKLISTS

When opening the Whitelists / Blacklist first

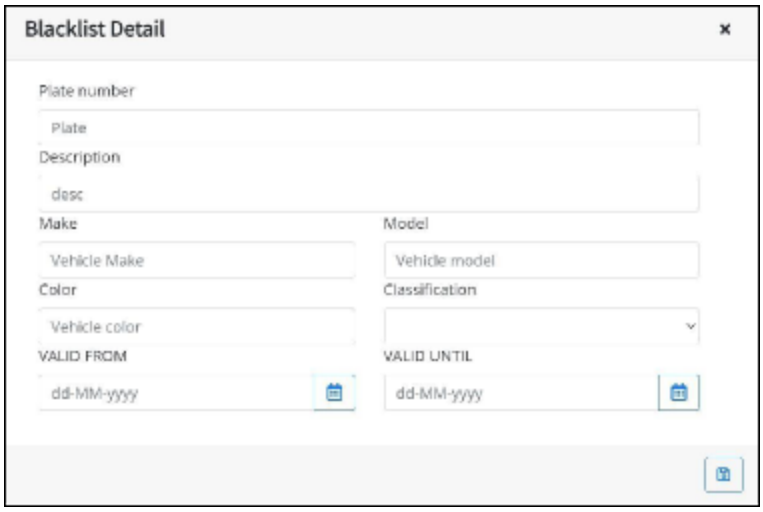
- If the list is empty, you'll see a message indicating no plates have been added.
- If plates are already present, a message will confirm how many plates have been loaded into temporary memory.

If you want to update the Whitelists / Blacklists from the camera, click reload list( ) button and wait for the confirmation (or error message).

ADDING A PLATE TO WHITELISTS / BLACKLISTS

To add a new plate to the Blacklist:

1. Click the add ( ) button.
2. Enter the plate details:



- **Valid Plate Number** (e.g., HA54ETR)
  Note: Plate numbers must not contain spaces or special characters like "-".

- **Optional Description**
- **Valid From** and **Valid To** dates
  Note: For whitelists, these dates determine when the vehicle is allowed access Note: The maximum "To" date is currently set to 31/12/2030 due to a technical limitation.
- **Make**, **Model,** and **Color** (optional)
- Vehicle **Classifiiction** from the drop-down menu (e.g., car)
  Note: This may differ from the MMCV details generated by the program based on the vehicle's shape.

3. Click the save button to add the plate, or close the window to discard changes.

EDITING A PLATE

1. Click on an existing plate entry to open the edit window.
2. Modify the necessary fields.
3. Click Save to confirm changes.

REMOVING PLATES

- To remove a single plate: Click the delete button next to the plate and confirm the deletion.
- To remove all plates: Click the remove all button on the right bottom of the page and confirm the action.

EXPORTS AND IMPORT WHITELISTS / BLACKLISTS

ALPR plugin provides functionality to import and export your whitelist or blacklist data using CSV files. This feature allows for easy bulk management of your lists, enabling you to update, backup, or transfer your data efficiently.

To import a list from a CSV file:

1. Prepare your CSV file with the required header fields: CLASSIFICATION, COLOR, DESCRIPTION, FROM, ID, and TO.
2. Click the import button.
3. Select the prepared CSV file from your computer.
4. The system will process the file and add the entries to your current list.

IMPORTANT:

- The first row of the CSV file MUST contain the field names as specified above.
- Use semicolons (;) as delimiters, not commas.
- Use hyphens (-) as date delimiters in US format (MM-DD-YYYY).

Sample CSV format:

classification;COLOR;DESCRIPTION;FROM;id;MAKE;MODEL;plate_number;TO
CAR;red;Fred Bloggs;2022-07-31T23:00:00.000Z;10;Audi;Q3;VHY777;2023-03-01T00:00:00.000Z
VAN;blue;Harry Oldham;2022-07-31T23:00:00.000Z;11;Ford;Kuga;ABC123;2022-08-30T23:00:00.000Z
CAR;pink;Fozzie Bear;2022-01-01T23:00:00.000Z;12;VW;Golf;BCD234;2022-12-31T23:00:00.000Z

To export your current list to a CSV file:

