IRS2100-60 Tailgate Detector

Installation and Set-Up Guide

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1 Introduction

1.1 About

The IRS 2100-60 Tailgate Detector utilises a low resolution array of thermal (infrared) sensors to detect people by their body heat. As they pass underneath it, the detector sees each person as activity in a cluster of the elements of the 16x16 array and converts it into a virtual object, which can then be tracked and counted.

The IRS 2100-60 is based on the IRISYS people counter and has been designed to detect tailgating in general commercial style applications. It is not intended to detect determined attempts to bypass the system in collusion with a valid card holder.

The Detector works in conjunction with access control systems that can provide a 'Valid Entry' input pulse to the detector for every validated entry (e.g. card swipe, biometric).

The IRS 2100-60 can also be configured to operate as a 'counter' without the Valid Entry input, for use in Airlock or One Way (Wrong way) detection applications.

Correct installation and configuration of the tailgate detector is essential if it is to function correctly.

1.2 How to use this Guide

Because the Tailgate detector is designed to be utilised in what is primarily a security application, precise positioning and configuration is required. Correct positioning on the ceiling relative to the door and other obstacles is even more important with the Irisys Tailgate Detector than it is with the Irisys range of People Counter units.

The following sections detail the main installation steps:

- Confirming that the detector is appropriate for your application
- Selecting a suitable location to install
- Installing on the ceiling
- Wiring connections
- Correct configuration

This guide covers some basic, but not extensive, fault finding procedures in the event of problems and any error messages given by the software are explained in the relevant section.

All installers should attend or go through the Irisys official training presentation before attempting to install and configure Irisys tailgate detectors.

Throughout this guide a number of boxouts will be shown at appropriate times:

This type of boxout denotes important information or instructions that must be followed.

This type of boxout denotes relevant information which may be of interest in certain applications.

This type of boxout denotes a useful piece of information (hints) that may not have been immediately obvious but which could be helpful in the future.

Throughout this guide, where an access controlled door is depicted, the non-secure side of the door is on the left and the secure side of the door is on the right. In the vast majority of cases the tailgate detector will be mounted on the secure side of the door.

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1.3 Will it Work?

Deciding whether the tailgate detector is appropriate for your particular application is dependent on only three things:

- Is the Detector technology appropriate for what you want to do?
- Are you able to Interface your existing equipment to the detector?
- Is the specific Location suitable for mounting/using the detector?

Some applications are more suited to the tailgate detectors operation than others, and the detector has three different 'modes' that it can operate in to satisfy a number of different functions (see sections 1.3.1 to 1.3.3).

But more fundamental than the detectors functionality, is whether the level of security provided by the detector is appropriate to its intended purpose. See section 1.3.4, below, "Security Levels".

Interfacing requirements are usually relatively simple but it depends on what you want the tailgate detector to do, and in what mode, but mainly this could be limited by the capabilities of your current access control system. Remember that, once installed and configured, the tailgate detector indicates line crossing events and alarm outputs by a relay pulse output, and – in the case of tailgate mode – expects to receive a relay input for every person granted access through the secure door. The access control system must be capable of accepting (and outputting in the case of tailgate mode) logic level pulses. If your system is not capable of handling these, additional relays and other components may be required. In all modes, an appropriate relay pulse width must be configured. See also, section 5, Access Control System Requirements.

Some environments may not be appropriate for using the Irisys tailgate detector. These usually correspond with environments of differing temperatures but see section 1.3.5 below for more information. The detector is intended solely for indoor use.

1.3.1 Tailgate Mode

In tailgate mode, the detector is usually installed on the secure side of an access controlled door, and it will track and count people passing through the doorway and across a virtual count line. Tailgating is detected by comparing the number of Valid Entry input pulses received from the access control system, with the number of people crossing the count line. If the number of people entering is greater than the number of Valid Entry pulses, an alarm is signalled by the detector.

