Aimetis Automatic License Plate Recognition (ALPR) Installation Guide

Disclaimers and Legal Information

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1 Welcome to Automatic License Plate Recognition

This document outlines the steps required to successfully plan and deploy an Automatic License Plate Recognition (ALPR) system using Aimetis Symphony software. ALPR installations have more demanding image requirements than traditional CCTV installations; therefore, images must meet specific criteria for accurate license plate readings. This includes license plate size in pixels, contrast, lighting conditions, motion blur, and exposure. This guide provides qualified image examples, as well as helpful tips to maximize the use of the ALPR system.

Overview and Usage

License plate recognition is available via Aimetis Symphony as the Automatic License Plate Recognition Add-On. It works with network video and is used to detect and index license plates. Specialized analog ALPR cameras can be connected to Aimetis Symphony using a video encoder.

Key Features

- License plates from different regions and countries are recognized and logged.
- License plates can be searched.
- Lists can be used to raise alarms on various subsets of plates.
- Aimetis Symphony can be leveraged for live and recorded video streams.

Working Scenarios

ALPR can be used in environments where vehicles are traveling a maximum of 30 kph (19 mph). It is not designed for mobile surveillance. With a 720p network camera, up to two lanes of traffic can be analyzed per camera (e.g. Axis P1344) provided that the qualified image requirements are met. For details, see Image Criteria. ALPR is able to analyze video in real-time; therefore, no external trigger is required.

Typical working scenarios include:

- Parking garage toll collection or assisted visitor management
- Traffic control
- Border crossings
- Marketing tool for logging patterns of use

Minimum System Requirements

If more than 12 images per second of processing is required (across all connected ALPR cameras), contact Aimetis for a multi-core option.

Recommended system requirements for processing 12 images per second across all ALPR cameras:

- CPU: Intel dual core 3Ghz or higher
- RAM: 2GB
- HD Space: 250MB
- OS: Windows® 7 or higher (with the latest updates)
- Automatic License Plate Recognition license
- PCI slot for hardware key (not necessary if using USB key)
- Microsoft Security Advisory 3033929

- Microsoft Hotfix 485407

Optimizing Server Performance

Other video engines can be run simultaneously against the same video stream as the ALPR. While the ALPR uses only one CPU core, other CPU cores can be used for other video engines. Therefore it is possible to successfully mix ALPR cameras with non-ALPR cameras on the same server.

ALPR uses one CPU core only; therefore, a multi-core processor will not be leveraged across all cores when processing ALPR video. It is more advantageous to a use a processor with a faster clock speed and fewer cores as opposed to a slower clock speed, but more CPU cores. A fast dual core processor is recommended. The number of ALPR cameras that can be run per server depends on the speed of the CPU core, frame per second (FPS) per each camera, and the analysis image size sent to ALPR for processing. Typically, one CPU core can process 12 FPS across all cameras. For example, this could mean two cameras each at 6 FPS, or 12 cameras at 1 FPS.

Image Criteria

For license plates with Latin characters, 32-pixel height is recommended. For non-Latin (Arabic, Chinese), characters, 40-pixel height is recommended.

Good Image Examples

The images shown are examples of good quality night and day images. For best results, use these types of images as a model. A network camera can be used in good lighting conditions; however, an external light source (such as an IR illuminator) may be required to avoid headlight interference in low light conditions. For more challenging environments, a professional ALPR camera may be required.

