Camera Placement Guide

Introduction

Where you place your cameras can dramatically improve the results you get from CheckVideo®. While the *CheckVideo Installation Guide* describes how to physically connect cameras, this booklet provides guidelines on where to place your cameras. It includes tips for handling common scenarios such as monitoring doorways and building exteriors. The more guidelines you are able to follow, the better the results you will get from your CheckVideo system.

> **NOTE:** Although you may not be able to adhere to all of the guidelines presented in this document, following as many of them as possible should result in detection of significantly higher numbers of events and lower numbers of unwanted events.

This document contains the following sections. For a quick overview of the material in this booklet, refer to the "Summary Checklist" on page 4.

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Summary Checklist

This checklist summarizes the best practices for placing cameras, as described in the following sections. You can use this checklist to conduct a survey of your setup and determine where to place cameras.

	Camera Mounting	✓
1	**Camera Position:** Camera is mounted 8 to 20 feet above the ground or at least 6 feet above the tallest object you wish to detect. Tilt camera downward at an angle between 15° and 45°. The detection range varies according to your camera's focal length (see page 7).	
2	**Target Direction of Motion:** People and vehicles (i.e., "targets") mostly travel from left-to-right or right-to-left across the camera view, not directly toward or away from the camera. Targets should remain in full view in the camera view for at least the amount of time specified in the event configuration's duration setting.	
3	**Image Sharpness:** Camera provides a sharp image. For example, do not point the camera through a window pane or screen, and avoid conditions that would cause the camera lens to fog up or accumulate water droplets.	
4	**Vertical Orientation:** Objects in the camera view appear upright (i.e., the camera body is not rotated clockwise or counter-clockwise).	
5	**Secure Mounting:** Camera is securely mounted.	
	Illumination	✓
6	**Adequate, Even Lighting:** Lighting is constant and sufficient to read a newspaper in the part of the camera view where targets appear.	
	Cabling	✓
7	**Cable Length:** For cable run lengths over 300 feet, it is recommended you use a video amplifier or equalizing amplifier.	

8	**Cabling Issues and Effects:** Confirm that in live video there is no video split or horizontal bar caused by cable damage, crimping, or extreme length.	
	Things to Avoid	✓
9	**Physical Obstructions and Distractions:** Avoid physical obstructions and sources of constant motion (e.g., moving doors, flags waving in the wind, etc.).	
10	**Reflections, Glare, and other Extreme Lighting**: Avoid reflective surfaces (e.g., mirrors, window panes, water, or polished floors) or bright lights. Also avoid headlights approaching the camera head on as it is best for these objects to go side to side in the scene.	

Camera Placement

1 Camera Position

The most important factors in camera setup are camera angle, camera height, and distance from the camera to the "target" (i.e., the person, vehicle, or other moving object you wish to detect). These three factors are collectively referred to as "camera position", which is the most important element in effective camera placement.

Camera angle refers to the degree of downward tilt of the camera in relation to the ground or ceiling. For example, a camera angle of 0° means the camera is pointed in a line parallel to the ground/ceiling and a camera angle of 90° is pointed straight down. Both of these camera angles are ineffective for CheckVideo detection.

An effective camera angle is between 15° and 45°.

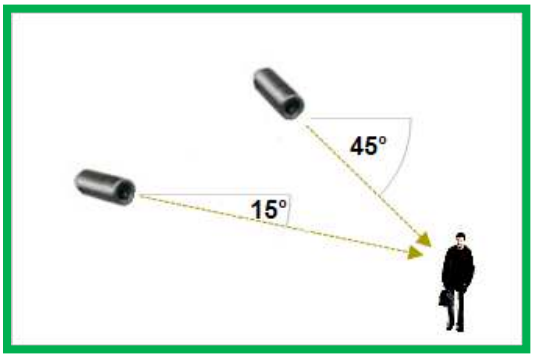


Figure 1. EFFECTIVE – Cameras are at a 15° to 45° downward tilt.

