Vision Detection Setup Guidelines

Autoscope Vision

Date: 7 February 2019

Document Number: AN2172

Purpose of Document

The document provides guidelines on how to setup Vision for optimal detection performance through discussion of Field of View (FOV), calibration, and zone setup. It also covers potential issues that could arise due to artifacts or objects in the FOV.

Introduction

Autoscope Vision uses a completely new detection algorithm, combined with a high-definition (HD) (720p) video sensor to provide the highest levels of video detection accuracy and versatility. Because of this the standard way of setting up the Field of View for Vision, as well as placement and size of zones isn't the same as past Autoscope products like Encore, Solo Terra or RackVision Terra. Since there are hundreds of examples of intersection configurations and multiple mounting locations it would be impossible to show all situations. This document therefore gives general guidelines on how to assess an intersection configuration and setup the FOV, calibration and zones for optimal detection results. As with any video detection product initial setup, it may need to be adjusted to improve performance if unanticipated results are found. This document is intended to help the user understand the important aspects of Vision setup, but as always, the Detection Support team is available to help the user if issues cannot be resolved.

Field of View

With Vision, the HD sensor provides much more information to the algorithm than in the prior products, therefore it is typical for the FOV to be zoomed out more than the user is used to with other systems. Either luminaire or mast arm mounts can be used very successfully, and generally location is dictated by overall objectives. Luminaire mounts being higher, tend to give better advance zone detection and keep cameras clean longer. However, for either, the main rule (for all video detection) to have **no horizon in the view** is still very important. There is a simple rule for Vision called the "Rule of Twos", which can help setup for most conditions. This rule not only optimizes detection performance, but also accurate data collection. Even if a user does not intend to use data, setting it up for good data collection is wise so that if the need for data changes, the data already collected will be useful. It should be noted that no set of rules are all encompassing since there are so many real-world scenarios. Therefore, if it is found that a detection issue can be eliminated by breaking one of these rules the user should assess that on a case-per-case basis.

Rule of Twos

In Figure 1 below, it shows that we want to set the aim and zoom of the camera such that:

1. Two (2) cars fit inside a detection zone (length will vary depending on mast arm or luminaire mounting height)
2. There are at least 2 car lengths in view before vehicles encounter the first zone (typically advance zone)
3. There are 2 lane widths on either side of the oncoming detection area (insures accurate turning counts)

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4. **There are 2 car lengths past the Stop Bar zone (insures accurate overall data collection)**

Note that if receding traffic zones are placed there still needs to be 2 car lengths of space before the zone, which would be on the lower right edge rather than upper edge of the FOV.