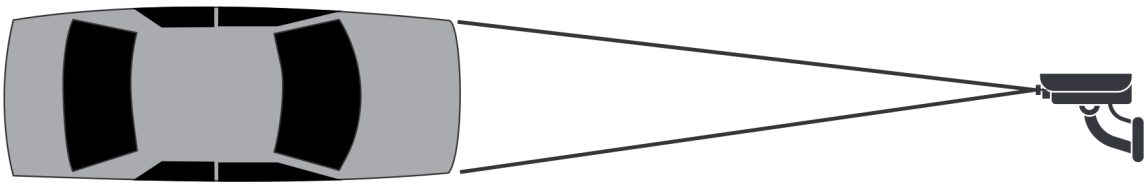
Poor Image Examples

Images to Avoid	Description
	Low spatial resolution. Characters are too small on the plate. For Latin characters the minimum character size is 16 pixels in height and 2 pixels line-width in image. For non-Latin characters (Arabic, Chinese, Thai, Korean) the minimum pixel height is 20 pixels and 2 pixels line-width in image.
	Blurred image.
	Low contrast. Minimum gray scale difference is required between the background and the characters of the plate.
	Overexposed.
	Poor lighting conditions (shadows and strong light).
	High distortion.
	Interlaced.

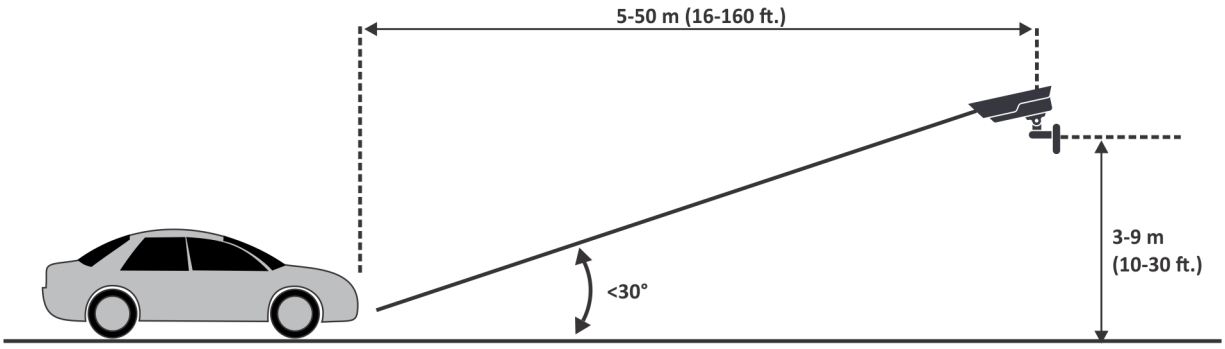
Camera Field of View

The number of FPS per camera that the ALPR requires to successfully detect license plates depends on how fast vehicles are traveling. If vehicles are stopping, 1 FPS per camera may be sufficient. If vehicles are traveling up to 30 kph (19 mph), up to 10 FPS may be required. It is important that the license plate is clearly readable for at least 3 frames of video.

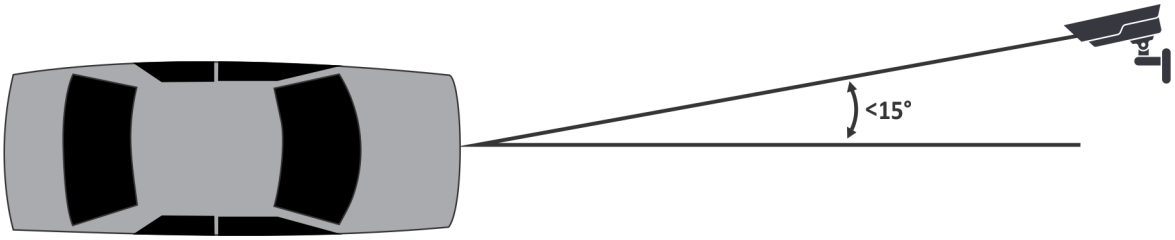
It is recommended that the camera is installed directly in line with the vehicle path as much as possible. This will ensure the vehicle will be in the field of view for the maximum number of frames, and the license plate will be easily readable.



The distance between the vehicle and the camera should be within 50 m (160 ft.). The camera height should be within 3 - 9 m (10 - 30 ft). The camera angle should not exceed 30°.



