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Site Design Guide

Designing a Site with the Avigilon H4 License Plate Capture Camera Kit and ACC™ License Plate Reader 6 Engine

Legal Notices

Disclaimer

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Introduction

This document provides design guidelines for installing an Avigilon H4 LPC Camera Kit to work with the License Plate Reader 6 engine on the Avigilon Control Center (ACC) system.

License Plate Recognition (LPR) is a licensed feature that allows you to read and store vehicle license plate numbers from any video streamed through the ACC system. The LPR options are only available if you have the LPR feature licensed and installed on a server at the site.

For information on how to install the License Plate Capture Camera Kit, see the *H4 LPC Camera Installation Guide*.

For information on how to use the License Plate Recognition feature in the Avigilon Control Center™ software, see the *Avigilon Control Center Client User Guide*.

Site Design

This section will help you to select an appropriate mounting location for installing the H4 License Plate Capture (LPC) Camera and to determine the appropriate setup for the IR illuminator.

Selecting a Mounting Location

You must select a mounting location before you can install the H4 LPC Camera Kit. It is important to mount the kit in an appropriate location to optimize the License Plate Recognition (LPR) accuracy.

The kit can be mounted in the overhead or roadside position.

Target Distance and Camera to Target Angle

For best results, the target distance should not exceed 30 m (100 ft) horizontal distance from the camera to the license plate.

Overhead Mounting
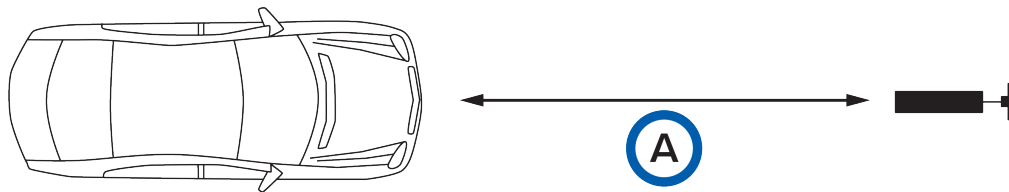
Figure 1: Overhead mounting (top view). A = Horizontal distance.
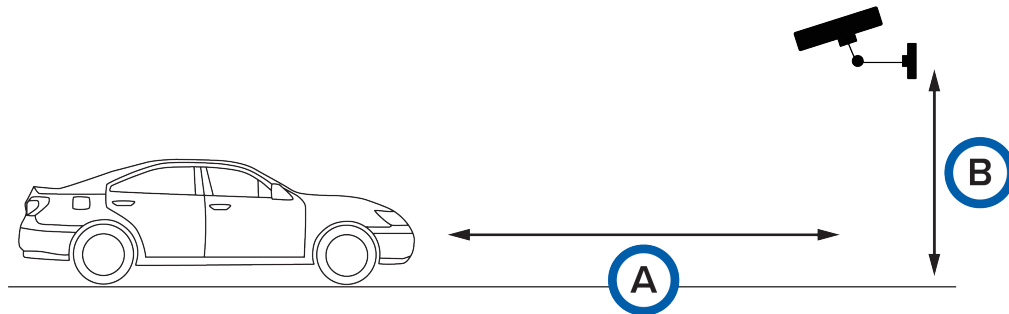
Figure 2: Overhead mounting (side view). A = Horizontal distance. B = Mounting height.

