

Installation Guide

Avigilon[™] License Plate Recognition System Models:

1L-HD-LP-35, 1L-HD-LP-50, 1L-HD-LP-75, 1L-HD-LP-100 and 2L-HD-LP-40

- EN: For a copy of this manual in your preferred language, see the *Avigilon LPR Design and Installation Guide* in the Avigilon Resource Center.
- FR : Pour obtenir un exemplaire de ce manuel dans la langue de votre choix, reportez- vous au *Conception et guide d'installation LPR d'Avigilon* sur l'Avigilon Centre de ressources.
- ES: Si desea una copia de este manual en su idioma preferido, consulte la *Guía de instalación y diseño LPR de Avigilon* en el Centro de recursos de Avigilon.
- IT: Per una copia del presente manuale nella propria lingua, fare riferimento alla *Guida di progettazione ed installazione Avigilon LPR* nel Avigilon centro risorse.
- DE: Eine Kopie dieses Handbuchs in Ihrer bevorzugten Sprache finden Sie im Avigilon Resource Center unter *Avigilon LPR-Design und Installationsanleitung*.
- PT-BR: Para obter uma cópia deste manual em seu idioma preferido, veja o *Guia de projeto e instalação do LPR da Avigilon* no Avigilon Centro de recursos.
- RU: Копию данного руководства по проектированию и установке *Avigilon LPR* можно загрузить с Avigilon Ресурсный центр.
- ZH: 如需适用您的语言的手册副本，请参阅 Avigilon 资源中心的 《Avigilon LPR 设计和安装指南》。

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Introduction

This guide provides instructions on how to install a License Plate Recognition (LPR) system using the Avigilon HD LPR Capture Kit.

For information on how to select an appropriate LPR camera model and mounting location, see *Site Design* on the next page.

For information on how to install and position the HD LPR Capture Kit, see *Installation* on page 11

For information on how to use the License Plate Recognition feature in the AvigilonControl Center™ (ACC), see *Configuring LPR in the ACC Software* on page 21

Site Design

This section will help you select an appropriate LPR camera model, number of NVR servers, and mounting location based on your video surveillance requirements. It is important to read this section before installing the HD LPR Capture Kit to ensure LPR accuracy.

LPR Camera Selection

The target distance is the physical distance between the LPR camera and the license plate detection area.

Each HD LPR Capture Kit model is calibrated for a specific target distance. Refer to the table below to select the appropriate kit:

Target Distance (ft [m])	Single Lane	Dual Lanes
35 [11]	1L-HD-LP-35	N/A
50 [15]	1L-HD-LP-50	N/A
75 [23]	1L-HD-LP-75	N/A
100 [30]	1L-HD-LP-100	N/A
40 [12]	N/A	2L-HD-LP-40

Required Number of Servers

The Avigilon HD LPR Capture Kit is designed to cover a single traffic lane of 10 ft (3m) or two adjacent traffic lanes. The maximum number of lanes that can be monitored on a single server depends on the target vehicle speed and the mounting height.

Speed (mph [km/h])	Maximum number of lanes per NVR (Recommended Overhead)	Maximum number of lanes per NVR (Maximum Overhead or Roadside)
0-20 [0-32]	4	2
20-30 [32-50]	2	1
30-40 [50-65]	1	1
40-60 [65-100]	1	Not recommended

NOTE: The Avigilon LPR software should only be run on Avigilon HD NVR servers or machines with similar specifications. For HD NVR servers, it is recommended that you use an additional processor to supplement the processing requirements of the LPR.

System Requirements

The Avigilon LPR software can only run on the following operating systems. Make sure the servers are using one of these operating systems before you install the LPR software.

- Windows Vista 64-bit
- Windows Server 2008
- Windows 7

Selecting a Mounting Location

You must select a mounting location before you can install the HD LPR Capture Kit. It is important to mount the kit in an appropriate location to optimize the LPR accuracy.

The kit can be mounted in the overhead or roadside position. The LPR camera can recognize vehicles traveling at up to 100 km/h (60 mph) when mounted in the recommended overhead mounting height, but the maximum detectable speed decreases to 65 km/h (40 mph) when mounted in the maximum overhead mounting height or when mounted in the roadside position.

Overhead Mounting

In overhead mounting, the HD LPR Capture Kit is mounted directly above the vehicle path. Refer to the following tables for recommended and maximum mounting heights for each HD LPR Capture Kit model and their corresponding horizontal distances to the license plate detection area.

Overhead Recommended Mounting Height:

HD LPR Capture Kit	Target Distance (ft [m])	Recommended Mounting Height (ft [m])	Horizontal Distance (ft [m])
1L-HD-LP-35	35 [11]	9 – 12 [2.8 – 3.6]	33 [10]
1L-HD-LP-50	50 [15]	13 – 17 [4.0– 5.2]	48 [14.5]
1L-HD-LP-75	75 [23]	19 – 26 [5.9 – 7.8]	72 [22]
1L-HD-LP-100	100 [30]	26 – 34 [7.9 – 10]	95 [29]
2L-HD-LP-40	40 [12]	10 – 14 [3.1 – 4.2]	38 [11.5]

Overhead Maximum Mounting Height:

HD LPR Capture Kit	Target Distance (ft [m])	Maximum Mounting Height (ft [m])	Horizontal Distance (ft [m])
1L-HD-LP-35	35 [11]	18 [5.5]	30 [9.2]
1L-HD-LP-50	50 [15]	25 [7.5]	43 [13]
1L-HD-LP-75	75 [23]	38 [11]	65 [20]
1L-HD-LP-100	100 [30]	50 [15]	87 [26]
2L-HD-LP-40	40 [12]	20 [6.1]	35 [11]