If overhead camera mounting is not possible, such as if a camera is pole mounted or located on the side of the road, make sure the camera angle does not exceed 15°.



2 Installation Instructions

Aimetis ALPR is an add-on video analytic in Aimetis Symphony. A server hardware key is required.

Installing all ALPR Components

1. Install Symphony Server and Client. For details, see the Symphony 7.0 Installation Guide.
2. Close any Aimetis applications that are running.
3. Download **LPR_Installer** from Aimetis Xnet and copy it to your desktop. The installer must be copied to a drive where you have write access because the installer first writes the extracted files to disk before running.
4. Run **LPR_Installer.exe** on all servers in the farm. All servers in the farm must have the LPR component installed regardless of whether they are the server hosting the cameras running the LPR video engine.
5. After reviewing the license and warranty information in the License Agreement window, click **I accept the terms of the license agreement**.
6. Click **Install**.
7. You may receive a message indicating the some files must be updated. By default, the **Close all applications and attempt to restart them** option is selected in the Files in Use window. Click **OK** to begin the installation process.
8. To exit the setup, click **Finish**.

To uninstall:

1. From **Programs and Features** in your Control Panel, select **GX Full Uninstall** and click **Uninstall**. Complete the uninstall wizard. **NOTE:** On 64-bit machines, you must remove both **GX Full Uninstall** and **32 bit GX Full Uninstall**.
2. From **Programs and Features** in your Control Panel, select the Aimetis Symphony **ALPR Module** item. Choose **Uninstall**.
3. Restart your computer.

Setting Up the License Plate Recognition Video Analytic in Symphony

The hardware key must be plugged into the server that is performing analytics. Plug in the USB key or install the PCI card into the server after installing the LPR Installer package. If you are using redundancy, you must switch the camera to **Unmovable** or you must install hardware keys on all servers in the redundancy group that the camera could switch to.

Task 1: Add a camera

1. If you have not set up cameras, add a camera as per instructions in the Symphony online help *Device - Network (IP) Cameras or Video Servers* page.

Task 2: Set up the analytic

1. Log into the server. Click **Devices > Cameras**. Select the camera on which you want to run ALPR and click **Edit**.
2. In the **Add Ons** section of camera configuration, select the LPR license from the **Analytic License Requested** list and click **Update License**.
3. In the **Add Ons** section of camera configuration, switch the **Automatic License Plate Recognition** option to **ON**. Click **Configure**.
4. Using the information in License Plate Configuration Options, configure options in the Overview, Processing Mask, and Plate Detection areas.
5. After configuration, click **OK** and then **Save**.
6. Set up a rule in Symphony to trigger alarms. Define Rules to Generate Alarms.

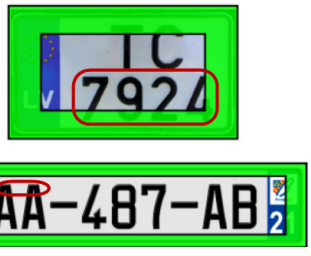
License Plate Configuration Options

Option	Usage
Analysis Resolution	Resolution used to analyze frames. Image captured by the camera is downsized to the selected analysis resolution. Downsizing improves performance, but may reduce the ability to detect a license plate, especially if it is a relatively small capture resolution. Higher analysis resolutions may degrade performance.
Analysis FPS	Number of frames per second that the LPR analytic uses for plate analysis. Enter a value from 1 to 10. Low Setting: In parking lots or at gates where a vehicle comes to a complete stop, or goes by slowly, use a lower setting. High Setting: Where a vehicle is moving fast, or the license plate is visible only for a short time in the camera, or both use a higher setting. Ideal Setting: Use a high frame rate, high analysis resolution and a small mask. Note that higher Analysis FPS resolutions and no masking will result in degraded performance.
Simple Mode	Set to ON by default.
Region for Plate Analysis	Select the geographical location of plate analysis; typically country or continent. If your region, country, state or province is not listed, select Default (No Region Data). If you are trying to optimize the speed of license plate recognition, select Default (No Region Data) as it provides the fastest recognition; however, state, province, and other regional information will not be recognized. Important! The Default (No Region Data) selection recognizes only Latin characters. This setting must be the same across all cameras on the same server.