Roadside Mounting
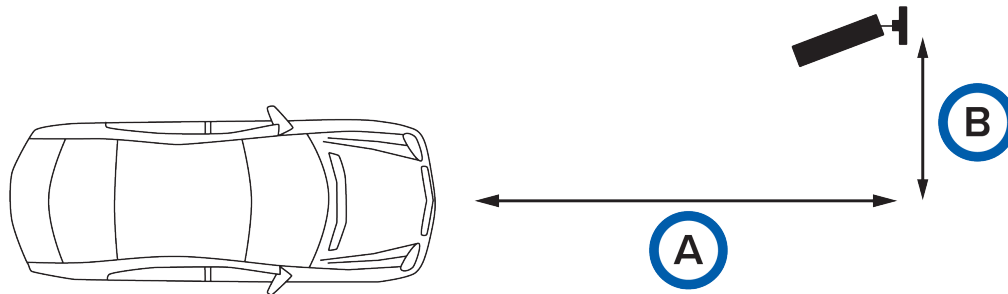
Figure 3: Roadside mounting (top view). A = Horizontal distance. B = Offset distance.
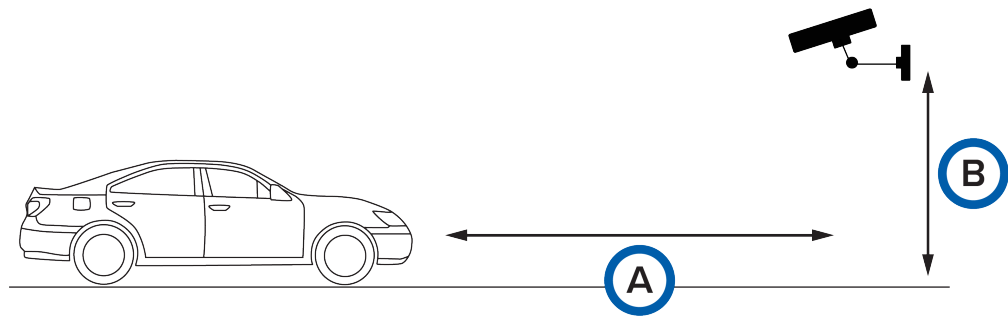
Figure 4: Roadside mounting (side view). A = Horizontal distance. B = Mounting height.

Important: It is highly recommended that the camera to license plate angle does not exceed 30° horizontally or vertically.

Camera to License Plate Angle — Horizontal
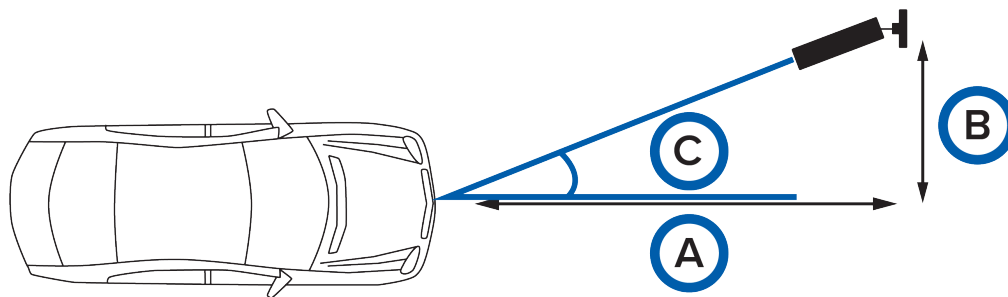
Figure 5: Roadside mounting (top view). A = Horizontal distance. B = Offset distance. C = Horizontal angle.

Example:

1. If the horizontal distance is 30 m (100 ft), the offset distance should not exceed 17 m (56 ft).
2. If the horizontal distance is 12 m (40 ft), the offset distance should not exceed 7 m (23 ft).

Camera to License Plate Angle — Vertical

Figure 6: Roadside mounting (top view). A = Horizontal distance. B = Mounting height. C = Vertical angle.

Example:

1. If the horizontal distance is 30 m (100 ft), the mounting height should not exceed 17 m (56 ft).
2. If the horizontal distance is 12 m (40 ft), the mounting height should not exceed 7 m (23 ft).

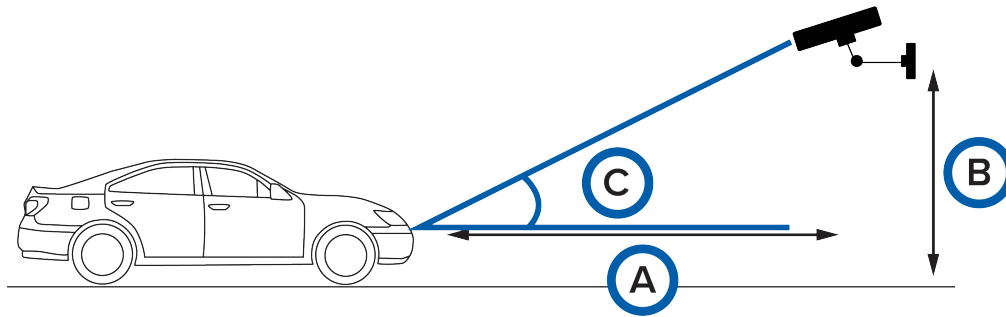The table below provides quick guidelines for determining the appropriate mounting height and horizontal distance.