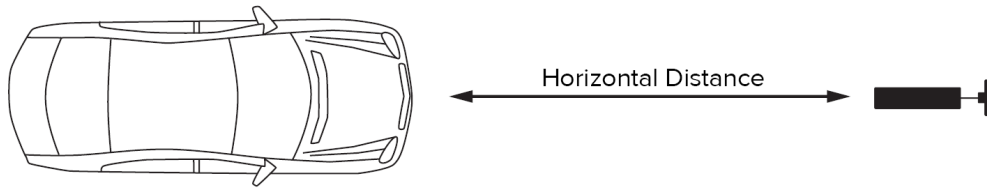


Figure 1: Overhead mounting (top view)

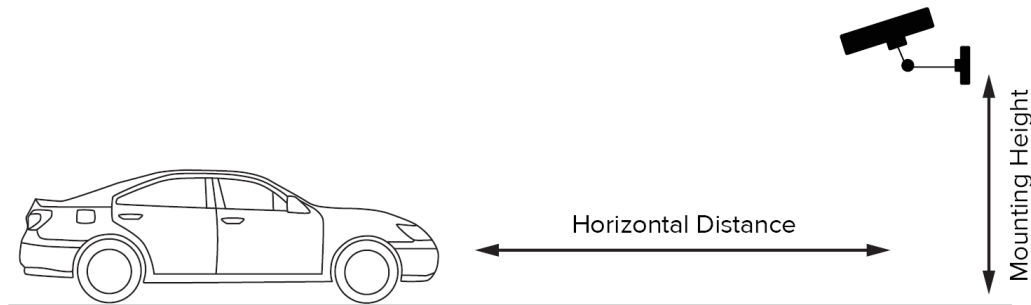


Figure 2: Overhead mounting (side view)

Roadside Mounting

If overhead mounting is not possible, then use roadside mounting. In roadside mounting, the HD LPR Capture Kit is often pole-mounted on the side of the road. Refer to the following table for the maximum mounting height and offset distance for each HD LPR Capture Kit model. Select the shortest target distance that results in a practical mounting location.

NOTE: The dual lane kit (2L-HD-LP-40) should not be mounted in the roadside position.

Roadside Mounting Height and Offset:

HD LPR Capture Kit	Target Distance (ft [m])	Max Mounting Height (ft [m])	Max Offset (ft [m])	Horizontal Distance (ft [m])
1L-HD-LP-35	35 [11]	12 [3.6]	12 [3.6]	32 [10]
1L-HD-LP-50	50 [15]	17 [5.2]	17 [5.2]	46 [14]
1L-HD-LP-75	75 [23]	26 [7.8]	26 [7.8]	69 [21]
1L-HD-LP-100	100 [30]	34 [10]	34 [10]	93 [28]

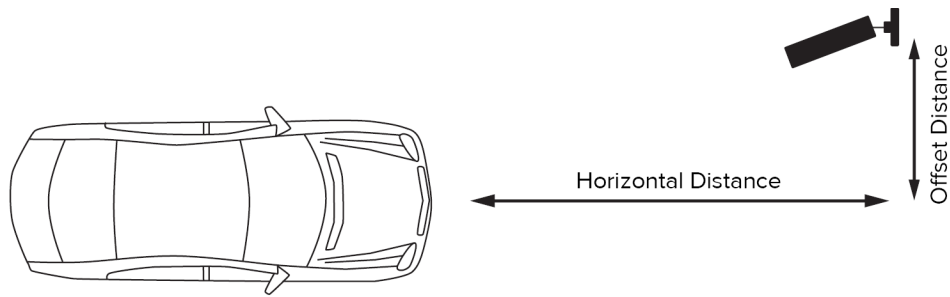


Figure 3: Roadside mounting (top view)

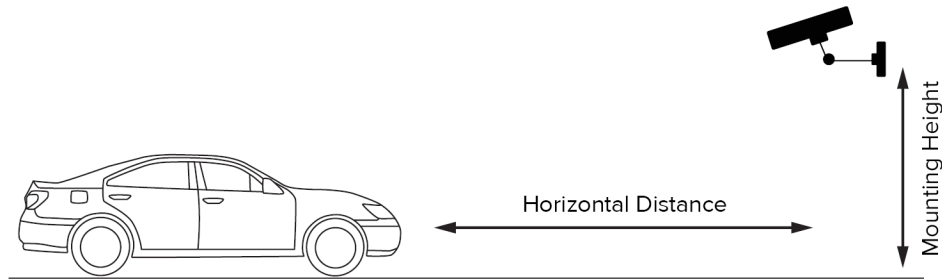


Figure 4: Roadside mounting (side view)

Maximum Cable Length

The distance between the Power Supply Unit (PSU) and the LPR kit is limited by the maximum length of the power and network cables. Refer to the following table to select a mounting location for the PSU.

Table 6: Wire Gauge vs. Max. Distance

Wire Gauge (AWG)	Max. Distance (m [ft])
18	4.0 [13]
20	2.5 [8.4]
22	1.6 [5.3]
24	1.0 [3.3]

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 LPR camera is not aimed at anything that could be interpreted as a series of alphanumeric characters such as a billboard or road sign. The LPR system may recognize this as a license plate and generate inaccurate results.

Installation

After you have selected a mounting location, you can install the HD LPR Capture Kit.

Package Contents

Ensure the package contains the following:

- Avigilon™ HD LPR Camera
- Avigilon™ HD LPR Enclosure
- Power Supply Unit (PSU)
- 3 mm Hex key for enclosure
- 2 x Network Cables (inside enclosure)
- Camera Power Connector Block
- Overview camera adapter
- UNC 20 bolt and washers
- Mounting assembly kit
 - Mounting bracket
 - Mounting bracket pad
 - 4 mm Hex key
- 10 x Shims (Single Lane only)
- 4 x Shim screws

Installation Steps

Complete the following steps to install the device:

Connecting Cables to the Camera

Important: Do not adjust the LPR camera inside the enclosure. It is calibrated for a specific target distance.



