

HIKVISION



License Plate Recognition (LPR)

Camera Installation Manual

Hikvision LPR Camera Installation Manual

About this Manual

This Manual is applicable to Hikvision LPR Network Camera.

This manual may contain several technical or printing errors, and the content is subject to change without notice. The updates will be added to the new version of this manual. We will readily improve or update the products or procedures described in the manual.

Different models may differ in functions. Please refer to the actual GUI of each model.

DISCLAIMER STATEMENT

"Underwriters Laboratories Inc. ("UL") has not tested the performance or reliability of the security or signaling aspects of this product. UL has only tested for fire, shock, or casualty hazards as outlined in UL's Standard(s) for Safety, UL60950-1. UL Certification does not cover the performance or reliability of the security or signaling aspects of this product. UL MAKES NO REPRESENTATIONS, WARRANTIES OR CERTIFICATIONS WHATSOEVER REGARDING THE PERFORMANCE OR RELIABILITY OF ANY SECURITY OR SIGNALING RELATED FUNCTIONS OF THIS PRODUCT."



Safety Instruction

These instructions are intended to ensure that user can use the product correctly to avoid danger or property loss.

The precaution measure is divided into "Warnings" and "Cautions"

Warnings: Serious injury or death may occur if any of the warnings are neglected.

Cautions: Injury or equipment damage may occur if any of the cautions are neglected.

	
Warnings Follow these safeguards to prevent serious injury or death.	Cautions Follow these precautions to prevent potential injury or material damage.

 **Warnings**

- Proper configuration of all passwords and other security settings is the responsibility of the installer and/or end-user.
- In the use of the product, you must be in strict compliance with the electrical safety regulations of the nation and region. Please refer to technical specifications for detailed information.
- Input voltage should meet both the SELV (Safety Extra Low Voltage) and the Limited Power Source with 24 VAC or 12 VDC according to the IEC60950-1 standard. Please refer to technical specifications for detailed information.
- Do not connect several devices to one power adapter as adapter overload may cause over-heating or a fire hazard.

- Please make sure that the plug is firmly connected to the power socket. When the product is mounted on wall or ceiling, the device shall be firmly fixed.
- If smoke, odor or noise rise from the device, turn off the power at once and unplug the power cable, and then please contact the service center.



Cautions

- Make sure the power supply voltage is correct before using the camera.
- Do not drop the camera or subject it to physical shock.
- Do not touch sensor modules with fingers. If cleaning is necessary, use clean cloth with a bit of ethanol and wipe it gently. If the camera will not be used for an extended period, please replace the lens cap to protect the sensor from dirt.
- Do not aim the camera at the sun or extra bright places. Blooming or smearing may occur otherwise (which is not a malfunction), and affect the endurance of sensor at the same time.
- The sensor may be burned out by a laser beam, so when any laser equipment is in using, make sure that the surface of sensor will not be exposed to the laser beam.
- To avoid heat accumulation, good ventilation is required for operating environment.
- Keep the camera away from liquid while in use.
- While in delivery, the camera shall be packed in its original packing, or packing of the same texture.

- Regular part replacement: a few parts (e.g. electrolytic capacitor) of the equipment shall be replaced regularly according to their average enduring time. The average time varies because of differences between operating environment and using history, so regular checking is recommended for all the users. Please contact with your dealer for more details.
- Improper use or replacement of the battery may result in hazard of explosion. Replace with the same or equivalent type only. Dispose of used batteries according to the instructions provided by the battery manufacturer.
- If the product does not work properly, please contact your dealer or the nearest service center. Never attempt to disassemble the camera yourself. (We shall not assume any responsibility for problems caused by unauthorized repair or maintenance.)

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1 Introduction

1.1 LPR Camera Overview

License Plate Recognition (LPR) cameras detect passing vehicles and capture images of their license plates. To obtain the maximum license plate recognition accuracy, you need to install the LPR camera properly to get clear images.

1.2 Typical Application Scene

1.2.1 Entrance Surveillance

To recognize license plates at entrances, it is recommended that you install cameras on both sides of the barrier gate.