License Plate Configuration Options

Option	Usage
V9 Dongle	Select to use the latest hardware dongle for China or the default region.
Enable with Relay	Configure how LPR responds to input to a relay. Select the relay device and input, configure whether LPR activates immediately or after a specific duration of input, and set the duration for which LPR remains active.
Enable with Motion Detection	By default **Enable with Motion Detection** check box is selected. This feature reduces the amount of processing the LPR analytic requires by analyzing video only where motion is first detected. For this option to work, you must enable a motion addon on the camera. When this feature is not used, the LPR analytic is constantly analyzing video even if no motion is detected.
Processing Mask	Use an image with a vehicle in the scene. The analysis image size is based on the image size defined in the motion mask. For example, the original image size may be 1280 x 720, but only 400 x 300 is masked and included for analysis. Normally, some of the image can be masked, which prevents the analytic from analyzing the entire image. Mask only the image where license plates are likely to be visible. This improves the speed at which the analytic can process frames of video. Only the areas highlighted in yellow will be used to detect license plates. License plates appearing outside of the masked area will not be reported. Smaller masking areas allow for higher frame rates and resolutions to be used. Motion tracking of a license plate will stop if the vehicle leaves the masked area. Using the displayed image from the video, define the area in yellow (a mask) where objects in motion should be detected. Select the **Analyze** option to define the yellow mask. Select the **Ignore** option to erase areas of the yellow mask where objects should be ignored. The **Size** slider adjusts the pen thickness.

License Plate Configuration Options

Option	Usage
Plate Detection	Using your mouse draw a rectangle around one line of the license plate in the image so that the top and bottom of the license plate characters are in the highlighted region. To rotate or slant the rectangle, click and drag the corners of the rectangle. To make the rectangle larger or smaller, click and drag the outer edges of the rectangle. To move the rectangle, click and hold in the center of the rectangle and drag to the new position. Set multiple plate areas to capture the change in plate orientation as the car moves away.  **Important! The rectangle is for one line of text in the license plate. Ensure that the top and bottom edges of the license plate characters are within the highlighted region.** The inner rectangle represents the minimum plate character size and the outer rectangle represents the maximum plate character size. If a red rectangle is displayed it indicates that the minimum plate character size cannot be detected at the current analytics resolution. If a green rectangle is displayed it indicates that the minimum plate character size can be detected at the current analysis resolution. NOTE: The Height, Slant, Slope Minimum and Maximum fields are automatically populated based on the rectangle drawn; however, if required these values can be manually changed to fine-tune the dimensions. **Example** **Good** - Character height is contained **within** the highlighted region:  **Bad** - Character height is NOT contained withing the highlighted region: 
Reporting Confidence	Slider is set to Medium (50%) by default. Plates that are detected below the specified confidence will not be decorated or reported in the database. Set to Low if the camera environment is not ideal. This will allow the engine to capture everything. If your system is detecting more than just license plates, raise the confidence to High to eliminate unneeded detection. For an actual value, hover your mouse over the bar. 0 is Low, Medium is 50% and High is 70% and above.

Define Rules to Generate Alarms

After configuring ALPR for your camera, you can set up rules to generate alarms in Symphony. Alarms can occur as a result of an event (such as motion detected) or a signal from another device (such as a door access device). Rules can be set up only if some form of analytic is running against a camera.

You must configure the Event, Action, and Schedule for each rule.

- Event - Define what causes an Alarm, such as motion detected, people loitering, door access, etc.
- Action - Define what actions Symphony should take after the alarm is detected.
- Schedule - Define when the Alarm Rule is active.