CAUTION — Do not tilt the enclosure backwards when the back panel is removed. The camera may slide out.

1. Loosen the four screws at the back of the enclosure and remove the back panel.
2. To add an overview camera, see *(Optional) Adding an Overview Camera* on the next page
3. Connect the terminal labeled J8 (CAT5) to the Ethernet port of the LPR camera using the network cable provided.
4. If Power over Ethernet (PoE) is not available, proceed to *Connecting External Power* on page 13
5. Reinstall the back panel of the enclosure.

(Optional) Adding an Overview Camera

You can install an overview camera in the LPR enclosure to record the wider surveillance area, which is useful for identifying a vehicle model or driver, or capturing video before and after an incident.

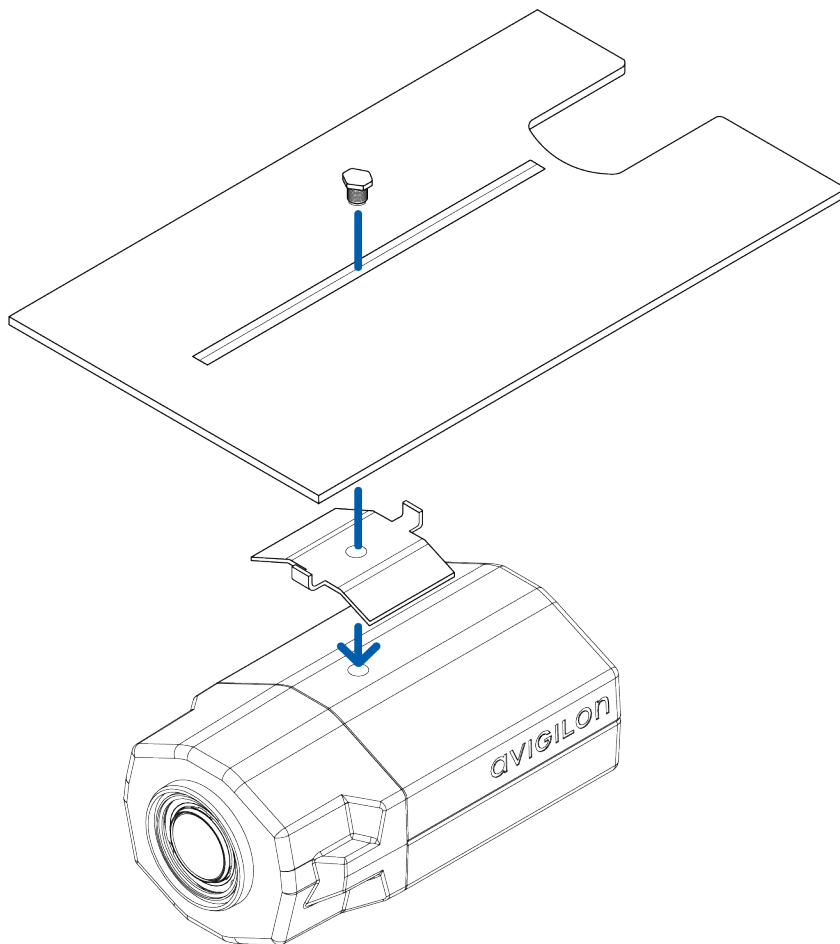
NOTE: It is recommended that you use Avigilon HD H.264 IP Camera models H3-B2 or H3-B3 as overview cameras.

Complete the following steps to install an overview camera:

1. Loosen the four screws at the back of the enclosure and remove the back panel.
2. Remove the network cables from the terminals labeled J8 (CAT5) and J9 (CAT5).
3. Slide out the metal mounting plate below the LPR camera.

Be careful not to touch the LPR camera or lens.

4. Use the provided UNC 20 bolt and camera adapter to attach the overview camera to the mounting plate.



5. Slide the mounting plate and overview camera into the enclosure. Ensure that the bolt has sufficient clearance from the LPR camera.

Be careful not to damage the circuit board below.

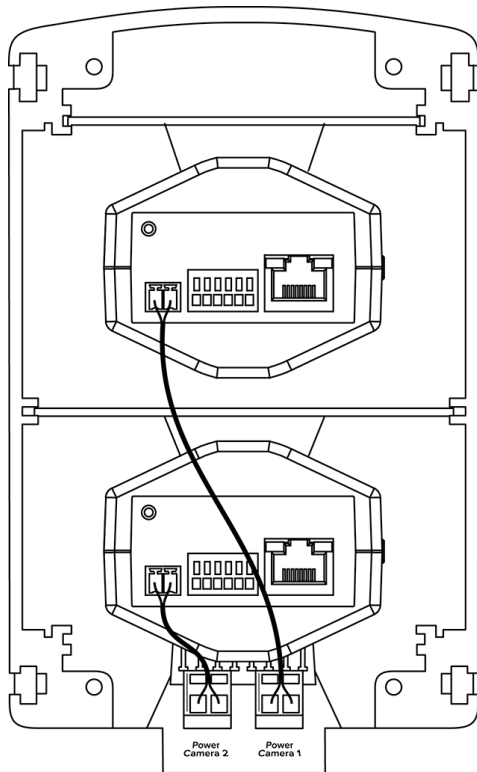
6. Connect the terminal labeled J9 (CAT5) to the Ethernet port of the overview camera using the network cable provided.

7. Connect the terminal labeled J8 (CAT5) to the Ethernet port of the LPR camera using the network cable provided.
8. If Power over Ethernet (PoE) is not available, proceed to *Connecting External Power* below
9. Reinstall the back panel of the enclosure.

Connecting External Power

NOTE: Do not perform this procedure if PoE is used.

