CAMERA INSTALLATION GUIDE

allread

We Spot it. We Read it. We Digitize it.

CONTENTS

1.Number of cameras ······1						
2. Camera installation height and distance to the						
reading object1						
3. Camera lens size······1						
4. Camera orientation and placement2						
5. Camera lens field of view ······2						
6.Shutter speed ······3						
7. Camera ISO sensor ······3						
8. Camera lens aperture ······4						
9. Annex5						







SPECIFICATIONS

Number of cameras

With AllRead, one single camera is enough to capture information accurately, as long as the target is visible in the field of view.

Various cameras might be needed to capture information in different parts of the asset, like combining a licence plate (front) and a dangerous goods sign (back).



HEIGHT

2-4 meters recommended (for Containers & Wagons).

1-2,5 meters recommend (for License Plates)

DISTANCE TO THE OBJECT

3-10 meters recommended (depending on the camera focal lens). If closer, fisheye might be needed (see below)



The optimal length is 2,8mmm, considering a 90° of field of view. However, it may vary depending on the distance where the camera is installed from the reading object.

The fisheye lens may help in creating a wider field of view angle in case when the camera is installed closer than 2 meters from the reading object.

Lens	2.8mm	3.6mm	6mm	8mm	12mm	16mm	
Angle	90°	69°	50°	33°	22°	18°	
Distance	3-5M	8M	15M	20-30M	40-50M	70-80M	



Camera orientation and placement

Depending on the use case, the camera orientation should be as perpendicular as possible from the reading object.

As a basic instruction:

- <u>Roll Rotation</u>: Below 15°
- <u>Yaw Rotation</u>: Below 25°
- <u>Pitch Rotation</u>: Below 25°





5.1 Container & Wagons IDs: reading on the side

In this case, the camera lens must have a transversal field of view of the reading object movement (90° of field of view).

5.2 Containers IDs & license plates (reading on the back)

In this case, the camera lens must have a longitudinal field of view of the reading object movement. (From 90° to 50° of field of view)

In general, the faster the reading object moves, the higher the shutter speed should be set:

Low				-	Shutter speeds							_	→		Hi	gh
30	15	8	4	2	1	1/2	1/4	1/8	1/15	1/30	1/60	1/ 125	1/ 250	1/ 500	1/ 1000	1/ 2000

Shutter speed is how long your shutter remains open. It can vary depending on the speed of the reading object, the level of luminosity, the camera frame rate and angle of field of view.







The shutter speed has a direct relationship with the camera frame rate. As default, it is set as twice the camera frame rate (*e.g.* 30fps = 1/60). However, the angle of view also plays an important aspect and may change this straight relationship.

For AllRead readings, the recommended shutter speed value ranges from 1/125 to 1/250. However, it could be adjusted based on the client reading scenario:

Truck, wagon or vehicle speed (considering a 90° field of view):

- Stationary: 1/125
- Slow speed (up to 15km/h) from 1/125 to 1/250
- Medium speed (up to 30km/h): 1/500
- High speed (up to 60km/h): from 1/1000 to 1/200

<u>This link</u> may help you to obtain the best shutter speed value according to your camera frame rate and its field of view angle.

Once the shutter speed is set, is necessary to adjust the lens ISO and the lens aperture.

Camera lens aperture

Aperture controls the brightness of the image that passes through the lens and falls on the image sensor. It is expressed as an f-number (written as "f/" followed by a number).

The wider the aperture, the shallower the depth of field, and the more light that comes in.





Basically, the higher the shutter speed is set, the wider/higher the aperture should be set in order to balance the level of light.



ISO is how sensitive your sensor is to light. Higher ISOs allow a sensor to absorb more light. The default ISO sensor is 100 – 200.

Basically, the higher the shutter speed is set, the lower the ISO sensor should be used. However, it is necessary to adjust the ISO sensor and camera lens aperture according to lightness conditions for outdoor places:



Also, the ISO sensor should be adjusted in case of indoor places (day/night) and if an extra light is used.

In conclusion, if you need more lightness in your video, a higher ISO is required, however, don't forget you need to have it balanced with the shutter speed and lens aperture.



•• 5



ANNEX

Our technology is agnostic to the acquisition equipment, it is able to extract from images acquired with different devices and in different conditions. Nevertheless, minimal visibility is required. As a rule of thumb, the software might not deliver results in cases where the target cannot be read by the human eye.

Below are some examples of images in good and bad conditions for AllRead's software.

Camera ISO sensor

The most important aspect when acquiring images for automatic text extraction is the text size in comparison with the image size. If the text in the image appears at a too low scale, the solution won't be able to "see" it.

AllRead's native resolution to process the images is usually in the range of 512 x 512 pixels. That is, larger images are downsampled to such resolution before processing. Bearing this in mind, it means that if the text is too small in a large resolution image, it will become invisible when downsampled.

Image resolution	Recommended Minimum Character Height (~9%)					
Processing size 512 x 512 px	45px					
Standard HD 1,280 × 720 px	115рх					
Full HD 1,920 × 1,080 px	170px					
Ultra HD 4K 3,840 x 2,160 px	340px					



As a rule of thumb, we recommend that the minimum character's height has to be at least around a 9% of the image longest side. That is, since for an image that will be processed at 512 x 512 pixels, we recommend a character height of 45 pixels, if the camera resolution is FullHD, we have to make sure that the characters have at least 170 pixels in height.

In order to meet this requirement, either we have to adjust the camera zoom lens to be sure that we are having an adequate text size, or, as an alternative, if the text always appear in the same zone of the image, we can just directly crop the region of interest from the image effectively reducing the image resolution and thus augmenting the text size ratio. See an example below:



Another important aspect when acquiring images is to make sure that the text, even if it is at a good scale, remains legible. In that sense, the acquisition pipeline should avoid distortion artifacts such as blur, highlights, low contrast, etc.

In that sense, when acquiring images we have to make sure to keep a good balance between shutter speed, frame rate, ISO sensitivity, etc. Images acquired at 24fps with good illumination and sensitivity shall produce good quality images, whereas working at low shutter speeds might produce that the text is blurred for objects in motion.

Keep in mind as well the camera position, since illumination changes due to highlights or shadows might severely hinder the contrast of the image making the text unreadable. See examples below.



Video Mode

Regarding videos, the same recommendations than from still images apply. We accept any of the standard video formats (avi, mp4, mkv, mov, etc.), and some proprietary CCTV video formats as well (*e.g.* dav format).

As stated before, acquisition frame rate should be enough to guarantee that the text is legible in several continuous individual frames, 24 fps shall suffice. When encoding the frames, we shall guarantee that the encoding and compression does not introduce too strong artifacts that affect the images, such as interlacing or video compression. See example below.







We Read What You Need.

Deep Learning based OCR software for Supply Chain and Industry 4.0.

AllRead Machine Learning Technologies

Plaça de Pau Vila, 1, C2, 08039, Barcelona (Spain) +34 932 20 36 99 | <u>info@allread.ai</u> <u>www.allread.ai</u>