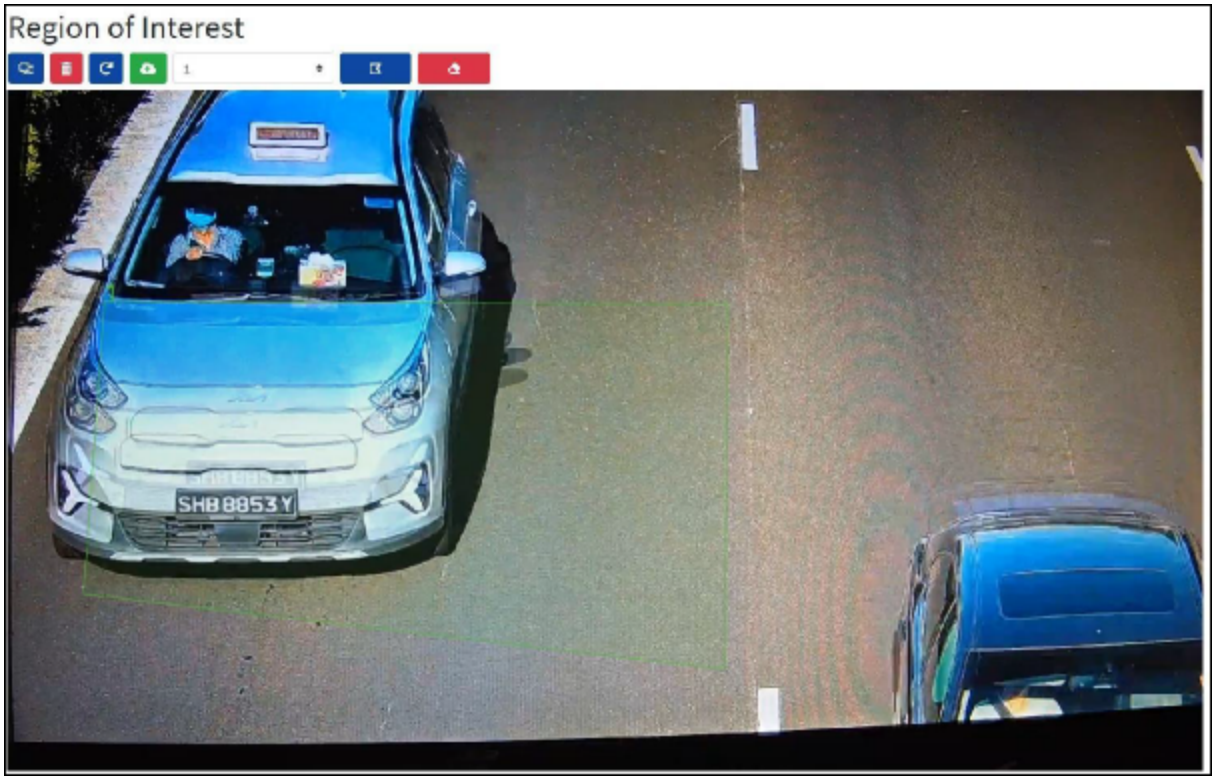
1. Click the export button in the ALPR plugin interface.
2. The system will generate a CSV file containing all entries in your current list.
3. The file will be saved as "{export data}-blacklist.csv" or "{export data}-whitelist.csv" (depending on which list you're exporting) in your computer's default downloads folder.

This exported file can be used for backup purposes, for editing in a spreadsheet application, or for importing into another ALPR plugin.

5.8 REGION OF INTEREST

A Region of Interest (ROI), also known as a Crop Zone, defines an area within the video frame where OCR analytics are performed. ROIs can:

- Decrease OCR processing time
- Reduce false positives
- Limit OCR to specific areas, reducing processor load
- Eliminate false detections from non-plate objects



ROI BASICS

The ROI system in the ALPR plugin is flexible and powerful. Users have the ability to define polygon-shaped regions, allowing for precise control over the areas of interest. In more complex scenarios, multiple ROIs can be set up, though this is relatively rare.

Each ROI must be assigned a unique numeric identifier, which helps in managing and distinguishing between different regions. It's important to note that ROIs can be configured in two ways: they can either include the defined areas for OCR analysis or exclude them. However, when using multiple ROIs, all must be of the same type – either all inclusive or all exclusive.

For an ROI to be effective, the entire license plate must be either inside or outside the defined region to pass the recognition test. This ensures that partial plate readings, which could lead to inaccuracies, are avoided.

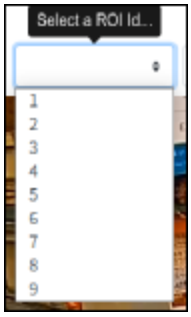
By mastering the use of ROIs, users can significantly enhance the performance and accuracy of their ALPR plugin, tailoring it to their specific surveillance needs and environmental conditions.

IMPORTANT: If multiple ROIs are added, they must all be of the same type (included or excluded).