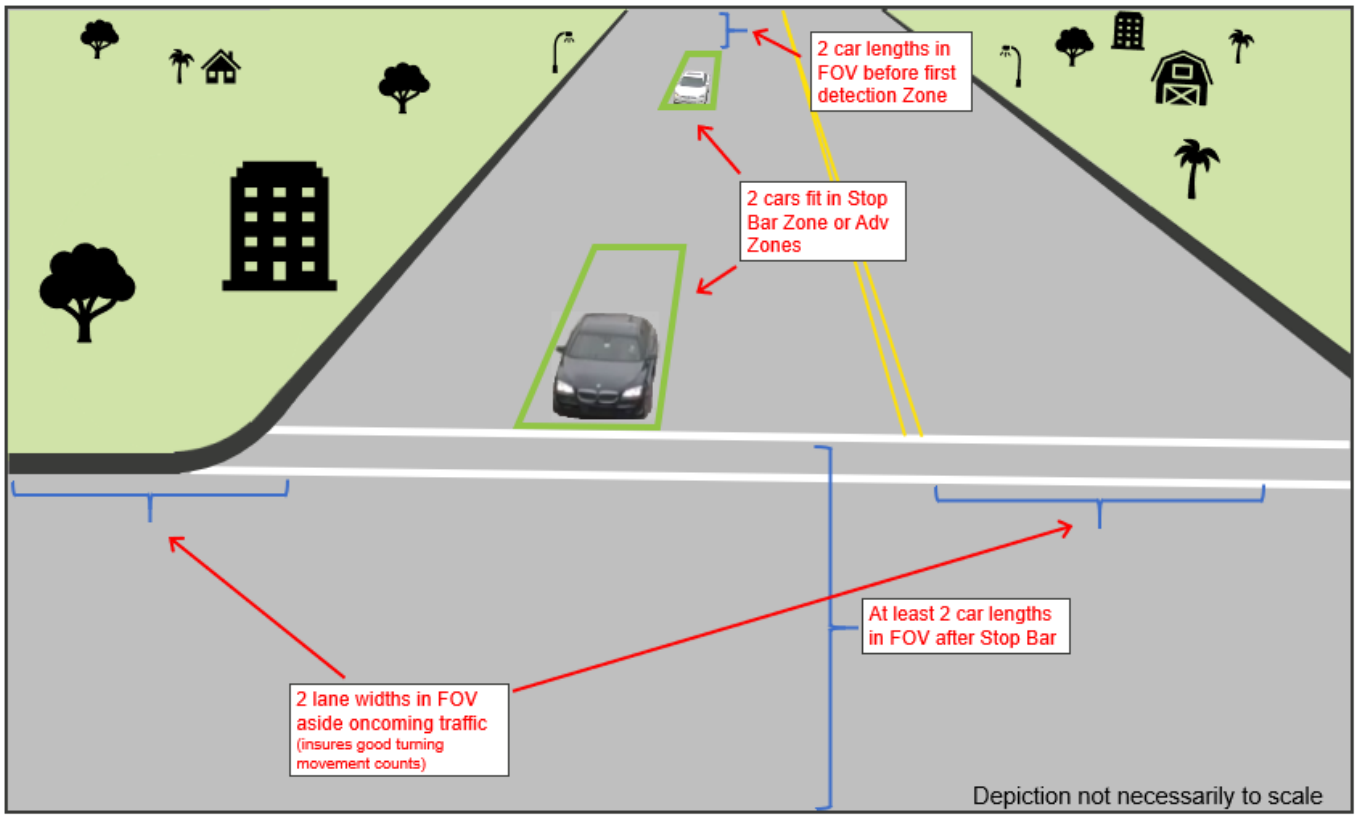

Figure 1. Rule of Two's

Rich Texture in Upper Corners

To avoid Contrast Loss issues, attempt to include rich texture in the upper corners of the FOV as depicted in Figure 2. When contrast loss issues occur, they are usually caused by zooming in too far, which causes there to be only roadway or sidewalk, etc., in the upper areas. Zooming out to include more scenery (<u>but no horizon</u>) usually resolves this condition.