The detector requires a connection from the access control system for every valid card authorised by the system, this must be separate from the systems door unlock signal in order to accommodate multiple people swiping their cards and walking through an open doorway.

The detector will output an alarm pulse to indicate an entry event without a corresponding valid card input. The alarm output is low and will open the relay to indicate a tailgate event.

Each Valid Entry pulse is timed-out at the end of a pre-programmed delay if no corresponding entry is detected. Counting in tailgate mode is in one direction only – into the secure area.

1.3.2 Airlock Mode

In Airlock mode, the detector is usually installed on the secure side of an access controlled door, and it will track and count people passing through the doorway and across two virtual count lines – one for each direction. When used in Airlock mode, the Valid Entry input is disabled and the detector now behaves as a two-direction people counter - a count output is given as a person crosses a count line 'IN' or 'OUT' and is output on two corresponding relays.

The detector requires two connections from the detector to the access control system to indicate every line crossing event. One output will pulse for every crossing of line 1, and the other will pulse for every crossing of line 2. Both are normally closed to 0V. It is then the responsibility of the access control system to perform the logic calculations in order to determine the correct use of the airlock gate. Some modification to the access controllers programming may be required in order to utilise these pulses in a meaningful way.

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System integrators must use the count outputs in their own airlock (interlocked door) logic control systems. This allows the systems integrator to configure rules for the airlock i.e. checking that two authorised persons are present etc. Note: for airlocks that just require detection of tailgating, Tailgate Mode should be used.

For airlock situations where both doorways are to be monitored, this will require a separate detector unit installed appropriately at each door.

1.3.3 One Way Mode

In 'One Way' (or 'Wrong Way') mode, the tailgate detector can be positioned at a doorway, but usually (and preferably) in an open area, with free flowing people traffic, such as in a corridor, or walkway. In this mode the detector will ignore people travelling in the 'allowed' direction but will provide an 'alarm' output when a person goes the other ('wrong') way.

It is intended for areas such as one way entrances or exit corridors where people going the wrong way would indicate a security concern, for example people boarding a plane or ferry via the exit ramp. The Valid Entry input is disabled and the output triggers as a person crosses the count line in the direction of detection.

When utilising the detector in one way mode, it simply requires one connection from the detector to the access control system to indicate any 'wrong way' alarm events. This output will pulse for every alarm and is normally closed to 0V.

One way mode is the easiest of the three modes to put together as the installation and interfacing requirements are fewer. Additionally, multiple units in one way mode can be installed next to each other if required, in order to cover a wide corridor or doorway.

1.3.4 Security Levels

It is important to note that the tailgate detector is designed to be used in low to medium level security applications for the detection of opportunist security circumvention.

Additionally, although the tailgate detector has been designed and validated - both in the lab, and in real world applications - to be very accurate (99.5%); it is still not 100% accurate and may, on occasion, produce false alarms/counts – see the section below on manual overrides.

For example:

In Tailgate mode, if an authorised employee enters through a security controlled door and carries on, but the door takes a few seconds to close behind that person, an opportunist intruder could quickly go through the door, and the tailgate detector is designed to spot this and would output an alarm.

But, the detector will not be able to detect two people actively working together in a coordinated effort to bypass the system. For this high level security requirement, a physical airlock or turnstile may be required.

Example 2:

In airlock mode, if an airlock had a single man rule, for example, which said that the second door into the secure area will not open if more than one person is present in the airlock - but two people actually went into the airlock - the tailgate detector would observe this and output two relay pulses, which the access control system could use to prevent the second door from opening.

But, if a person was to push a cart or trolley into an airlock, it is possible that the detector could see the cart as a second target, and output two pulses, even though in reality only one person is in the airlock.

Example 3:

In one way mode, a person could be going in the correct direction leaving a plane or boat, for example, but then realise that they have left something behind and return through the exit to collect their item. This would generate a false alarm.