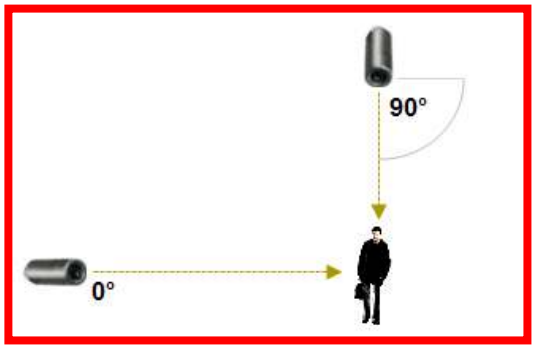


Figure 2. INEFFECTIVE – Cameras are at a 0° to 90° downward tilt.

Camera height: The optimal camera height is 8 to 20 feet.

Camera distance from where events are likely to occur is critical. The distance between the camera and the people you wish to detect varies according to your

camera's focal length. For each focal length, there is a "fan" shaped area in front of the camera where CheckVideo can reliably detect events.

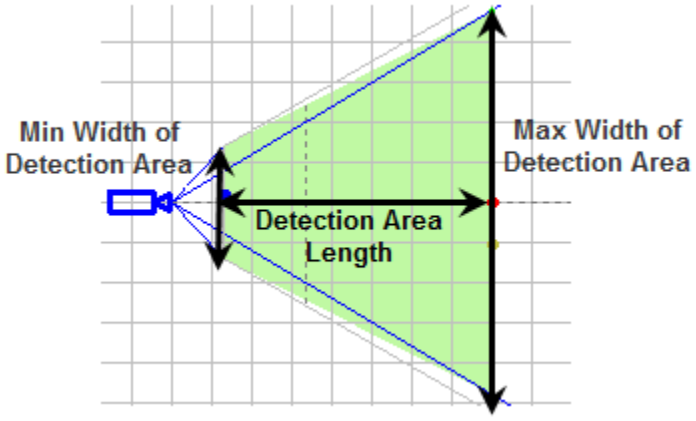


Figure 3. – Detection Area Dimensions.

The following tables provide detection area dimensions for various focal lengths. Both assume a camera mounted at 10-20 feet with a standard NTSC 1/3", 4:3 camera image. The detection areas differ according to whether you're mostly detecting people or mostly detecting vehicles.

Person Detection Areas			
Focal Length	Detection Area Length	Min Width of Detection Area	Max Width of Detection Area
2.8 mm	5 to 35 feet	15 feet	50 feet
3.6 mm	10 to 40 feet	15 feet	50 feet
6 mm	15 to 65 feet	12 feet	50 feet
8 mm	20 to 85 feet	12 feet	50 feet
12 mm	35 to 130 feet	12 feet	50 feet

Vehicle Detection Areas			
Focal Length	Detection Area Length	Min Width of Detection Area	Max Width of Detection Area
2.8 mm	17 to 50 feet	28 feet	72 feet
3.6 mm	20 to 60 feet	28 feet	72 feet
6 mm	32 to 95 feet	28 feet	72 feet
8 mm	40 to 125 feet	28 feet	72 feet
12 mm	60 to 185 feet	28 feet	72 feet

If you follow the preceding guidelines related to camera angle, height, and distance from events, most of your targets should take up between 0.5% and 20% of the camera view for CheckVideo to perform at its best.



Figure 4. EFFECTIVE – Two targets within the detection range (taking up 0.5% and 20% of the view).

2 Target Direction of Motion

You will receive the best results if the camera is mounted so that targets move across (left-to-right or right-to-left) the camera view, not directly toward or away from it.