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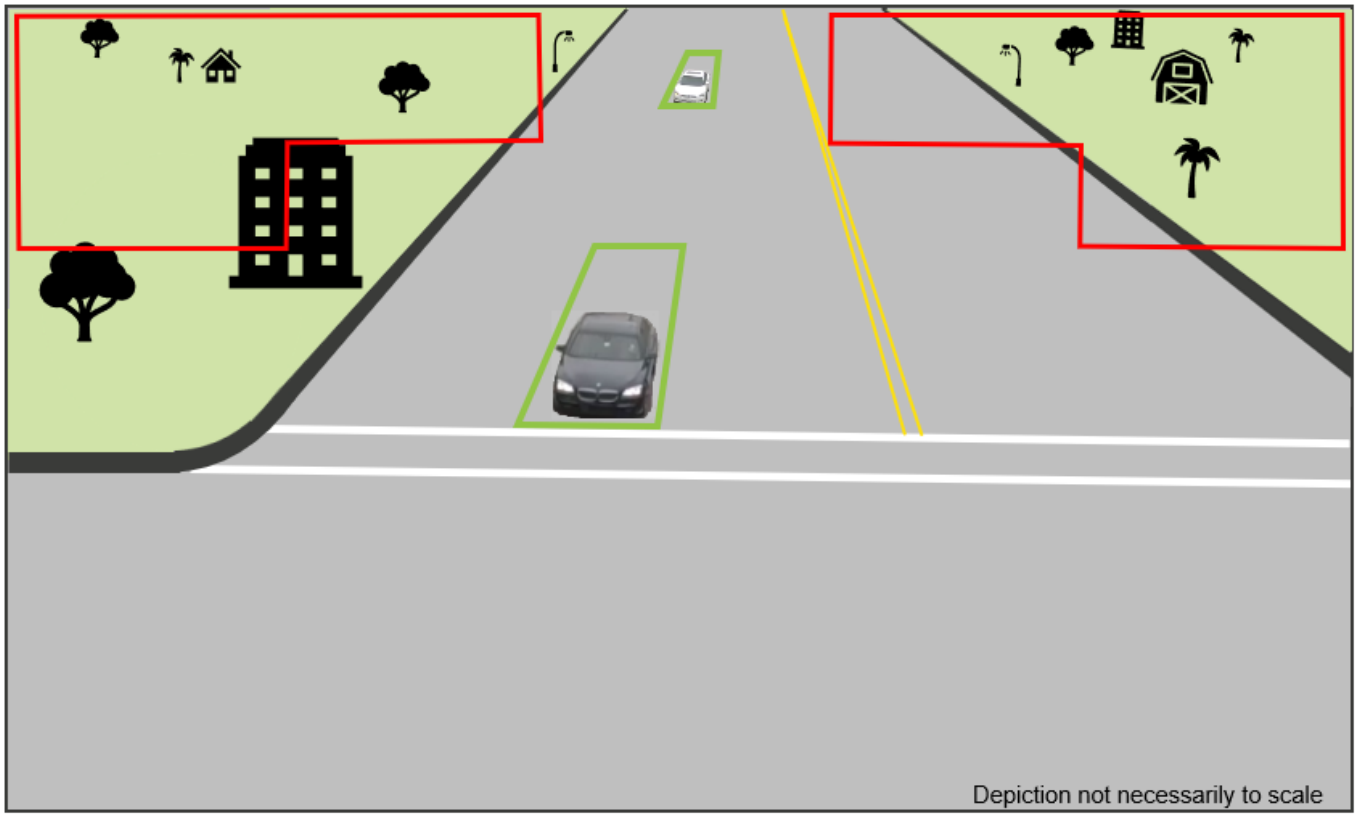

Figure 2. Rich text around upper corners

Avoid Vehicles Appearing Too Small At The Stop Bar

To insure there is adequate detail for detection of vehicles at the Stop Bar, make sure the majority of any Stop Bar zone is not in the upper 1/3 of the FOV, as shown in Figure 3. If the Stop Bar zone is in the upper 1/3 of the FOV, the size of the vehicle can be very small especially if zoomed out to capture texture in the upper areas of the FOV. This may not result in not enough tracklets being associated with a vehicle and could cause detection issues.