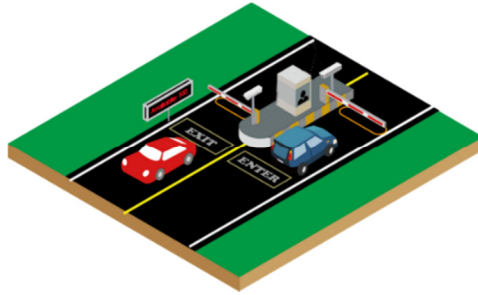


Figure 1-1 Entrance Surveillance Scene

1.2.2 Road Traffic Surveillance

To recognize two lanes, it is recommended that the camera be installed in the middle of a cross pole, and vehicle speeds should be less than 40 mph.

If the speeds are greater than 40 mph, it is recommended that the camera be used to recognize only one lane.

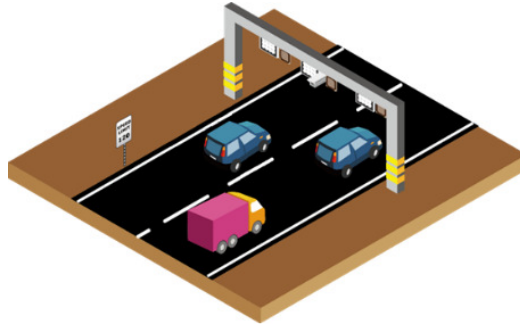


Figure 1-2 Road Traffic Surveillance Scene

2 Installation

2.1 Before you Start

The camera installation conditions should meet the following requirements:

- Make sure no trees or items are sheltering the vehicles.
- If you use a camera with a CS-mount lens, use a fixed lens. With greater depth of focus, fixed lenses perform better at license plate recognition.
- Direct sunlight can distort a picture. Use a lens with auto iris mode if the cars face direct sunlight.
- The license plate tilt angle must be within +/-5 degrees.



Figure 2-1 License Plate Tilt Angles

2.2 Lens Selection

Purpose:

To ensure that enough pixels are in the frame, select a proper lens.

Steps:

1. Define the Recognition distance of your scene.

Note:

To get the recognition distance, you need to define the camera height (H). The detection range (L) can be calculated with the equation $L = \cot 30^\circ \times H$.

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IM LPR Camera U61617NA

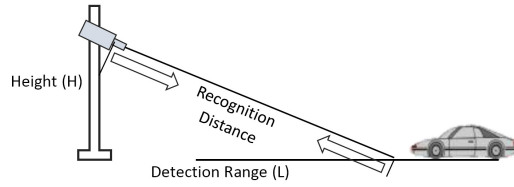


Figure 2-2 Recognition Distance

2. Select a proper lens according to the table below. The recognition distance is based on the camera's focal length.

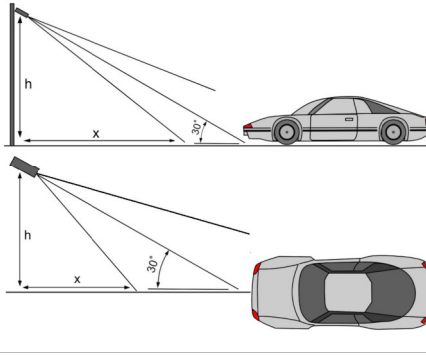
Table 2-1 Lens and Recognition Distance Table

Camera	Lens (mm)	Min. Recognition Distance (m)	Max. Recognition Distance (m)	Scene
LPR Camera	2.8-12	6	18	Entrance
	8-32	15	50	Road Traffic

2.3 Installation Angle

The installation angle must meet the requirements below:

- Vertical angle should not exceed 30 degrees.
- Horizontal angle should not exceed 30 degrees.



2.4 Entrance Surveillance Application

Take the figure below for the application of entrance surveillance use.

Note:

For entrance surveillance, the camera height (H) should be 1.6 meters to 2 meters.

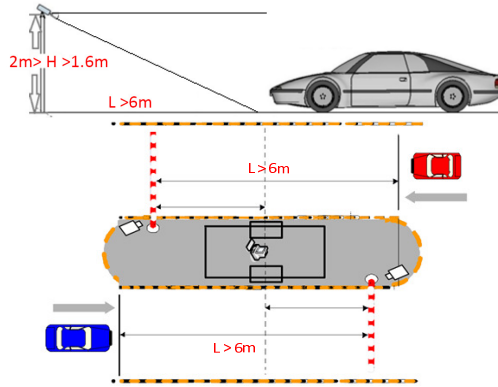


Figure 2-3 Entrance Surveillance Application

2.5 Road Traffic Surveillance Application

Notes:

- For road traffic surveillance, the camera height should be between 5 meters and 6 meters.
- To recognize two or more lanes, it is recommended to mount the camera on a crossbar.
- Make sure that the pole for mounting the camera does not vibrate excessively when a heavy truck or similar vehicle passes.