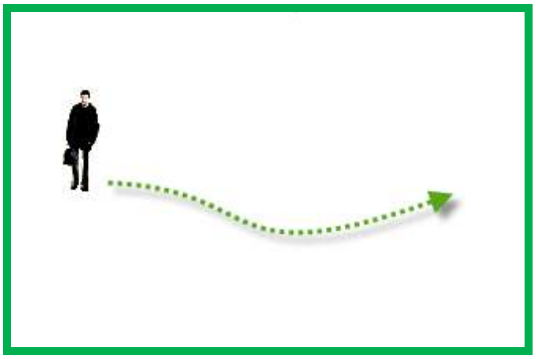


Figure 5. EFFECTIVE – A target traveling from left-to-right spends more time in the camera view and changes size gradually.



Figure 6. LESS EFFECTIVE – A target near the camera traveling directly toward the camera spends less time in the camera view and changes size rapidly.

3 Image Sharpness

To get the sharpest image possible, avoid pointing the camera through a window pane or screen. Similarly, you should avoid directly exposing the camera to outside conditions where the camera lens will fog up or accumulate dirt or water. For example, the protective glass cover over the camera lens may fog up due to internal condensation when the camera is placed in direct sunlight. Placing a hood on the camera can prevent this issue.



Figure 7. EFFECTIVE – Adequate image sharpness.



Figure 8. INEFFECTIVE – A blurry camera lens affects image sharpness.

4 Vertical Orientation

The camera body should be upright, not rotated or tilted clockwise or counter-clockwise. While CheckVideo can accommodate some degree of tilt, any tilt more than 5° may lead to missed events.



Figure 9. EFFECTIVE – An acceptable level of tilt (3° clockwise).



Figure 10. INEFFECTIVE – Too much tilt (15° clockwise).

5 Secure Mounting

Ensure that the camera is firmly fixed in place. Loosely-mounted cameras can shift over time due to wind, tampering, structural vibrations, or other factors.

Illumination

6 Adequate, Even Lighting

The camera must be placed in an area with enough lighting so that CheckVideo can see objects. If something is not visible to a human looking at it, it will not be visible to CheckVideo either. As a rule, there should be enough light so that someone in the camera view could comfortably read a newspaper. If there is not enough light, or if the area becomes dark at nighttime, add lighting as needed.



Figure 11. INEFFECTIVE – A poorly lit camera view.

If you aren't able to adequately illuminate the detection area by adding lighting, you may opt to use IR cameras with your CheckVideo Gateway.

Alternatively, the CheckVideo IP Camera supports IR illumination, so you may use an IR illuminator to monitor areas of low or no light. Use an IR illuminator that has a wavelength of 850 nm. Other IR sources will be blocked by the camera.

Place your IR illuminator so that it adequately covers the camera's detection zone (see page 7).

When placing your IR illuminator, observe the following guidelines:

- The IR illuminator should be placed at least 12 feet off the ground. Objects too close to the illuminator can cause reflections, so the illuminator should always be at least 12 feet off the g round to avoid reflections from people/vehicles you are trying to detect.
- Ideally, the illuminator should have the same vantage point as the camera (i.e., positioned close to the camera and pointed in the same direction). We recommend placing the illuminator about one foot above the camera. Don't place the illuminator below the camera.

NOTE: According to the camera height guidelines on page 6, you can place a camera as low as 8 feet off the ground. If the camera is mounted at that height, it is still recommended that the IR illuminator be mounted no lower than 12 feet off the ground.

- Surfaces such as structures, branches, lamp-posts, etc. can cause reflections for the IR illuminator. To the extent possible, make sure the area closest to the camera is as uncluttered as possible.
- The IR illuminator should never be pointed at the camera.

One IR illuminator that has been successfully tested with the CheckVideo IP Camera is the Lorex VQ-2121 100 FT Night Vision IR Security Illuminator.

Finally, avoid extreme variations in light intensity within the same camera view. When a camera view has extremely high and low light levels at the same time, the degree of contrast can interfere with event detection. This can occur with cameras close to windows.



Figure 12. INEFFECTIVE – This camera view includes too much contrast between the darkened hallway and the glare of light from the outside.