1. To connect power to the LPR camera, connect the terminal labeled J2 (Power Camera 1) to the power connector block of the LPR camera.
2. To connect power to the overview camera, connect the terminal labeled J3 (Power Camera 2) to the power connector block of the overview camera.



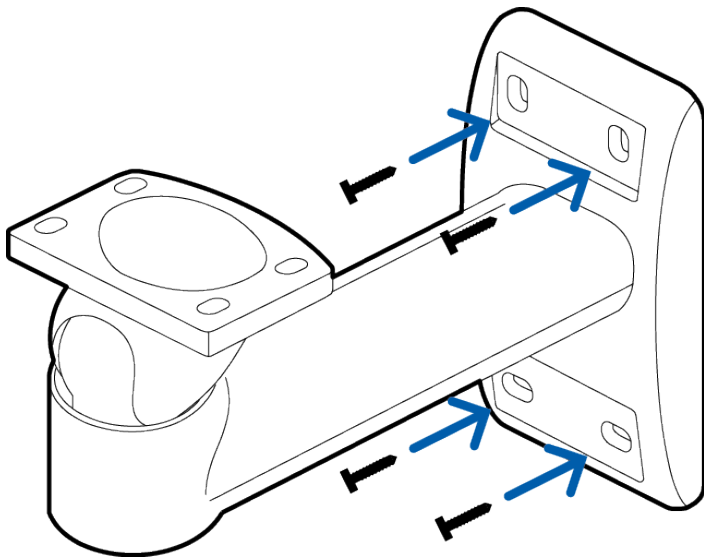
Mounting the LPR Enclosure

Before you can mount the HD LPR Capture Kit, you must choose a mounting location. For more information, see *Site Design* on page 7

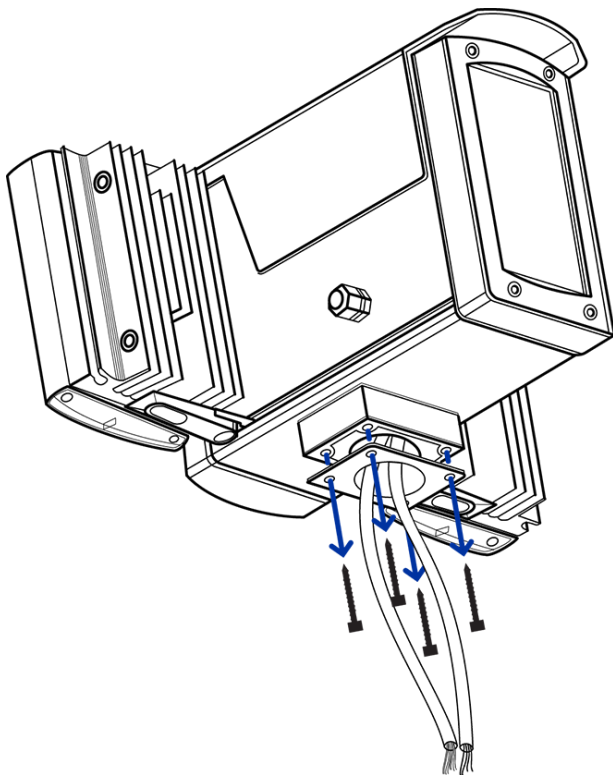
Complete the following steps to mount the enclosure:

NOTE: The required cameras should already be connected inside the enclosure.

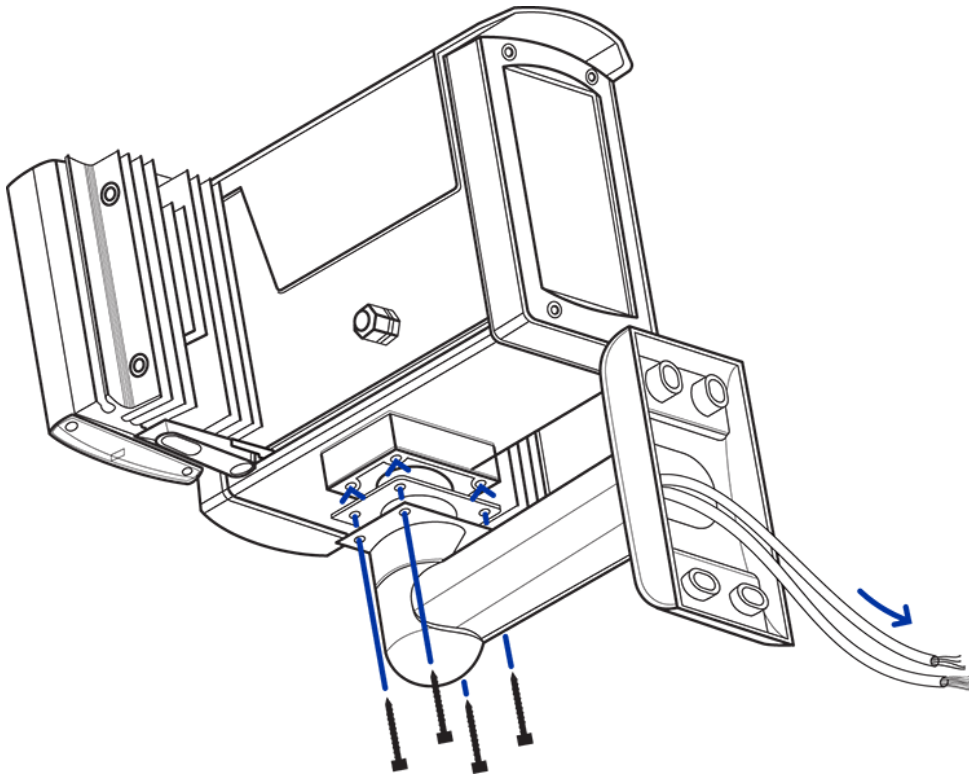
1. Drill four mounting holes and a cable entry hole into the mounting surface.
2. Attach the mounting bracket to the mounting surface.
 - Use screws that are appropriate for the mounting surface.
 - It is recommended that you apply silicone sealant into the mounting holes underneath the screw heads.