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1.3.5 Physical Location

Some environments may not be appropriate for using the tailgate detector. The fundamental requirements for installing the tailgate detector are:

- It must be installed at the correct mounting height, preferably between 2.5 and 3.2m high, but can be as low as 2.2m, and as high as 3.5m, see section 1.4 for the full mounting height range
- It must have a clear view of the ground beneath the detector. There should be no signs, lights, CCTV cameras etc., blocking any part of the detectors field of view
- The detector is intended solely for indoor use
- The location must be thermally stable, see below
- There must be enough space for people to walk through the detectors field of view and for it to function correctly, see Size of Airlock Considerations below

The detector operates by detecting changes in temperature caused by things which are hotter or colder than the background moving through the field of view. The detector 'initialises' a target corresponding with the temperature difference (see section 2.1), which is then tracking through the available field of view. To prevent false targets from being initialised and tracked, the background should be thermally stable. It should provide, a:-

- Invariable/constant/stable temperature
- Uniform temperature across the whole area preferred

Stable temperature

If the temperature of the background changes rapidly, the detector will detect this and could initialise a false target. This target could then be tracked across a count line and would generate errors and/or false alarms. Gradual temperature change that occurs throughout the day (i.e. the morning to afternoon temperature rise, and the afternoon to night temperature fall) will not be detected as these are very gradual changes and will therefore not cause any problems.

Any movement of air within the detectors field of view, for example from a heater or air conditioning unit, will also not be detected - only infrared radiation from solid objects will be detected. But, any hot or cold air moving over the floor may affect the temperature of the floor itself which the detector could then detect. This would depend on the floor material; things like concrete, tiles or wooden flooring will not change temperature rapidly and so are extremely unlikely to generate false targets in this way, but floors consisting of thick carpeting or rubber matting may well change temperature quick enough for the detector to generate unwanted targets. It is for this reason that installing at an exterior doorway is not recommended as any hot or cold air rushing into the building when the door opens could cause problems with false targets and subsequent false alarms and miscounts. This may not occur immediately, and for most of the year, but issues could arise at different times of the year; in winter, or summer, for example.

Installing the tailgate detector to monitor a doorway which opens externally is not recommended.

Uniform temperature preferred

A uniform temperature across the whole of the floor encompassing the detectors field of view is preferred. Any areas of differing temperatures within the field of view could cause tracking errors as people walk over these areas, depending on how great the difference is. This is because the detector will track objects which are hotter or colder than the background, but each type is treated separately. So, as an example, if a person is seen as a hot target over a cold background but then goes over an area of the background which is hotter than the person, that target will change to a colder target relative to that background temperature. Unfortunately, at this point the hot target will be lost and a new cold target will be initialised, and there is no way to associate the old and new targets. This means that there could be a small period of time between losing the hot target and initialising the cold target where no corresponding target is being tracked relating to that person. If the area within the field of view where the target is momentarily lost relates to the area where the count line has been configured, that person could, effectively, jump over the line without being counted and therefore they would have inadvertently bypassed the tailgate detectors security.

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Usually the floor beneath the detector will be of a uniform, temperature, but occasionally localised sources of hot or cold could mean that parts of the area are not. For example:-

- Spot lights that point down at the ground
- Heaters or air conditioning units that point down in only one area

In some cases the tailgate detector will operate sufficiently well in areas where uniform temperature of the floor is not guaranteed, but you should be careful of where the count lines are positioned so as to avoid any potential parts of the field of view which relate to those differing floor temperature areas on the floor. This is not always possible, so care should be taken when installing over areas which may contain differing floor temperatures.

As mentioned before, installing the tailgate detector at an exterior door is not recommended.

> The Irisys 3000 series people counters utilise a different tracking mechanism to the tailgate detector units, which is more resilient to changing and/or uneven floor temperatures, and may be a suitable alternative to the tailgate detector in some applications.