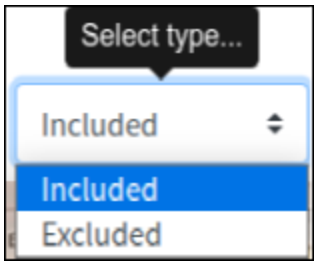
MANAGING ROIS

Adding ROIs

1. Click the add button to add a new ROI
2. Allocate an ID number to the ROI



3. For the first ROI, specify the ROI Type: Included or Excluded



4. Draw points on the live image to define the polygon (minimum 3 points)
5. Use the buttons to:

○ Start over

○ Cancel the new ROI

○ Confirm the shape

6. Add more ROIs as needed, selecting a new ID number each time

7. Submit ROIs using the Submit ROIs button to store them on the camera

Removing ROIs

- To remove one ROI: Select the ROI number and click the delete button
- To remove all ROIs: Click the delete all  button

Note: Deletion in the web interface doesn't affect ROIs saved on the camera until you submit changes

Editing ROIs

1. Select the ROI ID from the list and click the edit button
2. Modify points as needed:
   - ○ Add extra points by moving the cursor and clicking
   - ○ Clear all existing points to start over

3. Confirm changes with confirm button or reject them using the cancel button

Saving Changes

- Click the submit ROIs  button to save all ROIs to the camera's memory
- Wait for the confirmation message

Note: Once deleted, an ROI cannot be recovered. To avoid unexpected problems, It's recommended to periodically backup the ROI configuration by downloading the current configuration XML file.

Reloading ROIs

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

Best Practices

1. Use ROIs to focus on areas where plates are likely to appear
2. Exclude areas that might cause false positives (e.g., house windows, road signs)
3. Regularly review and adjust ROIs as needed
4. Always backup your ROI configuration before making significant changes

6 CAMERA SETUP (ADD CAMERA TO VIGIL)

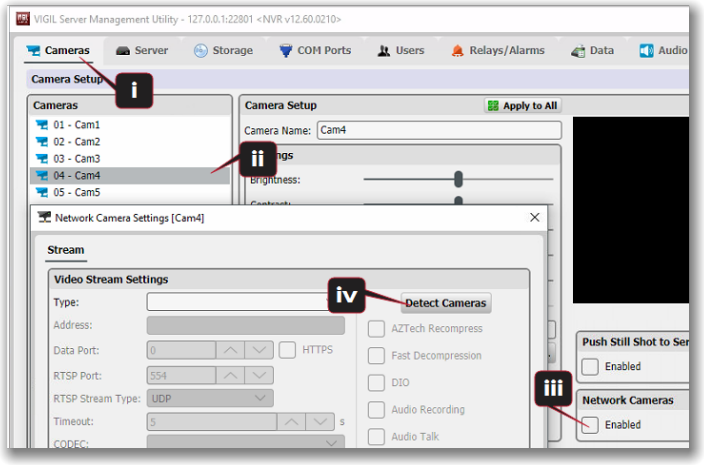
STEP 1: RUN DETECTION UTILITY / IDENTIFY CAMERAS

i. On your VIGIL Server system, open the **VIGIL Server Management Utility** (VSMU) and navigate to the **Cameras** tab (open by default).

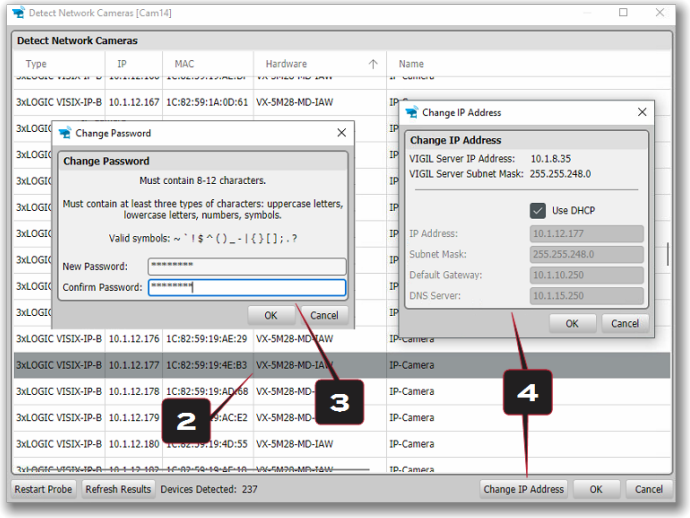
ii. Select the desired camera channel from the treeview.

iii. Enable **Network Camera**. The *Network Camera Settings* form will deploy.

iv. Click the **Detect Cameras** button. VIGIL's embedded camera detection utility's *Detect Network Cameras* window will now deploy and populate with a list of detected cameras on the network.