Table 1: Camera Installation Guidelines

Target Distance	Recommended Installation (20° to target)		Maximum Limits (30° to target)	
	Mounting Height	**Horizontal Distance**	**Mounting Height**	**Horizontal Distance**
11 m (35 ft)	2.8 – 3.6 m (9 – 12 ft)	10 m (33 ft)	5.5 m (18 ft)	9.2 m (30 ft)
15 m (50 ft)	4.0 – 5.2 m (13 – 17 ft)	14.5 m (48 ft)	7.5 m (25 ft)	13 m (43 ft)
23 m (75 ft)	5.9 – 7.8 m (19 – 26 ft)	22 m (72 ft)	11 m (38 ft)	20 m (65 ft)
30 m (100 ft)	7.9 – 10.0 m (26 – 34 ft)	29 m (95 ft)	15 m (50 ft)	26 m (87 ft)

IR Illuminator

The IR illuminator is configured to always stay on when powered up. Please read the safety instructions (page 2 of the manual in the illuminator box).

WARNING — Do not stare into the IR illuminator when it is powered up.

The illuminator is pre-installed with a 35° lens that provides suitable illumination for distances up to 14 m (46 ft). For further target distances it is recommended to remove the 35° lens which will result in the illuminator providing a 10° illumination pattern. The illuminator also comes with an additional 60° lens for applications requiring a wide illumination pattern of close targets. Please consult the illuminator manual for instructions on replacing the lens.

NOTE: Wider illumination patterns result in reduction of the illumination distance.

It is recommended to aim the illuminator parallel to the camera housing for short to moderate distances. For a longer distance, aim the illuminator slightly upwards. If you use a test vehicle you will notice that the license plate image will become brighter (provided that the plate is IR reflective) when the vehicle enters the IR illumination area. This will be noticeable even during the day time and sunny conditions.

Configuring the Camera

The camera settings have been optimized for the license plate capture application. These settings are appropriate for vehicle speeds up to 100 km/h (62 mph). The camera has been configured to the following default settings:

- Exposure = 1/1000 s
- Gain = 6 dB
- Frame rate = 30 frames per second
- Image quality = 6
- HDSM SmartCodec™ is disabled
- WDR is off to prevent image ghosting on moving objects

Shortening the exposure from 1/1000 s may result in the image becoming darker. An increase in gain may be required to compensate for the shorter exposure time. To avoid excessive noise, it is recommended to not exceed 24 dB gain.

NOTE: The H4 LPC camera is setup to be sensitive only to IR light and not to visible light. As a result, in overcast weather conditions the live image may appear very dim or completely dark. This is the expected operation as the goal is to capture license plates which will appear bright under IR illumination as they are IR reflective.

Setting the Frame Rate

The camera's frame rate is independent of the image analysis rate of the LPR engine. The camera's frame rate should either be equal to or higher than the image analysis rate set on the ACC LPR engine. Do not set a lower frame rate on the camera than the image analysis rate on the engine. Refer to *Configuring License Plate Recognition in the ACC Software* on page 10 for the recommended image analysis rate setting.

To change the camera's frame rate:

1. Open the ACC Client software.
2. Right-click the H4 LPC camera in the System Explorer and select **Setup**.
3. Click [image] in the camera Setup tab.

   The Compression and Image Rate dialog box is displayed.
4. Move the **Image Rate** slider to select the image rate for your installation environment.
5. Click **OK** to save your changes.

License Plate Pixels Per Target

Change the camera's zoom level to adjust the number of pixels on the target license plate.

- North American license plates: it is highly recommended to setup the camera so there are at least 100 horizontal and 80 vertical pixels on the plate. The minimum setting is 75 horizontal pixels on a standard 1-foot license plate.
- European license plates: it is highly recommended to setup the camera so there are at least 150 horizontal and 80 vertical pixels on the plate. The minimum setting is 90 horizontal pixels.

Resolutions higher than 250 horizontal pixels per plate will not improve results. Higher zoom levels than necessary will negatively impact server performance as a higher image analysis rate would be required on the server to capture the license plate for a defined speed.

Number of Lanes

Tip: All of the previous recommendations in this guide are applicable for a single lane installation.

For dual lane applications it is highly recommended to mount the camera overhead and to ensure that the camera to target angle does not exceed 20°. Do not exceed a horizontal distance of 14 m (46 ft) or a mounting height of 5 m (17 ft).