Take the figure below for the application of two lane with camera mounted on the side of crossbar.

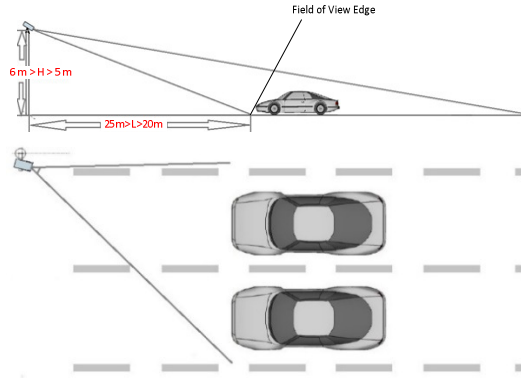


Figure 2-4 Two Lanes (Camera on the Side of Crossbar)

Take the figure below for the application of two lanes with a camera mounted in the middle of a crossbar.

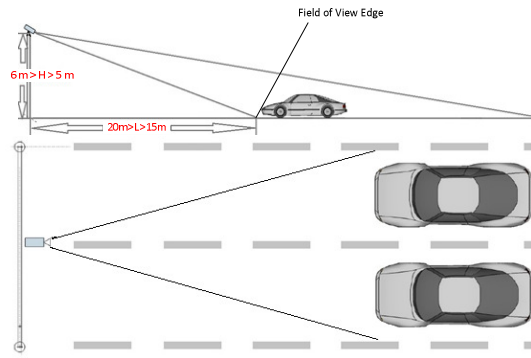


Figure 2-5 Two Lanes (Camera in the Middle of Crossbar)

3 License Plate Recognition

3.1 Before You Start

When using the license plate recognition function, you must meet the requirements below:

- To reduce the effect of the car's headlights at night, the shutter speed should be no less than 1/1000 s. To NOT obscure the edge of the lines (especially shadows), the shutter speed should not exceed 4/1000 s.
- To avoid overexposure of the license plate, the recommended Gain setting value is 20.
- Turn off the WDR and BLC functions to maintain all details.
- Keep the Digital Noise Reduction (DNR) value between 10 and 20.
- Sometimes, invalid information may be detected as a license plate such as ads or image parts with numbers and letters. You should follow the steps below:
 - a) Adjust the Region of Interest (ROI) accordingly to avoid areas that may be falsely detected.
 - b) Adjust the minimum and maximum license plate pixel settings.
 - c) Sometimes, changing the lens angle or moving the camera can improve accuracy.
- Set the exposure time according to the table below. We assume the camera is mounted at a horizontal angle of 30 degrees.

Exposure Time (s)	Maximum Vehicle Speed (kmph)
1/100	5
1/500	40
1/1000	100

1/2000	200
1/4000	400

3.2 Depth of Field

To effectively capture the vehicle image, the camera should be set so as to provide the minimum depth of field (DOF). Depth-of-field (or length of the zone of sharpness) is the amount of distance between the nearest and farthest objects that appear in acceptably sharp focus in a video.

You are free to calculate the minimum depth of field using the following formula.

$$L_{dof} = \frac{4 * T_{rec} * V_{max}}{3600}, m$$

L_{dof} (depth-of-field), length in meters, m

T_{rec} (recognition time per one plate), in milliseconds, ms

V_{max} (maximum vehicle speed), kmph

Using this equation, we've calculated some typical cases for you.