STEP 2: SELECT CAMERA



Select the desired camera from the list of devices.

STEP 3: CHANGE PASSWORD

To follow best security practices, you must first secure your camera by changing default credentials. The default username/password **must** be changed. Video will not stream from the camera until the default admin password is changed.

After selecting your new camera (double-clicking) from the list of devices, enter in the default username and password of **admin / admin** then click **OK**.

Once logged in, the *Change Default Password* prompt will deploy. Enter and confirm a unique password, then click **OK** to complete the change. A pop-up will confirm your success.

Note: The camera credentials will be set to defaults when a 'factory reset' is performed on the camera.

STEP 4: CHANGING CAMERA IP INFO (OPTIONAL FOR NON-DHCP)

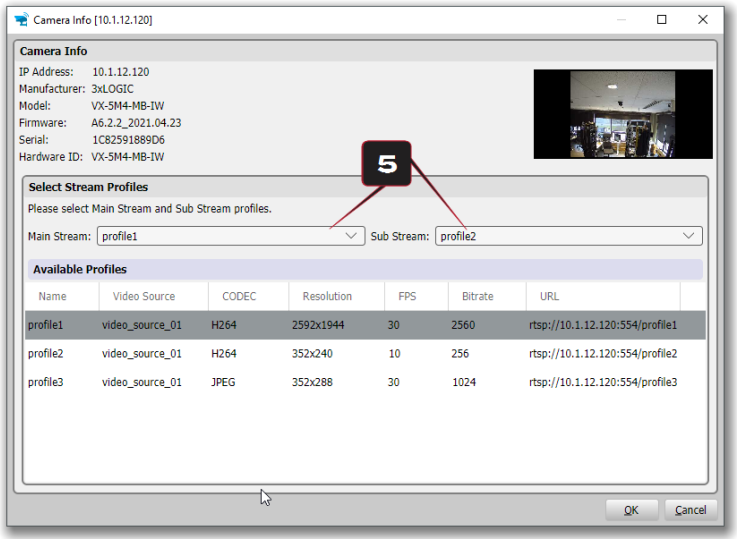
Note: If using DHCP, skip to Step 5.

The camera will use DHCP by default and should be assigned an IP by your network automatically. If the network lacks DHCP and requires a static IP for the camera, click **Change IP Address** with the camera selected in the *Detect Network Cameras* list. The *Change IP Address* window will deploy. Deselect the **Use DHCP** box and edit the camera's IP info. Enter the camera's credentials you configured in the previous step and click **OK** after making changes to save the new IP information.

Note: Default TCP/IP information (set after 90 seconds if no DHCP is detected):

- IP: 192.168.1.80
- Subnet Mask: 255.255.255.0
- Gateway: 192.168.1.1
- DNS : 168.126.63.1

After making and saving any IP changes, confirm the camera is still selected in the devices list then click **OK**. The utilities' *Camera Info / Stream Selection* window will deploy.



STEP 5: ASSIGN STREAM PROFILES

The final step before adding the camera to VIGIL is to assign stream profiles to the camera's Main and Sub streams in VIGIL. Camera info is also visible top left for your review.

profile1 contains settings ideal for high-quality Mainstream video. ***profile2*** contains settings ideal for Substream quality video (reduced quality, increased performance). These will be respectively assigned to Mainstream and Substream automatically by the utility but can be changed here if necessary. Settings for each available profile are visible in the *Available Profiles* list.

STEP 6: SAVE TO VIGIL

Click **OK** on the camera info window to save settings. The camera's settings will populate VIGIL's *Network Camera Settings* form. . Click **OK** to save the camera to VIGIL