3. Use the provided 3mm Hex key to remove the four screws from the base of the enclosure.



4. Pull the required cables through the mounting arm and into the cable entry hole. Then, secure the enclosure to the mounting arm.



Mounting the Power Supply Unit

Important: The PSU must be mounted within a certain distance from the LPR kit. For more information, see *Maximum Cable Length* on page 10

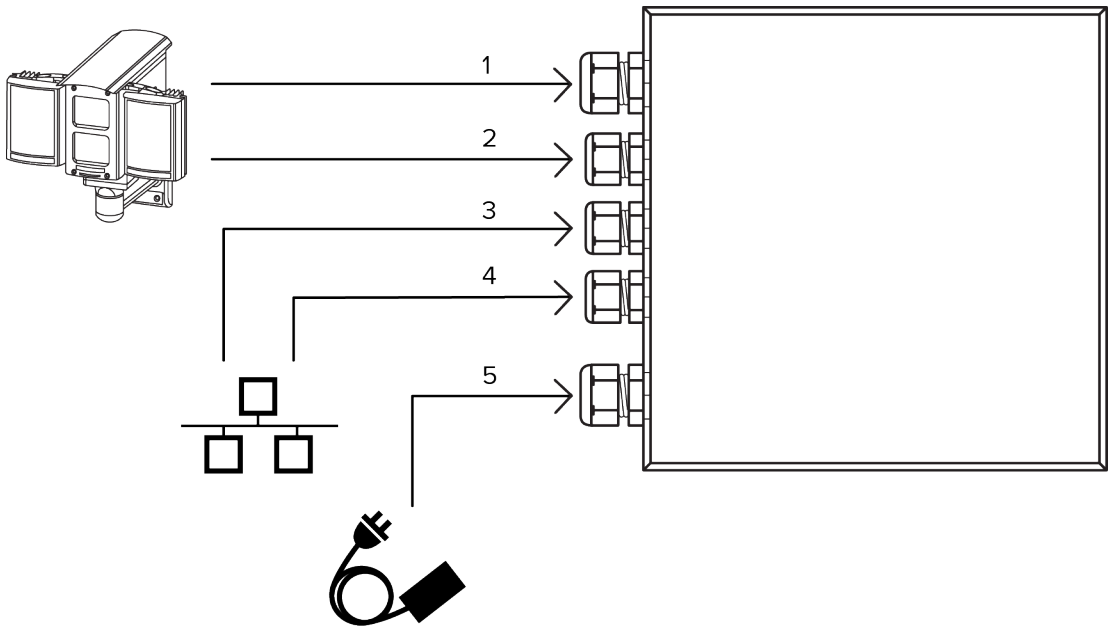
Install the PSU within the maximum distance using the four M4 mounting holes at each corner of the unit.

Do not connect power to the PSU until all other cable connections have been established.

PSU Cable Connections

PSU to LPR Kit Connections

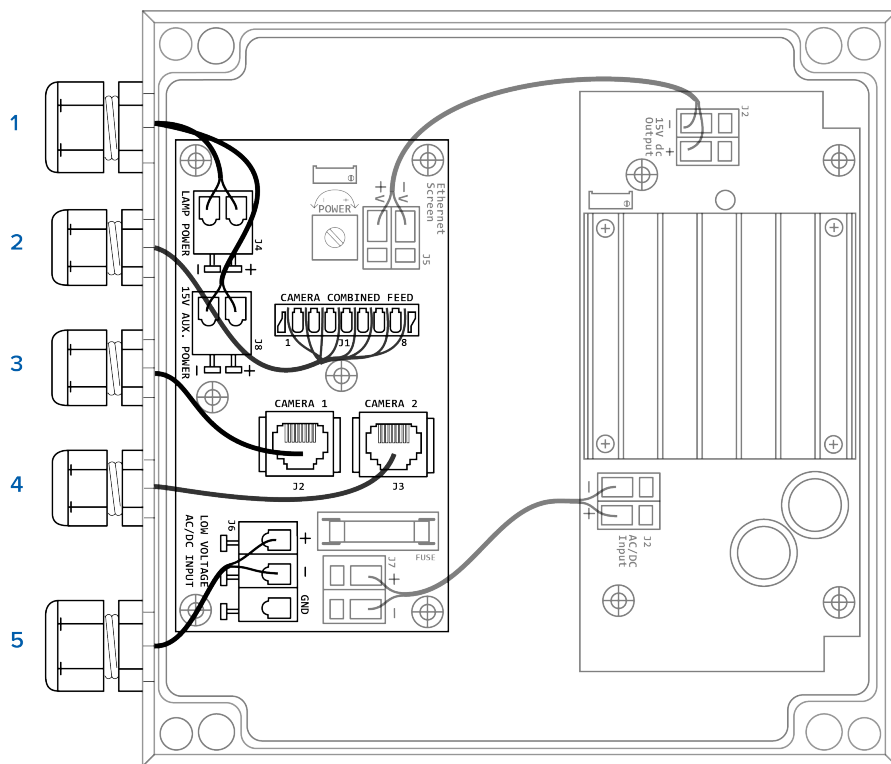
The HD LPR Capture Kit is powered and connected to the network through the PSU.



1. LPR camera power cable
2. LPR camera network cable
3. Network cable from switch (for LPR camera)
4. Network cable from switch (for optional overview camera)
5. Power supply cable to PSU

Connecting Cables in the PSU

Refer to the following diagram for the locations of the different connectors:



NOTE: The cable glands are designed for cables between 0.15 – 0.30 inches (4 – 8 mm) in diameter. For thinner cables, thicken the cable with electrical tape at the point of contact with the gland to ensure a tight fit. Unused glands should be plugged or sealed.