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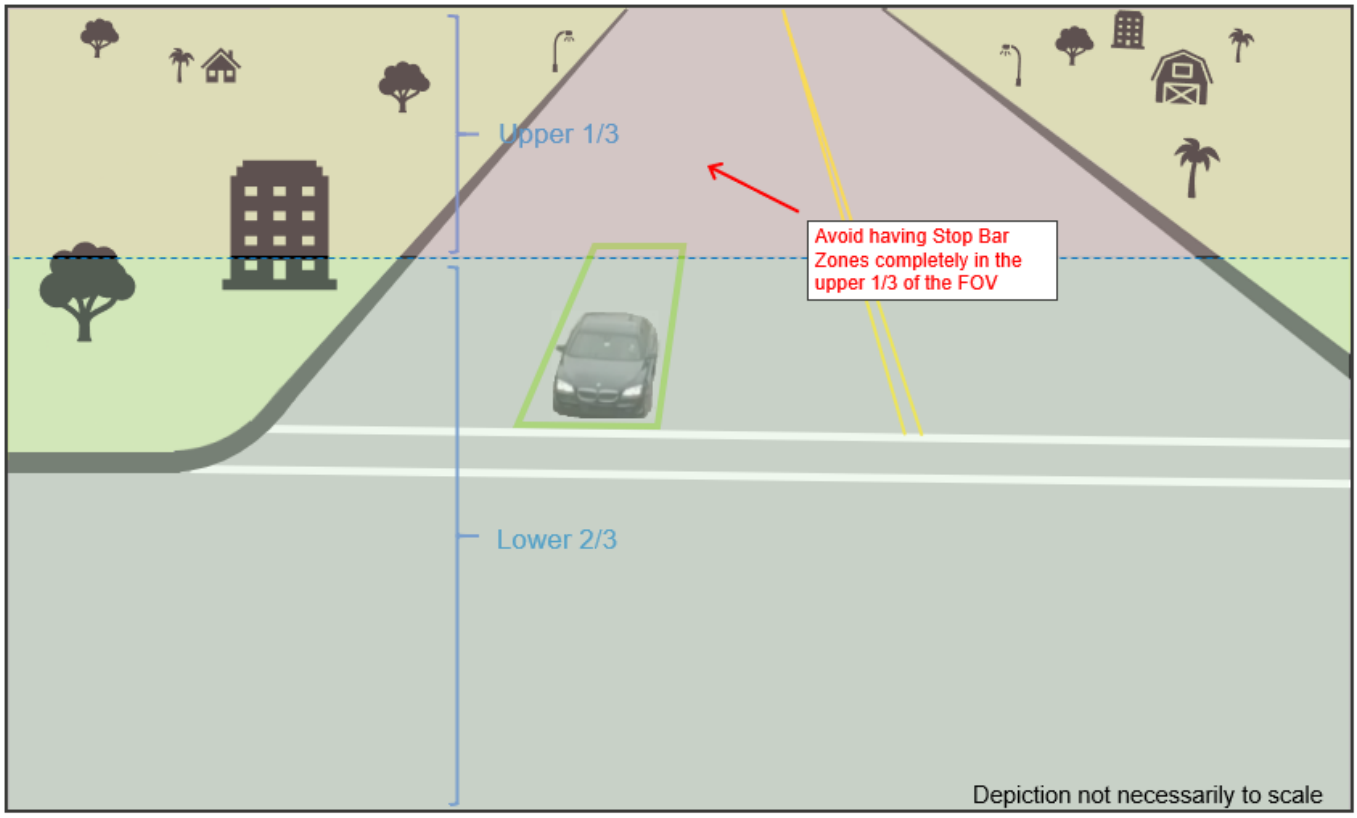

Figure 3. Avoid Area for Stop Bar Zones

Calibration

Calibration with Vision is the process that allows the algorithm to understand the FOV in three dimensions (3-D). Vision's algorithm has a unique ability to understand the 3-D space above a zone and help account for vehicles that appear to pass through an adjacent lane when the angle is not straight ahead.

The key to Calibration is to make sure the lines of the calibration zone are parallel on the road, both for those in direction of travel, as well as the front and back lines. Lane lines are most often used, but be careful as they are not always parallel such as with some isolated pork-chop-shaped left turn lanes, for example. You don't have to include all lanes. The Calibration Zone can be 2, or more, lanes wide. If there is only one oncoming lane use the receding lane as the second lane. Then align the upright bars on either side with something perpendicular to the ground (a sign post, building, side of a truck, person standing, etc.).

With the majority of intersections calibration can be done using the lane lines in the same area as the Stop Bar zones will be placed. This is advantageous since the Stop Bar zones can quickly be placed using the Calibration zones.