Cabling

7 Cable Length

For cable run lengths over 300 feet, it is recommended you use a video amplifier or equalizing amplifier to maintain video quality.

8 Cabling Issues

Confirm that there is no video split, horizontal bar, or other interference displayed in the video coming from the camera. To check this, connect a video monitor directly to the camera cable or look at the live video display on the CheckVideo Administration Portal. If the video shows interference, check for cable damage, crimping, or try shortening the length of the cable run between the camera and the CheckVideo Gateway.



Figure 13. INEFFECTIVE - Video display showing horizontal lines.

Things to Avoid

Before you can determine how to best set up your camera, you should think about what you want to detect. You should also think about what you do not want to detect. That way, you will place your camera in a way that maximizes your ability to receive the event notifications you want while avoiding bothersome notifications of events that do not interest you.

> **NOTE:** If you can't avoid things in the camera view that don't interest you, you can use CheckVideo's "zone" feature to select the part of the camera view you wish to monitor. For example, if the camera view must include a road in the background where passing cars and pedestrians might trigger unwanted events, place a zone on the camera view that includes everything but that road. For more information on zone creation, refer to the *CheckVideo Online Help* (**Dashboard** > **Support** > **Online Help** from the CheckVideo Administration Portal).

9 Physical Obstructions and Distractions

Be aware of items in the camera view that can obstruct objects you wish to detect. Indoors, this might include furniture, poles, columns, or fixtures. Outdoors, obstructions might include trees, vehicles, walls, buildings, signs, or boulders. Ideally, the objects you wish to detect should remain in full view the entire time they pass through the camera view.



Figure 14. INEFFECTIVE – Multiple obstructions blocking the camera view.

While CheckVideo can filter out random motion, it is best to avoid things in the camera view that frequently move (e.g., swinging doors, ceiling fans, water fountains, flags, or foliage). Try to position the camera so that you avoid such items in the area you are monitoring.

Cobwebs, insects, or other infestations near the camera lens can also be a problem, especially in an outdoor environment.



Figure 15. INEFFECTIVE – Spider appearing in the camera view.

Do not attempt to look through, around, or over trees. Also bear in mind how changes in the foliage, environment, or surrounding structures can affect your system's performance. For example, the amount of foliage in the camera view may change with the seasons. And if the scene becomes dominated by foliage (as in Figure 16), it will result in unwanted event detection. In extreme cases, you may need to change the position of the camera.



Figure 16. INEFFECTIVE – Foliage dominating the view

10 Reflections, Glare, and Other Extreme Lighting

Bright lights can obstruct the targets you wish to detect. This might include headlight glare, lights mounted in the foreground, or direct sunlight (more a factor if your camera is pointing East or West). To avoid these issues, place the camera so that the majority of lighting is behind it, shining in the same direction that the camera is pointing.



Figure 17. INEFFECTIVE – Example of light adversely affecting the camera view.



Figure 18. INEFFECTIVE – Light completely obstructing the camera view.

In addition to direct light, you must also account for indirect or reflected light. Reflective surfaces, such as mirrors, window panes, water, and some polished floors, can at times generate enough reflection that CheckVideo detects them as events. Try to point the camera away from reflective surfaces.



Figure 19. INEFFECTIVE – Windows and polished floors provide abundant reflections.

> **NOTE:** Bear in mind that reflective surfaces can cause problems even if they are not in the camera view. For example, a mirror that doesn't appear in the camera view could still reflect light from passing headlights onto a wall that appears in the camera view.

Sample Scenarios

This section illustrates scenarios commonly implemented by CheckVideo users:

- Doorways (page 23)
- Storage Areas and Closets (page 25)
- Building Interiors (page 26)
- Building Exteriors (page 28)
- Parking Areas (page 30)
- Fence Lines and Perimeters (page 31)

Each scenario includes a single snapshot of an effective camera setup (i.e., one which incorporates the guidelines described in the previous sections). Each scenario also includes three snapshots that are less effective, with descriptions of why this is the case for each.