Airlock Mode – Size of Airlock Considerations

When using the tailgate detector in airlock mode - counting in and out of an airlock - the airlock must be large enough for a person to enter and walk on past the count line. If the airlock is very small then there is a risk that the person would step back across the line again. If this was to happen it would mean that the full counting system would reason that the person has left the airlock and therefore would not open the second door:

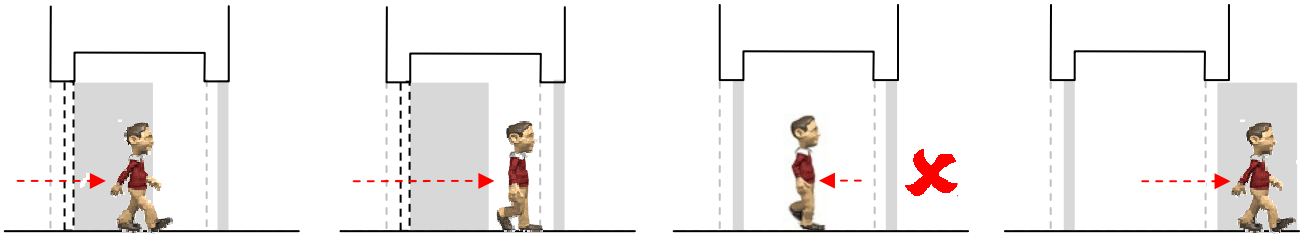

Figure 1.3.1

A person stepping backwards is especially likely to occur in airlocks with inward opening doors, as they make space for the door to open:

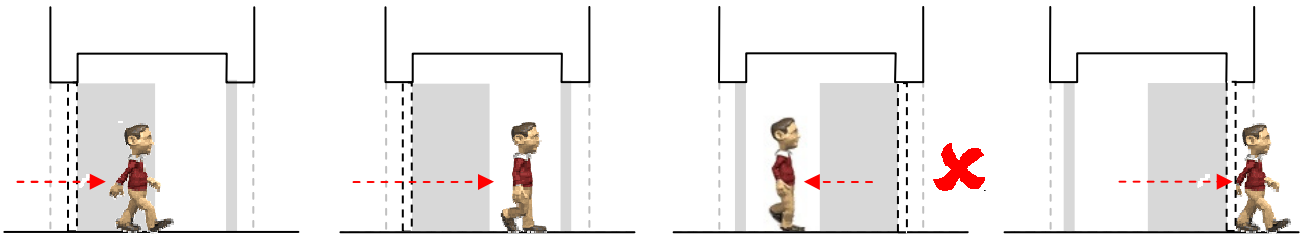

Figure 1.3.2

Also, when multiple people can walk through the airlock together, they may bunch together into the airlock, but when the door closes they could then move back in order to be more comfortable as they wait for the second door to open:

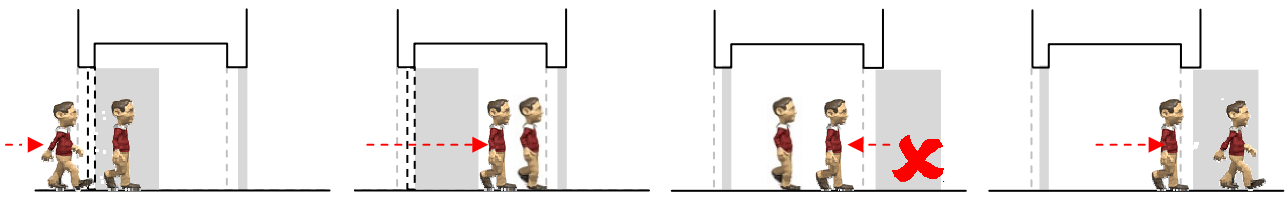

Figure 1.3.3

Airlocks which are very small or exhibit this stepping back behaviour are therefore not suitable for use with the tailgate detector.