Table 3-1 Depth of Field Calculation

V _{max} (kmph)	T _{rec} (ms)				
	100	200	300	400	500
	L _{dof} (m)				
40	4	9	13	18	22
80	9	18	27	36	44
100	11	22	33	44	56
120	13	27	40	53	67
140	16	31	47	62	78
180	20	40	60	80	100
200	22	44	67	89	111
220	24	49	73	98	122
240	27	53	80	107	133

Notes:

- The minimum sizes of the number plate on the edges of the zone of sharpness shall not be less than the width pixel requirements in Section 3.2.
- DOF depends on the F-number of the lens diaphragm, which may be automatically adjusted by a camera in case of illumination changes. So iris control must be set to "manual" not "auto." Or ensure that DOF length is enough for the worst possible illumination case.
- Change the iris type to manual before focusing the lens, and change the iris type back to auto-iris.

3.3 License Plate Recognition

Purpose:

By using the client software and a Web browser, you can set the rule to capture pictures and make the LPR camera identify the numbers. Here we take the road traffic surveillance application as an example.

Steps:

1. Enable **Vehicle Detection**.
 - 1). Open the Internet Explorer (IE) Web browser.
 - 2). Access the camera via the IE Web browser.
 - 3). Go to **Configuration -> Road Traffic -> Detection Configuration** tab.
 - 4). Select Vehicle Detection and check the Enable checkbox.

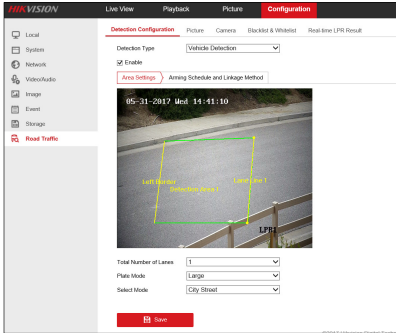


Figure 3-1 Enable Vehicle Detection

2. Set the detection area.

IM LPR Camera 061617NA

Move the left and right yellow lines on the image to set the license plate detection area. The green borders will change automatically after you click **Save**. Make sure both yellow borders are parallel to the direction of the car. The red arrow indicates the direction of the driving car.

Note: Only one license plate can be captured at one time for each lane.

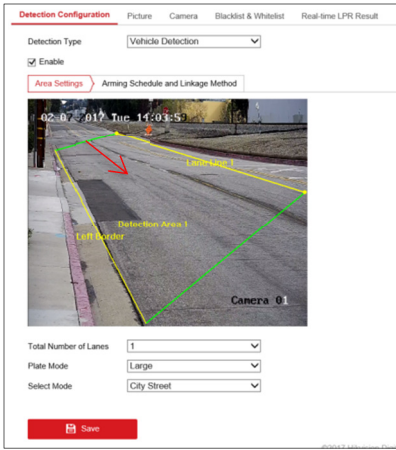




Figure 3-2 Draw the Detection Area

3. Select the lane number from the drop-down list. Up to four lanes are selectable.
4. Select the large or small Plate Mode.

- 1). Large Mode: License plate height is between 30 and 50 pixels.
 - 2). Small Mode: License plate height is between 20 and 30 pixels.
5. Select City Street or Alarm input for Select Mode.
6. Set the Arming Schedule for Vehicle Detection.
- 1). To edit the arming schedule, click **Edit**.
 - 2). Choose the day you want to set the arming schedule.
 - 3). Click  to set the time period for the arming schedule.
 - 4). (Optional) After you set the arming schedule, you can click **Copy** to copy the schedule to other days.
 - 5). Click **OK** to save the settings.
7. Set the Arming Schedule for Vehicle Detection.
- 6). To edit the arming schedule, click **Edit**.
 - 7). Choose the day you want to set the arming schedule.
 - 8). Click  to set the time period for the arming schedule.
 - 9). (Optional) After you set the arming schedule, you can click **Copy** to copy the schedule to other days.
 - 10). Click **OK** to save the settings.
- Note:** The time periods cannot overlap.
8. Check the checkbox to select the linkage method. Notify Surveillance Center and upload to FTP are selectable.
- Notify Surveillance Center:** Send an exception or alarm signal to remote management software when an event occurs.
- Upload to FTP:** Capture the image when an alarm is triggered, and upload the picture to an FTP server, and save the picture on the local SD card or connected NAS.

