



Application Focus: Lighting for ANPR / LPR

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Raytec are world leaders in LED lighting for safety and security. PULSESTAR is our range of LED pulsed lighting products designed specifically for transport applications. In this Application Focus, we explore the lighting requirements for ANPR (Automatic Number Plate Recognition) / LPR (License Plate Recognition) systems and identify some of the key elements to consider when specifying lighting for these applications.

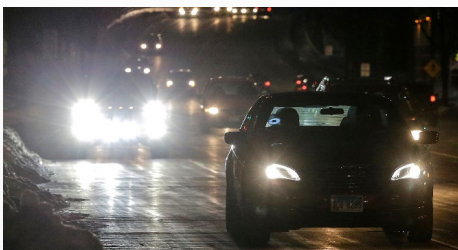
What is ANPR / LPR?

Firstly, let's start with what actually is ANPR / LPR? ANPR (or LPR depending on your locality and terminology) is technology used to automatically capture the details of a vehicle's number/license plate. ANPR / LPR has various uses, such as car park or toll road access, monitoring driver speed, as well as tackling traveling criminals, and generally disrupting crime on our roads.

The need to read and detect a vehicle's plate is one of the most common requirements for transport systems used across the world.

Why is Lighting Needed for ANPR / LPR Systems?

ANPR / LPR systems are often required to operate 365 days, 24 hours a day, and must overcome the challenges of fast-moving vehicles, dirty number plates, vehicle headlights, as well as changing ambient light levels and environmental conditions. Dedicated, high-quality illumination plays a vital role in enabling the ANPR / LPR system to effectively capture the plate.



However, as with all intelligent transport systems, it's essential to take a systems-wide approach and consider all aspects of the system which affect image capture. This includes the set-up of the camera, lens, filter as well as dedicated illumination. In this guide, we will focus specifically on the lighting element and the key considerations around capturing the plate. You may also be interested to read our white-paper which takes a more in-depth look at all the aspects which affect image capture for ANPR / LPR systems.



Specifying Lighting for ANPR / LPR

In this section, we take you through the key things to consider when specifying an illuminator for use as part of an ANPR / LPR system.

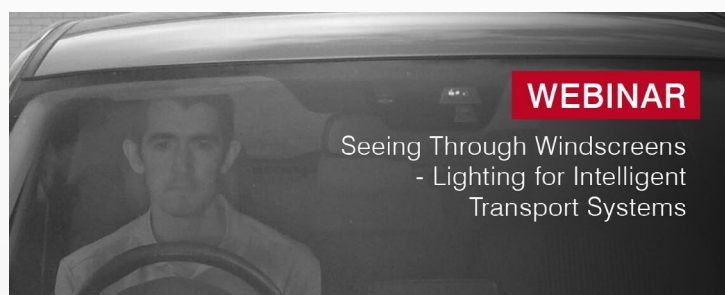
Wavelength

One of the first considerations is the type, or wavelength, of light that is required for the system. Most ANPR / LPR systems tend to use 850nm Infra-Red (IR). IR provides the best results for capturing images of the vehicle's plate, and aside from a faint red glow from the illuminator, there is also zero visible light which limits the possibility of distracting the driver.

With many ANPR / LPR systems, visible light is filtered out and only IR light is used by the camera. This is done to help overcome some of the challenges of capturing the plate that we highlighted earlier, such as dirty plates and problems with glare on the plates from headlight, sunlight, or wet roads.

In some rare cases, the colour of the plate may need to be identified. In these instances, White-Light could be deployed. However, given that White-Light is highly visible to the human eye, it may limit its suitability to many ITS (Intelligent Transport System) applications.

A wavelength of 730nm, or Far Red, is also becoming more popular in ITS applications. However, 730nm tends to have a more specific use for seeing through the windscreen of a vehicle, to identify occupants within. If the sole objective is to capture the vehicles' plate, then 730nm would generally not be required.



If you want to know more, watch our webinar
Webinar 'Seeing Through Windscreens'

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Constant vs. Pulsed

When designing an ANPR / LPR system, you have the option of using either constant or pulsed light. Let's start by looking at the difference between the two;

Constant Illumination

This is when a light is switched on 100% of the time, usually due to a specific user requirement, where they want the light to be constantly available.

Pulsed Illumination

This refers to fast flashes of light that syncs directly with the camera's shutter. Using pulsed lighting provides on-demand lighting to accurately record imagery of fast-moving objects. The illuminator can be synced with the camera's shutter via a digital input to ensure there are maximum levels of light when required.