STEP 7: ADVANCED OPTIONS / FACTORY RESET / REBOOT

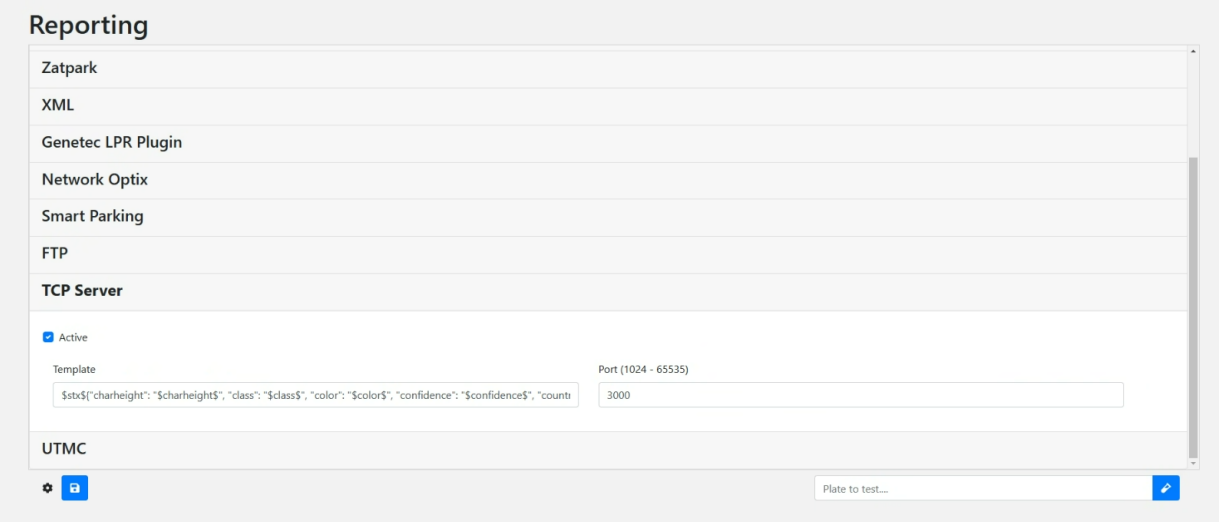
If advanced configuration of camera image(and other) settings is required, see the latest version 3xLOGIC VISIX Gen III User Guide for more information on accessing and configuring these settings via the camera's browser UI.

If a factory reset is required, login to the camera's browser interface (enter IP into a browser URL bar and login to the camera) then navigate to *Setup* > *System* > *Factory Reset*. To perform a basic camera retart, navigate to *Setup System* > *Restart*.

STEP 8: ENABLE ANPR DATA IN VIGIL (ANPR LICENSE REQUIRED)

In order to allow for reporting of ANPR data from the camera in VIGIL, confirm TCP reporting has been enabled in the camera's ALPR plugin settings:

1. In the camera's browser interface, navigate to *Setup>ALPR>Enable* and click the **Open ALPR Web Page** link.



2. Click the context menu button and select the **Reporting** menu.
3. Open the *TCP Server* node and confirm the **Active** checkbox is toggled.
4. Click the **Save** button

After saving the TCP settings on the camera, rule data must now be enabled in VIGIL:

1. Login to the VIGIL Server you want to interface the ANPR camera with.
2. Navigate to *VSMU > Cameras Tab*.
3. Select the camera channel associated with you ANPR Camera and open the **Network Camera Settings** form.
4. Click the **On-Board Analytics** button.

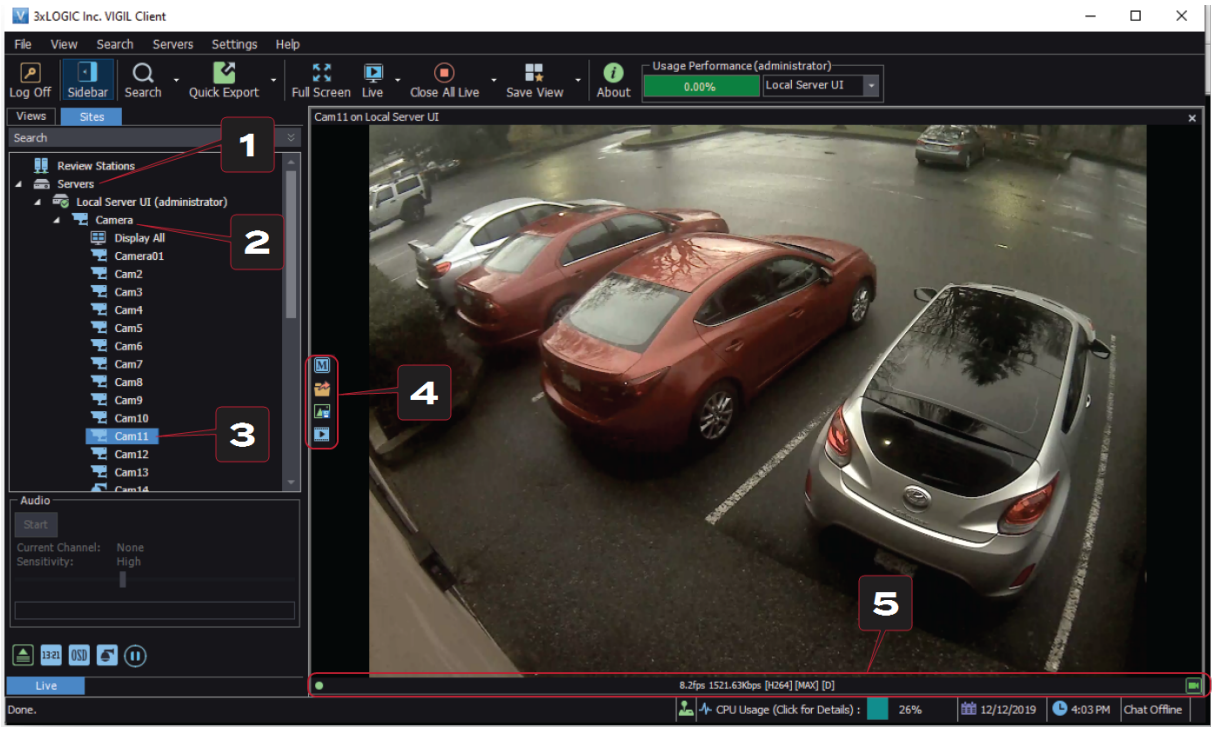
5. Toggle the **ANPR** checkbox.
6. If you want to generate alarms in VIGIL based on ANPR rule data, toggle the **Alarm** checkbox for the ANPR rules.
7. Click **OK**.