To create a rule:

1. Log into the server. Click **Rules** and then click **Add**.
2. In the **Rule name** field, enter an appropriate and easily identifiable name for the rule you want to associate with LPR.
3. In the **Events** section, select New Events from the list and click **Add**. Rules can be set up only if an analytic is running against a camera. When adding cameras for events, hover the mouse over the camera name. If the camera is not associated with an Add-On (analytic), you will not be able to add it to an event.
4. Click **Add Devices**. Select the camera that is running the ALPR analytic and click **OK**.
5. In the **Name** field, enter an appropriate name for this event. The devices you selected are listed. (Optional - To remove the camera from the list, hover over the camera name and click Remove.)
6. From the **Select video engine from those running on camera** drop-down list, select **Automatic License Plate Recognition**.
7. Select the Alarm Type.
    - **Alarm on all license plates**: By default, this option is selected. A useful option when a perimeter should not be crossed at a specific time, for example, a parking lot at night.
    - **Alarm only on license plates in the list(s)**: Any plates seen by the system that are on the selected list will raise an alarm. Select one or more lists.
    - **Alarm only on license plates not in the list(s)**: Any plates seen by the system that are not on the selected list will cause an alarm. Select one or more lists.
8. Click **Save**.
9. To set up Actions and Schedule, follow the instructions in the Symphony online help, Rules section.

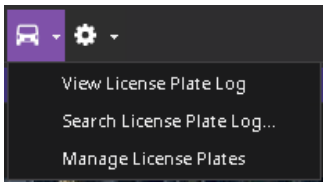
3 Working with the LPR Menu in Symphony

The **LPR** menu option is available only if you have purchased and completed the License Plate Recognition (LPR) installation. For details, see Installation Instructions.

By default, the LPR icon (car icon) is not on the toolbar. To add the icon, click the **Customize toolbar** icon and select **Add or Remove Buttons > Main Menu > LPR**.

Use the main menu within Symphony Client for:

- Viewing and Sorting License Plate Logs
- Searching License Plate Logs
- Managing License Plates



Viewing and Sorting License Plate Logs

The License Plate Log displays one day's worth of logs, either for a date in the past, or for today's date. If today's date is selected or you are in live mode, the License Plate Log will continue to display new incoming plates. Each time you select a new date, the License Plate Log will be updated and contain only plates for that date. Multiple date selections do not accumulate plates. New plates and logs are synced in two-second intervals. The License Plate Log is sorted by date in descending order.

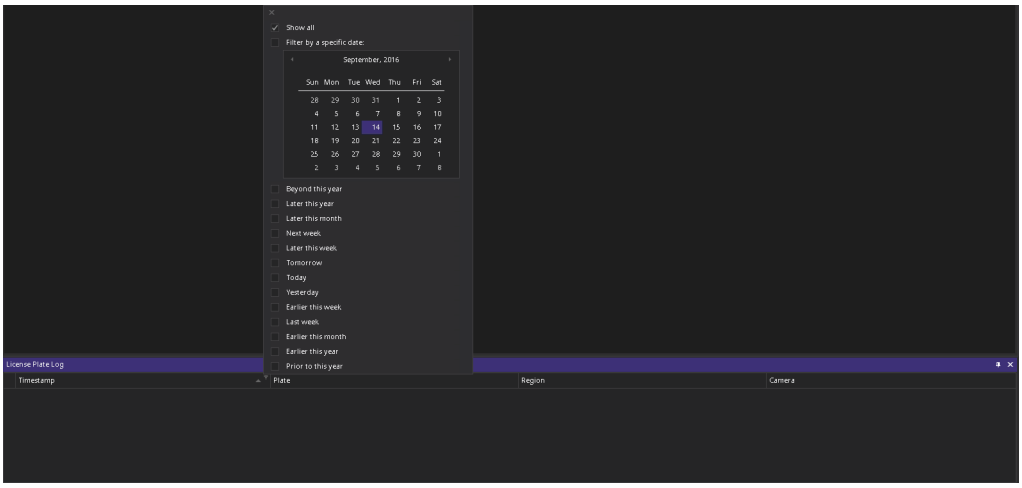
The License Plate Log contains the following information fields:

- **Timestamp:** Indicates when the license plate was first detected by your camera. Each license plate instance has a start and end time (to create a duration) but the log displays only the start time.
- **Plate:** Indicates the plate number of the detected vehicle.
- **Region:** Indicates the region of the license plate.
- **Camera:** Indicates the camera that detected the license plate of the vehicle.