1. Connect the black power cable from the LPR camera to the PSU:
 - a. Pull the cable through the first cable gland (#1 in the diagram)
 - b. Connect the red and black wires to J4 (Lamp Power):
 - Red — positive
 - Black — negative
 - c. Connect the purple and white wires to J8 (15 V Aux Power):
 - Purple — positive
 - White — negative
2. Connect the gray network cable from the LPR camera to the PSU:
 - a. Pull the cable through the second cable gland (#2 in the diagram)
 - b. Connect the wires to the appropriate terminals in the punch down block labeled J1 (Camera Combined Feed):
 - Orange/ White — terminal 1
 - Orange — terminal 2
 - Green/ White — terminal 3
 - Blue — terminal 4
 - Blue/ White — terminal 5

- Green — terminal 6
 - Brown/ White — terminal 7
 - Brown — terminal 8
3. Connect a network cable from a network switch to the PSU:
 - a. Pull the cable through the third cable gland (#3 in the diagram) and terminate it with an RJ-45 jack.
 - b. Connect this cable to J2 (Camera 1).
 4. If you are using an overview camera, connect another network cable from the network switch to the PSU:
 - a. Pull the cable through the fourth cable gland (#4 in the diagram) and terminate it with an RJ-45 jack.
 - b. Connect this cable to J3 (Camera 2).
 5. Connect a 24V AC/DC power supply cable to the PSU:

NOTE: It is recommended that you use a 24 V (secondary) 100 VA transformer.

- a. Pull the cable through the fifth cable gland (#5 in the diagram).
- b. Connect the red and black wires to J6 (Low Voltage AC/DC Input) terminal.
 - Red — positive
 - Black — negative

Tip: If power is supplied to the PSU, there will be a red glow from both IR panels. You can verify this by taking a photo of the IR panels with a phone camera. The red glow will be more visible in the photo.

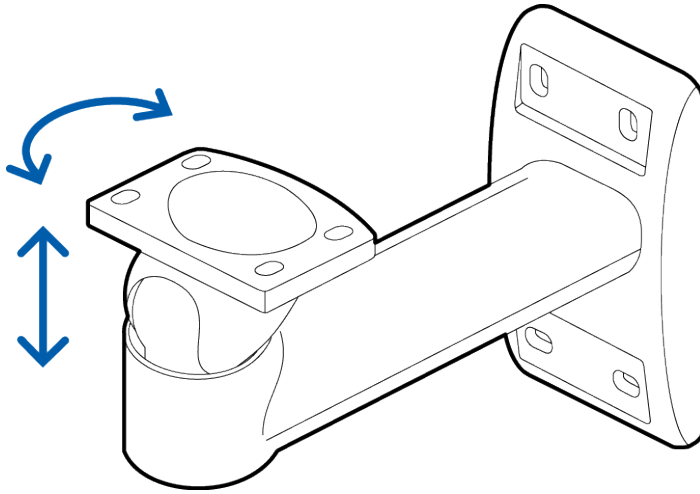
CAUTION — Do not adjust any of the potentiometers in the PSU.

Positioning the HD LPR Capture Kit

Adjusting the Mounting Bracket

The Avigilon HD LPR Capture Kit is pre-calibrated for a specific target distance as indicated by the model number. It is important to aim the camera at the appropriate distance.

1. Use the 4mm Hex key provided to loosen the screw at the head of the mounting bracket.
2. Adjust the head as required.



3. Tighten the screw to secure the head.

Adjusting the Enclosure

When the HD LPR Capture Kit is mounted in the roadside position, vehicle license plates may appear skewed. To improve LPR accuracy, you can use the shims provided to adjust the enclosure such that vehicle license plates appear horizontal in the image.

1. Park a vehicle in the center of the field of view.
2. View the image of the vehicle. If the image is horizontal, you do not need to install the shims.
3. If the vehicle's license plate is not horizontal in the image, unscrew the 2 screws in the base of the enclosure on the side that needs to be corrected and replace them with shim mounting screws. Do not tighten.
4. Install a shim under each shim mounting screw at the enclosure/ mounting bracket interface.

Repeat until the license plate is horizontal in the image. Up to 3 shims per screw may be necessary.

5. Tighten the screws at the base of the enclosure.

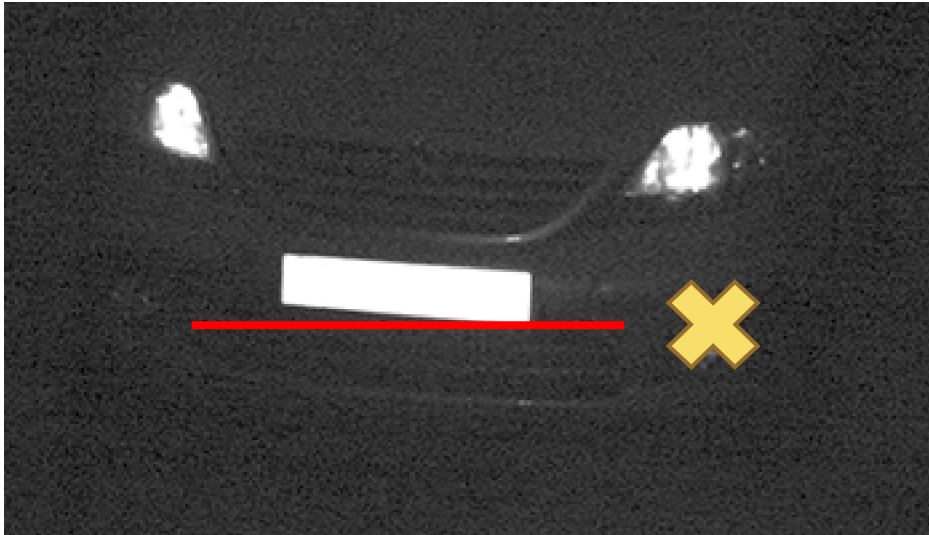


Figure 5: Tilted license plate (incorrect)