The camers should now successfully pass ANPR data to VIGIL.

7 VIEWING CAMERA IN VIGIL CLIENT

VIEWING LIVE

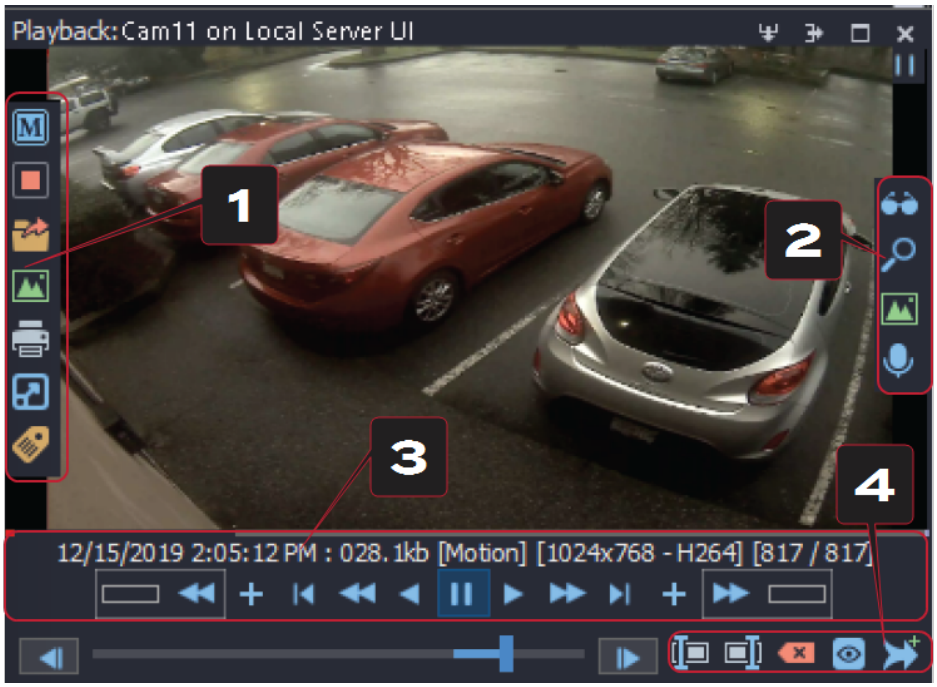
After adding the camera to VIGIL Server or setting the camera up as a standalone device (applicable models only), 3xLOGIC recommends VIGIL Client for viewing live and playback. Client's powerful toolset can be leveraged by users to thoroughly and quickly review camera footage and other data collected by a VIGIL Server or VIGIL All-in-One camera. Refer to the steps in this section for details on viewing the camera's footage in VIGIL Client.



1. After launching VIGIL Client, extend the Servers node located in the Sites tab treeview then double-click the desired VIGIL Server / standalone camera to reveal available devices and tools.
2. For Standalone devices, simply double-click the camera name in the drop-down to open a live view from the camera (skip to step 4). For VIGIL Servers, expand the Cameras node to reveal a list of available devices interfaced with the Server.
3. Double-click the desired camera. The camera's live stream will be automatically displayed in the viewing area.
4. Live Edge Controls instantly grant the user access to common tools such a Capture Still Image, Instant Replay and Stream Type Selection.
5. Stream information such as FPS rate, bitrate and CODEC type are listed when the cursor hovers over the boom edge of the frame.