1. From the main menu in Symphony Client, click the car icon and select **View License Plate Log** to open the License Plate Log dialog box.

If you know which camera is currently running ALPR, you can also right-click on a camera in the Camera Tree and select **View License Plate Log**. The results will only be for the camera you selected.

2. To sort each field so that only the information you need is displayed in the log list by **Timestamp**, **Plate**, **Region**, or **Camera** right-click on the filter icon of the field you want to sort to open the column editor.
3. Click on the **Timestamp** filter icon to access a dialog box that enables you to specify a specific date on which to filter.



Searching License Plate Logs

The Search License Plate Log dialog box allows you to search detected license plates in your system based on:

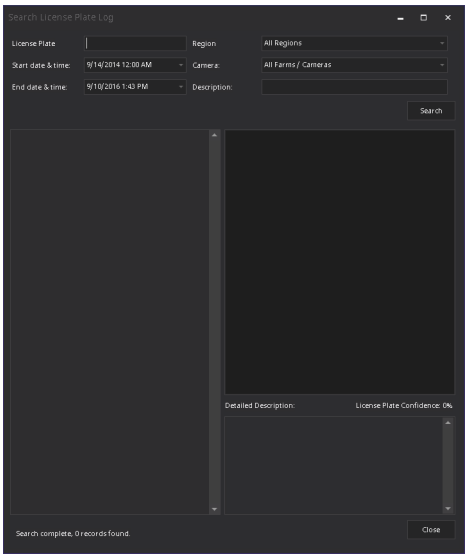
- License Plate.
- Start Date and Time/End Date and Time.
- License Plate Region: region which the detected plate is from.
- Camera: All farms and cameras or specific cameras.
- Description: A key word or phrase that was entered in the **Description** field when the license was plate was reviewed and information about it was edited to include a description in the Add New Plate dialog box. For details, see Adding License Plates.

If you do not know the first letter or number of the license plate, use the % (per cent) sign as a wildcard character to complete the search for plate number or plate description. For example, **R2%R%S** or %**R7S** or **%FR%** would match the plate R2FR7S.

1. From the main menu in Symphony Client, click the car icon and select **Search License Plate Log** to open the Search License Plate Log dialog box.

If you know which camera is currently running ALPR, you can also right-click on a camera in the **Camera Tree** and select **Search License Plate** log. The results will be only for the camera you selected.

2. Use any of the available fields to refine your search and click **Search**.



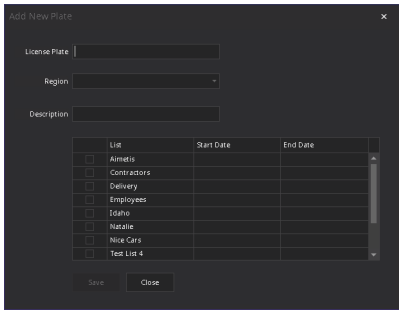
3. Search results are displayed in the left pane, the video associated with the license plate can be viewed in the right pane. By default, the search results contain all license plates for the current day (since midnight). This search is automatically executed before you open the Search License Plate Log dialog box. This means that when you first open the Search License Plate Log, you will potentially see results. The search will return a maximum of 10,000 results. If there are more than 10,000, a message is displayed indicating that the first 10,000 results have been returned and that you should refine your search criteria.
4. Click on a license plate in the resulting search to display the associated video and detailed description in the right pane.
5. Once you have selected the license plate to which you want to add information, enter information in the **Detailed Description** field in the lower right pane.
6. Click **Close**.