Doorways

If monitoring the area near a doorway or other entrance where people are coming and going, observe the following guidelines:

- Do not point the camera directly at the door, since targets will move directly toward or away from the camera (see page 8).
- Try to capture the approach to or exit from the doorway, not the actual door.
- Minimize the view of the swinging door.



Figure 20. EFFECTIVE – This camera position shows the approach to the door. The height and angle of the camera are optimal for event detection. Since the door is glass, the fact that the camera is not facing it will minimize the effects of reflections on the glass.

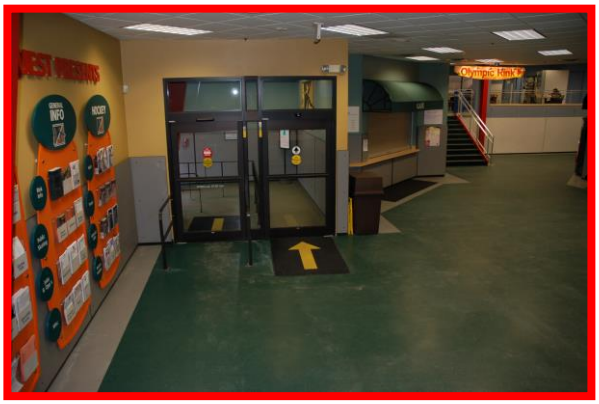


Figure 21. INEFFECTIVE – The camera is directly facing the glass door, which can reflect light.

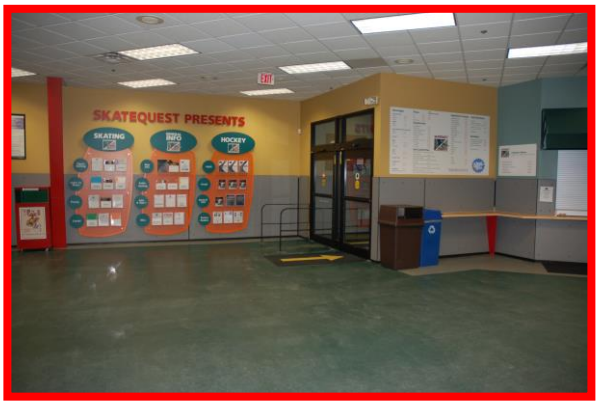


Figure 22. INEFFECTIVE – The camera is mounted too low, providing a 0° angle (see page 6).



Figure 23. INEFFECTIVE – The camera is positioned

too close to the door.

Storage Areas and Closets

Monitoring a storage area or equipment closet presents unique challenges. Often, you face space constraints due to the size of the room or the abundance of boxes, racks, or other potential obstructions. In addition to the general guidelines discussed previously in this document, consider the following:

- Place the camera to exclude doorways, moving objects, or flashing lights.
- Make sure that people appear vertically and in full view in at least one area of the camera view.
- Avoid the temptation to just focus on one area of interest; get as wide a view as possible.



Figure 24. EFFECTIVE –The camera view includes as wide a view as possible. A person standing in front of the area of most interest (in this case, an equipment rack housing computers), would be in full view.



Figure 25. INEFFECTIVE – The camera is too close to the area of interest.

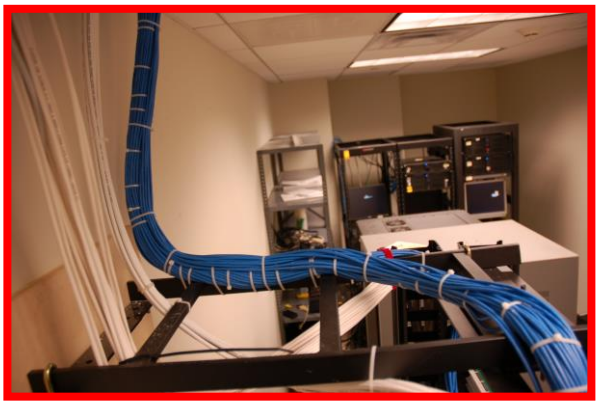


Figure 26. INEFFECTIVE –Too many obstructions.