Field of View

The camera field of view is the area that is visible in the video image. When a moving vehicle is not in the field of view, it is important that the H4 LPC camera is not aimed at anything that could be interpreted as a series of alphanumeric characters such as a billboard or road sign. The License Plate Recognition system may recognize this as a license plate and generate inaccurate results.

Configuring License Plate Recognition in the ACC Software

For detailed information about configuring LPR in the ACC software, see the *Avigilon Control Center Client User Guide*. Please refer to the following sections:

- *License Plate Recognition*
- *Monitoring License Plates*
- *Initiating a Search*

To analyze license plates, the LPR engine requires a defined Region of Interest (ROI) and Image Analysis Rate to be set. Use the tables below to determine recommended image analysis rate for a defined Region of Interest of 400k pixels or 1MP. For optimal performance of the LPR engine it is generally preferable to increase the Image Analysis Rate than increase the Region of Interest.

The following recommendations are applicable when the camera is mounted at the recommended height and horizontal distance (20° to target) as outlined in *Table 1: Camera Installation Guidelines* on page 7.

Table 2: Frame Rate Recommendation (20° to target)

Speed	Recommended Image Analysis Rate (Region of Interest = 400k pixels)	Recommended Image Analysis Rate (Region of Interest = 1MP)
0 – 16 km/h (0 – 10 mph)	7	4
16 – 32 km/h (10 – 20 mph)	13	6
32 – 48 km/h (20 – 30 mph)	20	9
48 – 64 km/h (30 – 40 mph)	25	12
64 – 80 km/h (40 – 50 mph)	30	14
*80 – 100 km/h (50 – 62 mph)	Not Recommended	16

The following recommendations are applicable when the camera is mounted at the maximum height and horizontal distance (30° to target) as outlined in *Table 1: Camera Installation Guidelines* on page 7.

Table 3: Frame Rate Recommendation (30° to target)

Speed	Recommended Image Analysis Rate (Region of Interest = 400k pixels)	Recommended Image Analysis Rate (Region of Interest = 1MP)
0 – 16 km/h (0 – 10 mph)	9	4
16 – 32 km/h (10 – 20 mph)	16	7
32 – 48 km/h (20 – 30 mph)	24	10
48 – 64 km/h (30 – 40 mph)	30	14
64 – 80 km/h (40 – 50 mph)	Not Recommended	16
*80 – 100 km/h (50 – 62 mph)	Not Recommended	20

NOTE:

- Use Table 3 to determine image analysis rate for *all roadside mounting* applications while ensuring a maximum camera to target angle of 20°.
- When drawing the ROI, cover the full lane width and include more area in the direction of travel for the vehicles.
- * For speeds above 80 km/h (50 mph):
    - Increase gain to 12 dB.
    - Decrease exposure to 1/2000 s (0.5 ms).

Verification Test

After the H4 LPC camera has been installed and the software has been configured correctly, a simple verification test should be performed.

Important: Before performing this test, ensure to block off a section of the road for safety purposes.

1. Drive a vehicle through the defined Region of Interest of the H4 LPC camera.
2. Replay the video and review each frame of the vehicle passing through the Region of Interest being analyzed. The brightness of the license plate should peak as the vehicle passes through the IR illuminator's illumination region.
3. Run a License Plate Search with a blank search term.
4. If the license plate does not appear or does not appear correctly, check the following:
   a. Software is configured correctly. For more information, see *Configuring License Plate Recognition in the ACC Software* on page 10.
   b. The license plate is readable in the captured image.
   c. The license plate is bright compared to the rest of the scene.
   d. There is contrast between the license plate background and the license plate characters.
5. Unblock the road and watch the LPR camera capture actual traffic. Run a License Plate Search with a blank search term.
6. Review the search results and compare them to the captured images. Incorrect results often result if:
   a. The license plate is partially covered.
   b. The license plate is dirty.
   c. The license plate is a vanity plate.
   d. The reflective coating has severely worn off.
   e. The license plate is from a region with a different font.

NOTE:

- Advertisements and other text on vehicles may be interpreted as license plates and generate extra results.
- If the captured license plate is overexposed on the ACC client or player, the auto contrast setting will have to be disabled in the ACC client/player settings.

Limited Warranty and Technical Support

Avigilon warranty terms for this product are provided at **avigilon.com/warranty**.

Warranty service and technical support can be obtained by contacting Avigilon Technical Support: **avigilon.com/contact-us/**.