SEARCHING AND VIEWING PLAYBACK

Select Instant Replay from the Live Edge Controls to open the last 5 minutes of footage from the camera or perform a playback search to review a custom me range of playback. A Playback viewer featuring the requested footage will deploy.



1. Playback Live-Edge controls include Export Video or Stills, Stream Mode Selection and Screen Record, etc...
2. Right-Edge Controls include more tools such as Smart Search, Audio and Zoom Controls and Image Control.
3. Stream information and standard playback controls are accessible at the boom of the frame.
4. Located next to the scrub bar, footage markers and export tools can be used to quickly narrow down and export portions of interest within larger video clips.

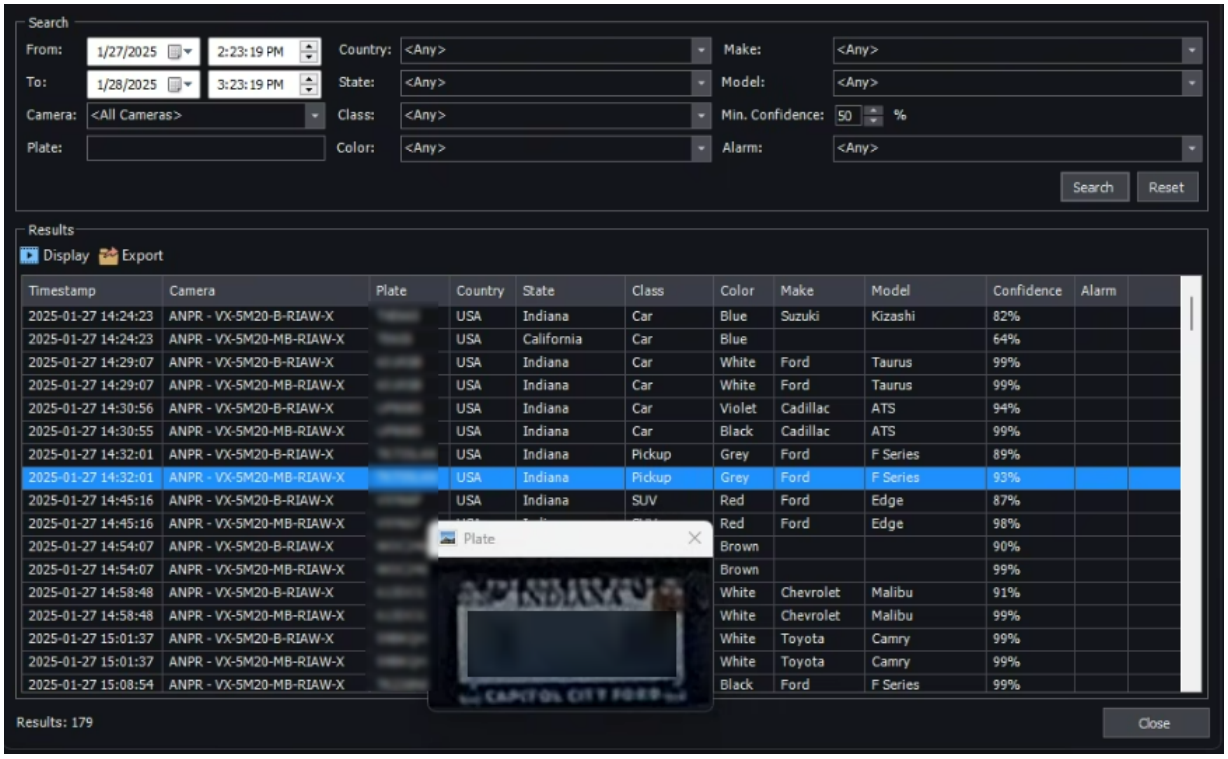
For further details on reviewing and exporting playback and other advanced features such as audio recording and two-way audio talk, POS Data OSD and more, please visit www.3xlogic.com and consult the product documentation library for VIGIL Client-related support documentation.