Managing License Plates

Adding License Plates

You can add license plates and organize them into lists, as well as import/export these lists.

1. Click the car icon and select **Manage License Plates** from the main menu in Symphony Client.
2. Click **Add Plate** to open the Add New Plate dialog box.
3. Enter the license plate number.
4. Select the region of the plate from the **Region** drop-down list.
   For details, see Supported Regions.
5. *(Optional)* Add a description that will be displayed when an alarm occurs or in search results. Adding a description helps you distinguish a plate number when searching all plates.
6. Click **Save**.

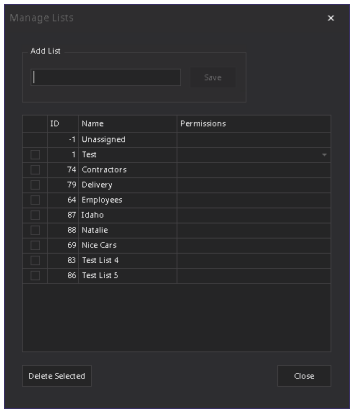


Creating a License Plate List

Creating lists enables you to easily categorize and manage a specific database of license plates. You can organize license plates in lists, for example, categories such as full-time employees, part-time employees, contractors, and more. For information on how to add license plates to a list, see Adding License Plates to a List.

1. Click the car icon and select **Manage License Plates** from the main menu in Symphony Client.

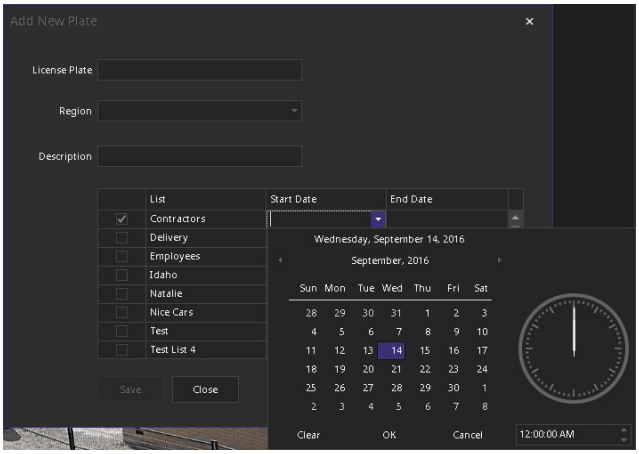
1. Click **Manage Lists** to open the Manage Lists dialog box.
2. Enter a name in the **Add List** field.
3. Click **Save**.



4. In the **Permissions** list, you can select the user groups that have access to the list.
5. Click **Close**.

Adding License Plates to a List

1. Click the car icon and select **Manage License Plates** from the main menu in Symphony Client.
2. In the **Manage License Plates** dialog box, click **Add Plate...**
3. Type the license plate, select the region, and type a description.
4. *(Optional)* Define the start and end times that the plate is on a list. This is a useful feature if you have a restricted area, but you frequently allow visitors at scheduled times into the area. You can add the license plate of the scheduled visitor to a list for a designated period of time. An alarm will not be generated during the set time because that visitor is a valid member of a list. **NOTE:** These times are compared with rules set for cameras that use the **Alarm only on license plates in the list(s)** or **Alarm only on license plates not in the list(s)** options setup in the Rule Wizard.
   If no start time and end time are entered, the plate is always in the list. If no end time is entered, the plate is part of the list if the current time is after the start time. If no start time is entered, the plate is part of the list if the current time is *before* the end time.
   a. Click the arrow in the **Start Time** and **End Time** fields. A clock and date interface appears.
   b. Select the date and set the time.
   c. Click **OK**.
6. Click **Save**.



Exporting and Importing License Plate Lists

You can import and export CSV and XML (.lprdata) files for license plate lists.
CSV files are organized by plate number, region ID, List ID (separated by |), and description.