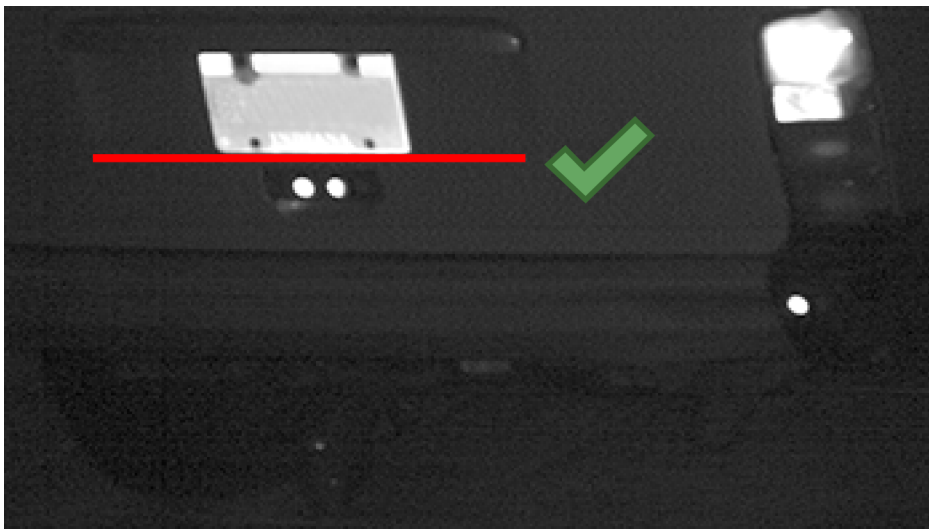


Figure 6: Horizontal license plate (correct)

Configuring LPR in the ACC Software

License Plate Recognition is a licensed feature that allows you to read and store vehicle license plate numbers from any video streamed through the Avigilon Control Center system.

The LPR options are only available if you have the feature licensed and installed on a server in the site.

For more information about the features available in the ACC software, see the *Avigilon Control Center Client User Guide*.

Configuring the Camera

Before you configure the LPR feature, you must configure the camera in the LPR kit. To optimize license plate detection, it is recommended that you set the camera image rate based on the following table:

Speed (mph [km/h])	Minimum Frame Rate (ips) (installed at the recommended overhead mounting height)	Minimum Frame Rate (ips) (installed at the maximum overhead or roadside mounting height)
0 – 20 [0 – 32]	5	10
20 – 30 [32 – 50]	10	15
30 – 40 [50 – 65]	15	24
40 – 60 [65 – 100]	24	Not recommended

To change the camera's image rate and quality, complete the following steps:

1. In the ACC Client software, right-click the LPR camera in the System Explorer then select **Setup**.



2. In the camera Setup tab, click .

The Compression and Image Rate dialog box is displayed.

3. In the **Image Rate:** bar, move the slider until you've selected the recommended image rate for your installation environment.
4. In the **Image Quality:** drop down list, select **4**.
5. Click **OK** to save your changes.

Setting Up License Plate Recognition



1. In the server Setup tab, click .

The License Plate Recognition dialog box is displayed.

2. Select a lane from the License Plate Lane list.

The number of lanes listed is determined by the number of License Plate Recognition (LPR) channels that are available on the server.

3. Complete the following fields:

- **Name:** enter a name for the lane.
- **Camera:** select the camera that will perform LPR. One camera can be used for multiple lanes.
- **License Plate Configuration:** select the regional license plate format that needs to be recognized by the camera.
- **Pre-Event Record Time:** enter the amount of time that video is recorded before the license plate is recognized.
- **Post-Event Record Time:** enter the amount of time that video is recorded after the license plate is recognized.
- **Minimum Confidence:** move the slider to set the minimum confidence required for a detected license plate to be recognized. The default value is 80%.
- **Enable this lane:** select this check box to enable LPR on this lane.

4. Move and adjust the green overlay until it spans the width of the traffic lane in the camera's field of view. LPR is only performed in the green area.

NOTE: If the overlay is red, the license plate detection area is too large and cannot be used.

5. Click **OK**.

Configuring the Watch List

The License Plate Recognition (LPR) Watch List identifies license plates that are of special interest. When a license plate on the Watch List is detected, an event is generated to notify you of the license plate and can be used to trigger an action in the Rules engine.


You can manually add each license plate that needs to be recognized, or import a list of license plates into the Client.

Adding Licenses to the Watch List



1. In the server Setup tab, click .

The License Plate Recognition dialog box is displayed.


2. Select the **Watch List** tab.
3. Click . The Add License Plate dialog box is displayed.

4. Enter the license plate number that you want to watch for.
5. Move the **Minimum Confidence** slider to determine how similar the detected license plate must be before it is considered a match.

For example, if a license plate on your Watch List is ABC 123 and the ACC software detects an ABC 789 license plate, the system will be 50% confident that it has found a match. If the system detects ABC 129, it will be 83% confident that it has found a match.

6. Click **OK**.

Deleting a License Plate from the Watch List

1. In the License Plate Recognition dialog box, select the **Watch List** tab.
2. Select the license plate from the Watch List then click .

Exporting a Watch List

1. In the License Plate Recognition dialog box, select the **Watch List** tab.
2. Click **Export...**
3. In the Save As dialog box, name the file and click **Save**.

The Watch List can be exported as a text file or a comma-separated values (CSV) file.