Figure 27. INEFFECTIVE – The camera view includes the area where the door will swing open.

Building Interiors

If monitoring the interior of a room, observe the following guidelines:

- Get as wide a view as possible; at least some of the view must be able to display a person walking or standing in full view.
- Minimize obstructions due to furniture, doorways, etc.
- If the room has windows, mount the camera over a window and point toward the camera view instead of pointing toward the window.
- Avoid showing exterior views through windows. Minimize the amount of exterior light coming in.



Figure 28. EFFECTIVE – This camera is mounted at the entrance of an office suite to monitor people who enter the suite after hours. The camera is mounted at an appropriate angle, height, and distance from people coming into the room. While the camera view includes a glass entry door, the fact that the camera is not directly facing it minimizes the risk of unwanted event



Figure 29. INEFFECTIVE – The camera is directly facing the glass door at the entrance (see page 19).



Figure 30. INEFFECTIVE – The camera is too low.



Figure 31. INEFFECTIVE – The camera view

notifications due to reflections or lighting.

unnecessarily includes a doorway leading to the suite.

Building Exteriors

If monitoring the exterior of a building, observe the following guidelines:

- If possible, do not mount the camera on the building; mount it on a fence line or pole away from the building.
- If the camera must be mounted on a building, offset it as much as possible from the wall, providing a side view looking down along the wall. Avoid pointing the camera straight down or into the horizon.
- Watch the entry and approach areas such as a driveway, walkway or loading zone instead of a door.
- Minimize moving foliage and areas of pavement or wall that would typically get headlight reflections.



Figure 32. EFFECTIVE – The camera is placed to observe people approaching the building from the left. The camera covers a wide view of the building exterior while minimizing the wall it is mounted on.



Figure 33. INEFFECTIVE –Too much wall.



Figure 34. INEFFECTIVE – Several parked vehicles obstruct the camera's view of the entire camera view.



Figure 35. INEFFECTIVE – Foliage obstructs the view.

Parking Areas

If monitoring a parking area, observe the following guidelines:

- Include the area closest to where a vehicle would have to park or would be moving slowly.
- Minimize obstructions from other parked vehicles or structures.
- Do not include sections of a busy street.
- Try to get a view where the side of the vehicle(s) is seen, instead of a head-on view.
- Place the camera sufficiently far away so the vehicle does not occupy more than 20% of the view.



Figure 36. EFFECTIVE – The camera angle and height are correct, and the camera position maximizes the amount of activity covered.



Figure 37. INEFFECTIVE – The camera is too low.



Figure 38. INEFFECTIVE – The camera is not tilted downward enough, including too much of the sky.



Figure 39. INEFFECTIVE – A sign in the foreground obstructs part of the camera view.

Fence Lines and Perimeters

If monitoring a fence line or perimeter, observe the following guidelines:

- Mount cameras along the fence line looking down the fence line, with cameras placed roughly every 40 feet or on corners. Looking down the fence line will provide a view where someone climbing over would be moving from left-to-right or right-to-left across the view.
- Avoid placing cameras far from the fence line.
- Minimize areas that have constant activity, such as pedestrians or vehicles moving inside or outside the fence line.



Figure 40. EFFECTIVE – The camera is mounted along a fence line. While roads and a parking area appear in the camera view, they are not heavily trafficked.



Figure 41. INEFFECTIVE – The camera is directly facing the fence, so people climbing the fence would be moving away from the camera.



Figure 42. INEFFECTIVE –A road in the foreground.



Figure 43. INEFFECTIVE – Signs obstructing view.

Connecting the Camera

Once you have mounted the camera in the desired location, connect it to the CheckVideo Gateway. Instructions can be found in the *CheckVideo Installation Guide.*

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