Using pulsed lighting offers several advantages over constant illumination, most notably delivering a significant increase in power. This is crucial for ANPR / LPR applications capturing fast-moving vehicles. The faster the vehicle is travelling, the faster the shutter speed of the camera must be, and the more light that's required (the faster shutter allows less usable light to pass to the camera sensor).

Other elements of the set-up, such as using a higher f-stop, or a narrow band pass filter, can further restrict the amount of light to the camera and places further importance on using additional, purpose-designed lighting.



The benefits of using pulsed illumination over constant light illuminators

However, pulsed light is not necessarily required for all ANPR / LPR systems. For those capturing the vehicles' plate at low speeds, or while the vehicle is stationary (such as car park entry systems), a constant light illuminator could provide ample levels of power.

Control & Communication

An illuminator being used as part of an ANPR / LPR system will often be integrated with other devices, such as the ANPR / LPR camera. Therefore, it's important to consider how the illuminator can be controlled, and how it can communicate with other devices in the system.

For more complex ANPR / LPR systems, we would always recommend specifying an illuminator that is IP enabled so it can be connected to other devices via an ethernet connection. This will allow the illuminator to communicate with other devices on the network and means it can be controlled remotely in real-time.

While an ethernet connection is the most widely used method of communication, some older systems may still be using an RS232 connection. While RS232 can deliver much of the same functionality, using ethernet offers some distinct advantages; longer cable distances can be utilised while also providing a more reliable, higher-performing connection. Furthermore, with ethernet being more widely used, the illuminator is likely to have greater compatibility with existing network infrastructures.

Adjustable Pulse Settings

If light is being pulsed within the ANPR / LPR system, it's also important for the user to be able to control and adjust the pulse settings of the illuminator. Among other criteria, the length, frequency, and intensity of the pulse can all be adjusted and fine-tuned for the requirements of the application. For example, vehicles travelling at high speeds will generally require the camera to utilise a faster shutter speed, which in turn could mean a narrower pulse width, and higher intensity is required compared to a system capturing vehicles travelling at slower speeds.

It should be possible to control the illuminator through its own internal web pages, or GUI (Graphical User Interface). The level of control which is possible through the GUI, and its ease of use, is an important factor to consider when specifying an illuminator for an ANPR / LPR project.

Raytec's PULSESTAR VTR and VCT illuminators also offer a 'multipulse' function which can be useful in ANPR / LPR applications where vehicles are passing at different speeds. With the multipulse function enabled, once the illuminator receives a trigger it can deliver up to five subsequent pulses, at different pulse lengths. This provides five separate images to increase the chance of obtaining the best possible quality image.

Durability

Lighting being used as part of an ANPR / LPR system is often exposed to challenging environmental conditions. For example, an illuminator mounted to an overhead gantry will be exposed to varying weather conditions and temperatures throughout the year. The conditions, as well as passing traffic, will also mean the illuminator must be able to withstand high levels of vibration.

When specifying an illuminator, always it's IP rating and whether it's suitable for your application. If necessary, we'd also recommend that you check its protection against salinity, humidity and vibration if necessary.

With ratings up to IP66, as well as extreme protection against salinity, humidity and vibration, many of the illuminators within Raytec's PULSESTAR range are designed for use in the harshest environmental and operating conditions.

Other Considerations

Testing

While it may seem obvious, taking the time to test your setup is a critical part of achieving an effective system. With a large number of variables (such as vehicles travelling at different speeds, changing weather conditions, as well as the performance of cameras, lenses, filters and other equipment), the more testing that can be done prior to full deployment, the greater chance of achieving high quality, reliable images.

Other Hardware

As we highlighted earlier, lighting is one of the critical components of an effective ANPR / LPR system. However, you must adopt a system-wide approach when designing an ANPR / LPR system. The quality of the final image is based on a combination of the key optical elements; the camera, lens and any filtering used. In our white paper 'Lighting for Intelligent Transport Systems' (see page 1) we look at these elements more closely and discuss the Raytec 'Magic Formula'; what we believe makes the ideal set-up for transport systems such as ANPR / LPR.

How Raytec Can Help

Raytec has a full range of pulsed and constant light illuminators designed specifically for ANPR / LPR and other ITS applications. PULSESTAR is our dedicated pulsed lighting range, available in White-Light and Infra-Red, as well as various power outputs to suit a wide range of projects.

We love to talk lighting, and what's more, and our people have many years of experience working with ITS projects.

You can call us on **+44 (0) 1670 520 055**, or email Raytec Global at **sales@raytecled.com** or Raytec Americas at **ussales@raytecled.com**



PULSESTAR

Click to see the full PULSESTAR range.