1. Click the car icon and select **Manage License Plates** from the main menu in Symphony Client.
2. After sorting and editing license plates, you can make a copy of your list by clicking **Export**. The file will be saved on your client computer.
3. You can import this list at any time by clicking **Import** and then selecting the name of the file from the Import License Plate Configuration Data file manager.

4 Supported Regions

The following section lists the global regions that ALPR can support. If the region you are located in is not listed here contact Aimetis.

Asia

Region	Country or State/Province
Bangladesh	
China	Anhui
	Beijing
	Embassy
	Guangdong
	Hebei
	Hubei
	Jiangsu
	Liaoning
	Military Police
	Shangdong
	Shanghai
	Zhejiang
Korea	
Mongolia	
Philippines	
Taiwan	
Thailand	

Commonwealth of Independent States (CIS)

Country or State/Province	
Armenia	Russia
Azerbaijan	Tajikistan
Belarus	Turkmenistan

Country or State/Province	
Kazakhstan	Ukraine
Kyrgyzstan	Uzbekistan
Moldova	

Europe

Country or State/Province	
Albania	Liechtenstein
Andorra	Lithuania
Austria	Luxembourg
Belarus	Macedonia
Belgium	Malta
Bosnia and Herzegovina	Monaco
Bulgaria	Montenegro
Croatia	Netherlands
Czech Republic	Norway
Denmark	Poland
Estonia	Portugal
Finland	Romania
France	San Marino
Germany	Serbia
Gibraltar	Slovakia
Greece	Sweden
Hungary	Switzerland
Iceland	Spain
Ireland	Turkey
Italy	United Kingdom
Latvia	

Latin America

Region	Country or State/Province	
Mexico	Aguascalientes	Morelos
	Baja California	Nayarit
	Baja California Big Sur	Nueovo Leon
	Campeche	Oaxaca
	Chiapas	Puebla
	Chihuahua	Queretaro
	Coahuila	Quintana Roo
	Colima	San Luis Potosi
	Durango	Sinaloa
	Federal District	Tabasco
	Guanajuato	Tamaulipas
	Guerrero	Tlaxcala
	Hidalgo	Veracruz
	Jalisco	Yucatan
	Mexico State	Zacatecas
	Michoacan	
South America	Argentina	Ecuador
	Bolivia	Paraguay
	Brazil	Uruguay
	Chile	Venezuela
	Columbia	

Middle East

Country or State/Province	
Bahrain	United Arab Emirates
Egypt	United Arab Emirates DUBAI
Iraq	United Arab Emirates ABU DHABI
Jordan	United Arab Emirates AJMAN
Kuwait	United Arab Emirates FUJAIRAH
Lebanon	United Arab Emirates SHARJAH
Oman	United Arab Emirates UMM AL QUWAIN
Qatar	United Arab Emirates RAS AL KHAIMAH
Saudi Arabia	Yemen
Syrian Arab Republic	

USA and Canada

Country or State/Province	
Alabama	New Mexico
Alaska	New York
Arizona	North Dakota
Arkansas	Ohio
California	Oklahoma
Colorado	Oregon
Connecticut	Pennsylvania
Delaware	Rhode Island
District of Columbia	South Carolina
Florida	South Dakota
Georgia	Tennessee
Hawaii	Texas
Idaho	Utah
Illinois	Vermont
Indiana	Virginia
Iowa	Washington
Kansas	West Virginia
Kentucky	Wisconsin
Louisiana	Wyoming
Maine	**Province**
Maryland	Alberta
Massachusetts	British Columbia
Michigan	Manitoba
Minnesota	New Brunswick
Mississippi	Nova Scotia
Missouri	Ontario
Montana	Quebec
Nebraska	Saskatchewan
Nevada	Yukon
New Hampshire	
New Jersey	

Other

Country or State/Province
Morocco