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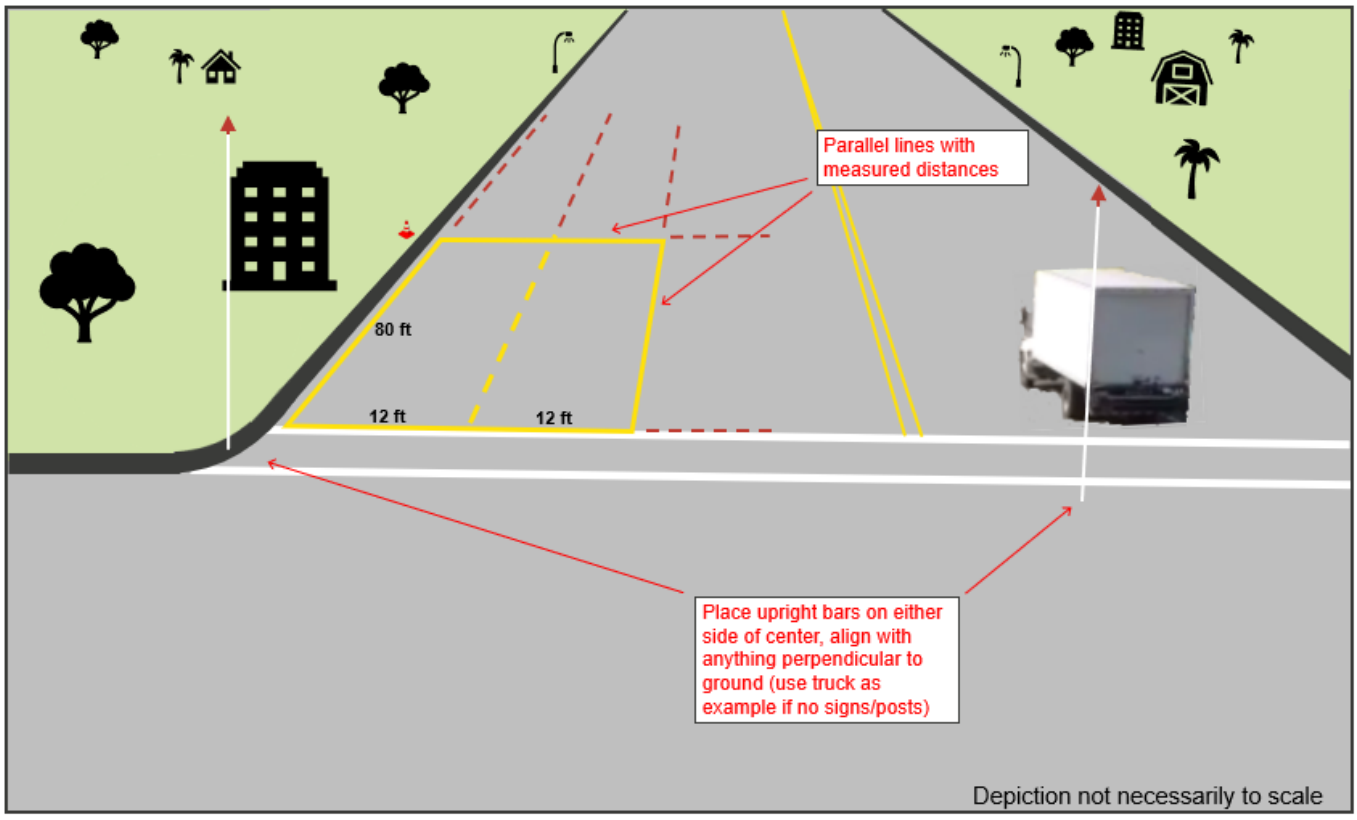
However, if the road is curved it may be better to use a different area for Calibration. Regardless, whether at the Stop Bar or not, measure off and enter a known length and width for the rectangular Calibration zone.

To summarize here are the important points for Calibration as depicted in Figure 4:

1. Insure all lines of the Calibration Zone are parallel in the real world.
2. Calibration does not have to be done at the Stop Bar. It can be anywhere an accurate depiction of a rectangle with known length and width can be placed.
3. Place the upright lines on either side of the center of the image, over anything perpendicular to the ground (sign, building, panel truck, person, etc.).



Avoid Obstructions Prior to Zones in the FOV

Be aware of objects in the FOV that could cause the tracklets associated with a vehicle to be lost just prior to entering a zone. Objects such as signal heads, signs, power lines, overpasses, etc., can obscure enough of the vehicle to cause

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issues. If there are 2 car lengths after the obstruction before the vehicle enters the zone, then it meets the "Rule of Twos" guideline and should be OK. Otherwise, move the sensor to another location to avoid the obstruction. See Figure 5 for some examples.