9. Click **Save** to save the settings.

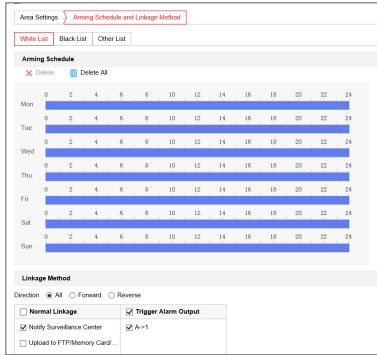


Figure 3-3 Arming Schedule and Linkage Method

3.4 Real-Time LPR Result

The real-time LPR result page displays the captured license plate in the license plate result area. The information including Capture Time, Plate No., Captured Picture, Lane No., Direction, and Matching Result will be listed as well.

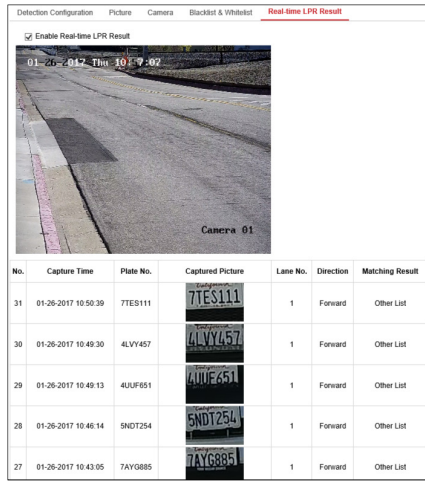


Figure 3-4 Real-time LPR Result Interface

Notes:

- The real-time LPR result page appears only when you check the Enable Real-time LPR Result checkbox in the detection configuration page.
- Up to 20 latest pictures can be displayed on the LPR result area.

3.5 Picture Download

In the Picture page, captured pictures can be searched for and downloaded. Select File Type as Vehicle Detection and choose day and time.

The file is named by time_plate.jpg. Select files and click download. Make sure you are running as administrator for Internet Explorer so that you can find the downloaded pictures in your computer.

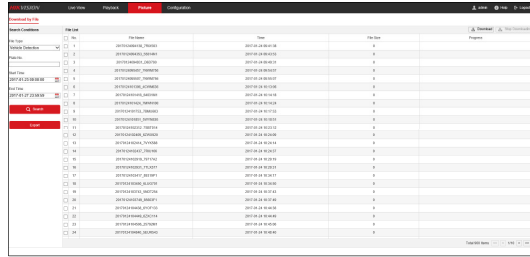


Figure 3-5 Picture Download

3.6 Pixel Requirements

Purpose:

License plate dimensions vary by region. To get a valid image with the LPR camera, you must measure the license plate size and define the minimum valid pixels in the Live View.

Steps:

1. Capture a Live View picture of a passing vehicle.
2. Measure the pixels of the license plate.

1). Open the Paint application.

Note: You can use any graphic editor (e.g., Photoshop) to measure the pixels of the license plate.

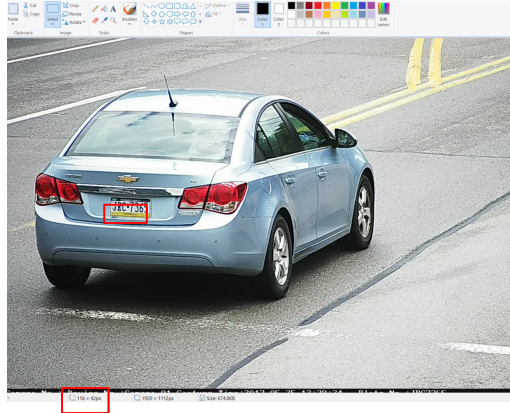


Figure 3-6 License Plate Pixels

2). Click **Select** and select the license plate. The frame pixels display in the lower left corner of the Paint interface.

Notes:

- The license plate itself must be clear in Live View.
- When Plate Mode is selected as large, the height of the plate character in the detection area should be between 30 and 50 pixels.

- When Plate Mode is selected as small, the height of the plate character in the detection area should be between 20 and 30 pixels.
- The width of the plate character in the detection area should be between 100 and 180 pixels.



Figure 1. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 2. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 3. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 4. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

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Figure 9. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 10. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 11. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 12. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 13. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 14. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 15. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 16. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 17. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 18. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 19. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 20. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 21. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 22. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 23. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 24. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.

Figure 25. Distribution of *Chrysomelids* in the world. The shaded areas represent the distribution of *Chrysomelids* in the world.