Importing a Watch List

1. In the License Plate Recognition dialog box, select the **Watch List** tab.
2. Click **Import...**
3. In the Import dialog box, locate the Watch List file and click **Open**.

Monitoring Detected License Plates

After the LPR system has been installed, you can use the ACC Client software to monitor license plates as they are detected. To monitor license plates as they are detected, you must first enable the license plate overlay.

If you have a Watch List configured, you are automatically notified when a license plate on the Watch List is detected.


You can also use the available search feature to look for specific license that were recorded by the system.

License Plate Overlay

While you monitor video in an image panel, you can also monitor license plates as they are detected by the system.

When the license plate overlay is enabled, detected license plate numbers are displayed in the bottom right corner of the image panel.

To enable the License Plate overlay:

1. In the top-right corner of the Client window, select  > **Client Settings** > **Display**.
2. In the Image Overlays: area, select the **License Plate** check box.
3. Click **OK**.

When you display live video for a camera that is configured for license plate recognition, the detected license plates are displayed by the overlay.

Reviewing License Plate Matches


To export all listed search results, click **Export results to a file** and save the file. The search results can be saved as either a CSV or Text file.

If your system is configured to track specific license plates through the Watch List, you will be notified by a pop-up dialog box when matches are detected.

Select one of the license plate matches and do any of the following:

- Click **View this Event** or double-click the selected license plate to open a snapshot of the detected license plate in a new View.
- Click **Delete** to delete the license plate from the list.
- Click **Clear All** to empty the current match list. The list will be repopulated as new license plates are detected.

Performing a License Plate Search

1. In the New Task menu, click 

The Search: License Plates tab is displayed.

2. In the **Camera(s) to Search:** area, select all the cameras you want to include in the search.
3. In the **Time Range to Search:** area, set the date and time range of your search. The time range is highlighted on the Timeline by the black time range markers. You can also drag the time range markers to modify the time range.
4. In the **License Plate Search Options:** area, enter the license plate you want to find and a minimum confidence of a match.
5. Click **Search**.

Viewing Search Results

1. In the **Search Results** area, select a search result. The event is highlighted on the Timeline and the video is displayed in the image panel. Details about the search result are displayed to the right.
2. Use the Timeline controls to review the event.
3. If the search result is linked to multiple cameras, select a camera from the drop down list above the image panel to change the video that is displayed.
4. Click **Export this event** to export the selected event video.
5. Click **Bookmark this event** to bookmark the selected search result.

6. Click **Add to new View** to display the search result video in a new View tab.
7. To export all listed search results, click **Export results to a file** and save the file. The search results can be saved as either a CSV or Text file.

Verification Test

After the HD LPR Capture Kit 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. Park a vehicle in the center of the field of view.
2. The vehicle license plate text should be displayed in the image panel as an image overlay.
3. 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 LPR in the ACC Software* on page 21.
 - b. The camera is mounted in a suitable location for the target distance. For more information, see *Site Design* on page 7.
 - c. The license plate is horizontal in the image. For more information, see *Adjusting the Enclosure* on page 19.
 - d. The license plate is bright compared to the rest of the scene.
 - e. There is contrast between the license plate background and the license plate characters.
4. Drive a vehicle through the field of view of the LPR camera and check that the license plate was read correctly.
5. Review each frame of the vehicle passing through the field of view. The brightness of the license plate should peak as the vehicle passes the center of the field of view.
6. Unblock the road and watch the LPR camera capture actual traffic. Run a License Plate Search with a blank search term and wait until at least 100 search results are found. For more information about the search function, see the *Performing a License Plate Search* on page 24.
7. Play the video over the search range and see if any license plates did not generate a result. License plates are often rejected if:
 - The reflective coating is severely worn off.
 - The license plate is from a region with a different font.
8. Review the search results and compare them to the captured images. Incorrect results often result if:
 - The license plate is partially covered.
 - The license plate is dirty.
 - The license plate is a vanity plate.

NOTE: Advertisements and other text on vehicles may be interpreted as license plates and generate extra results.

Specifications

Camera Resolution		
Single Lane		1280 x 720
Dual Lane		2592 x 720
Illuminator Technology		High-power SMT LED
Wavelength		850 nm
Network		
Network		100 BASE-TX
Cabling Type		CAT5
Connector		RJ-45
Security		SSL
Protocol		UDP, TCP, SOAP, DHCP, Zeroconf
Mechanical		
Enclosure	Dimensions (LxWxH)	284 mm x 279 mm x 221 mm (11.0" x 11.2" x 8.7")
	Weight	4.0 kg (8.8 lbs)
	Mount	4x M5 holes at 40mm x 62mm (1.57" x 2.44")
Illuminator	Dimensions (LxWxH)	160 x 160 x 81 mm (6.3" x 6.3" x 3.2")
	Weight	1.85 kg (4.1 lbs)
	Mount	4 x M4 holes at 145 mm x 123 mm (5.71" x 4.85")
Electrical		
Camera	Power Source	24 VDC, 24 VAC, PoE: IEEE802.3af Class 3 compliant
	Power Consumption	6 W per camera
	Power Connector	2-pin terminal block
Illuminator	Power Source	24 VDC, 24 VAC
	Power Consumption	72 W
	Power Connector	3-wire terminal block, 12-20 AWG
Environmental		
Environmental Rating		IP66
Operating Temperature		-10 °C to +45 °C (14 °F to 113 °F)
Storage Temperature		-10 °C to +70 °C (14 °F to 158 °F)
Certification		
Safety		UL 60950 CSA60950 EN 60950-1 CE ROHS WEEE

Limited Warranty & Technical Support

Avigilon warranty terms for this product is provided at [avigilon.com/warranty](https://www.avigilon.com/warranty).

Warranty service and technical support can be obtained by contacting Avigilon Technical Support: [avigilon.com/contact-us/](https://www.avigilon.com/contact-us/).