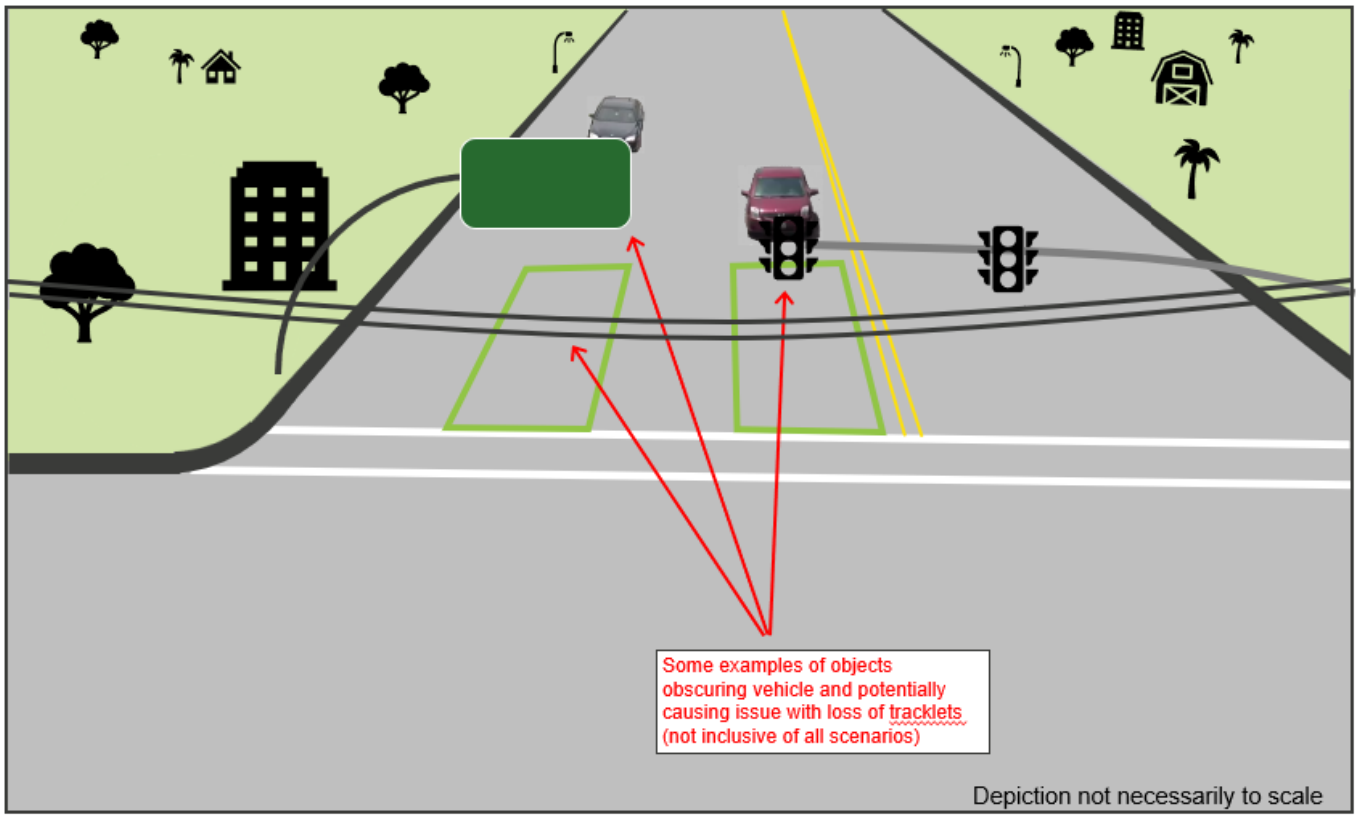

Figure 5. Obstructions too close to a detection zone

Summary

The depictions shown in this Application Note are intentionally vague in order to discuss the concepts at a high level since intersection configurations and camera views can vary greatly. The intent is to give the user a set of guidelines to put into practice and use for potential troubleshooting. Additionally, the Detection Support team can be contacted at 800-225-6480 or DetectionSupport@Econolite.com to provide assistance.