ANPR TOOLS IN VIGIL CLIENT (ANPR LICENSE REQUIRED)

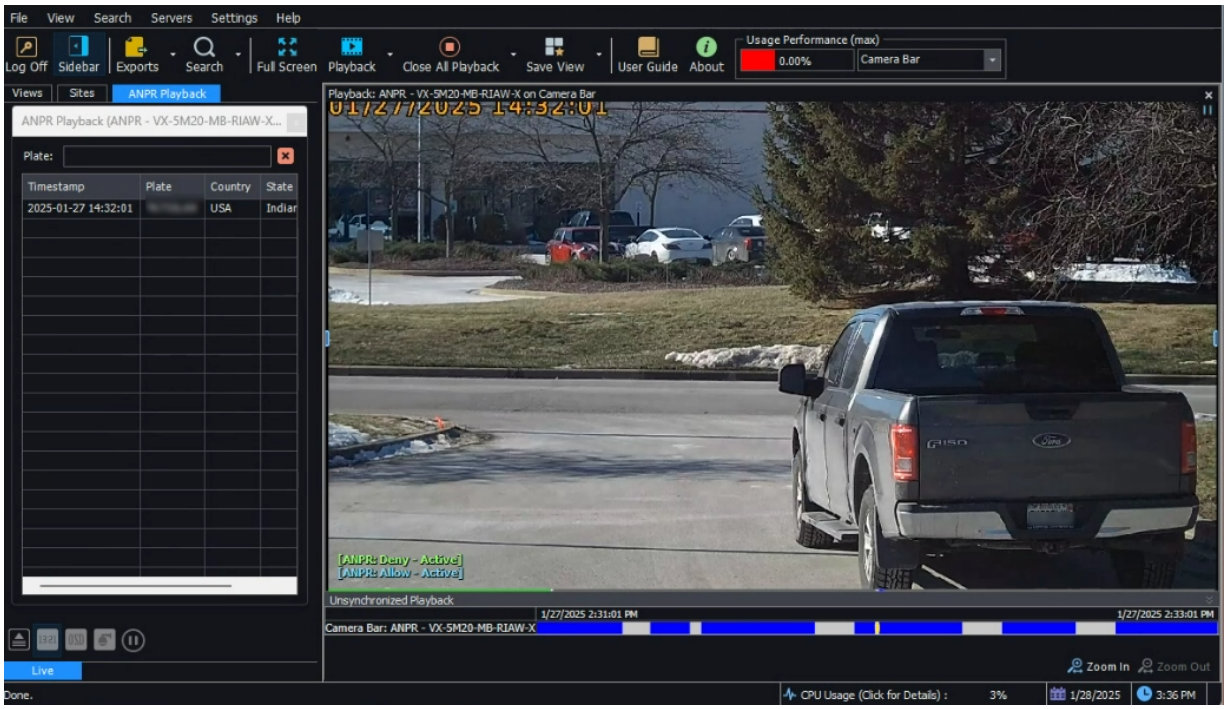
ANPR SEARCH

To access ANPR reporting in VIGIL Client:

1. Login to the desired VIGIL Server via VIGIL Client and open its treenode in the **Sites** tab.
2. Open the **Analytics > ANPR** node.
3. Double-click the **Search** option.



4. Enter desired search criteria and click **Search** to return results.
5. To see a thumbnail of a captured plate, single-click one of the search results. To open corresponding playback from a captured plate, double-click the desired search result entry.

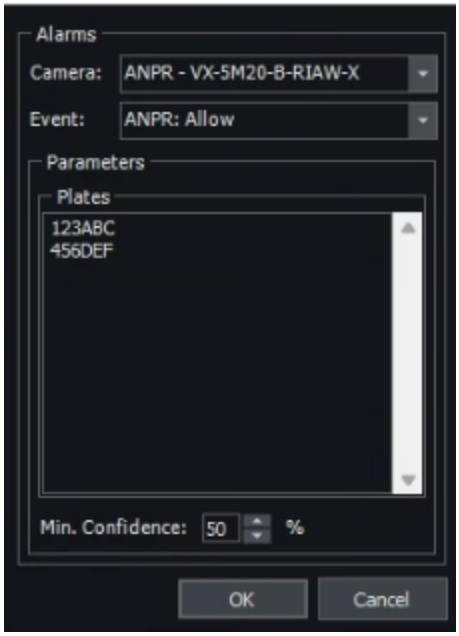


The ANPR data will be docked automatically to the left of the playback window. If multiple plate captures exist within the playback clip, all entries will be listed in the ANPR capture list.

ANPR ALARM SETUP

To add license plates to your ANPR *Allow* or *Deny* list (plates in the list will trigger an alarm when captured):

1. Navigate to *Sites* tab, select the desiered VIGIL Server and open the **Analytcs > ANPR** node.
2. Double click the **Alarm Settings** option. This will launch the ANPR Alarm settings window.
3. Select the *Allow* or *Deny* event type from the **Event** drop-down and manually enter plates numbers as desiered into the *Plates* field.



4. Click **OK** to save settings.

When a plate from either list is detected by the camera / VIGIL, acorepsonding alarm will be triggered in VIGIL. These alarms can be used to activate access control mechanisms using a DIO, etc...