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1.4 Count Area

The detector has a lens with a 60° field of view which determines the detection area based on the mounting height. The detector will 'see' a square on the ground with the length of each side slightly less than the mounting height, as shown in Figure 1.4.1. The detector must have an unobstructed view of its detection area, particularly the paths from the entry point into the secure area.

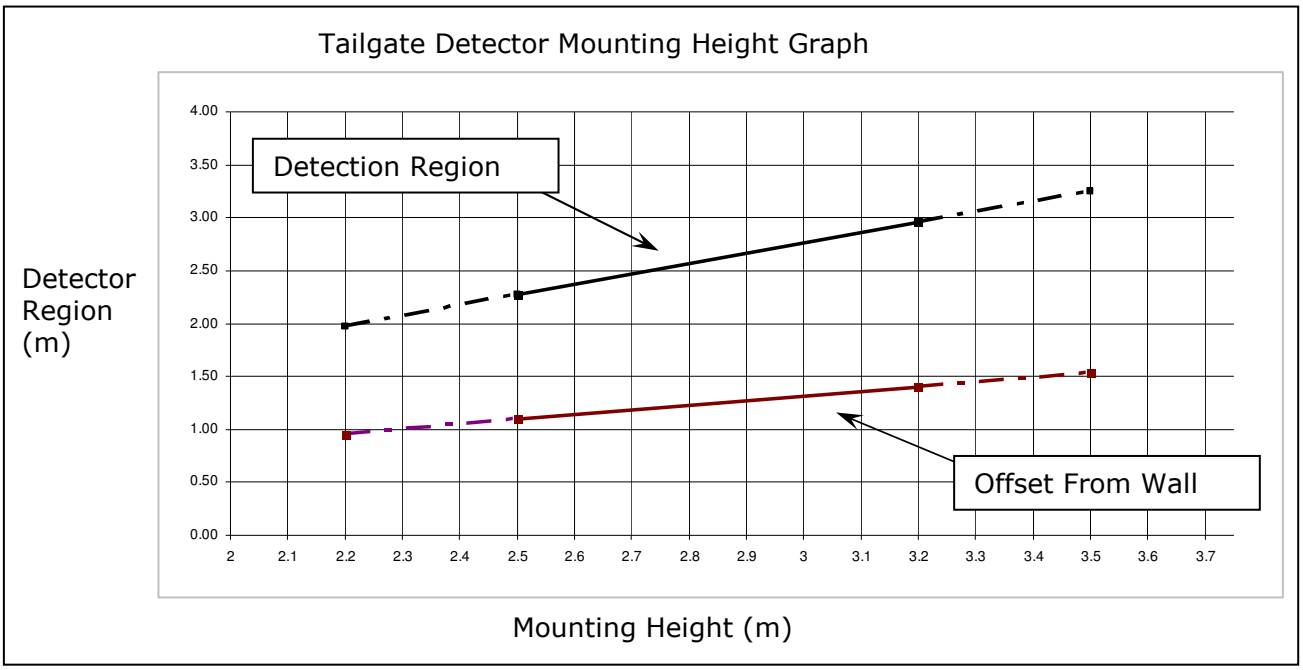

Figure 1.4.1

The main installation mounting height range is between 2.5m and 3.2m. The detector can also be installed on ceilings which are as low as 2.2m or as high as 3.5, but some inaccuracies may be experienced at these heights.

The 'Offset from wall' is the maximum distance that the detector can be installed from the wall incorporating the door. This is utilised in some installation types, dependant on door type, see sections 2.4 and 2.5.

> ⚠ Note that the detector must be mounted horizontal, looking straight down, so that the centre of the field of view is directly below the unit. Never angle the detector in an attempt to shift the field of view to another area. Doing this will cause tracking issues and the detector will not work correctly. Instead physically move the detector and install as per the guidance in sections 2.4 and 2.5.

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1.5 Detector Operation

The detector is ceiling mounted and detects peoples movement through a germanium lens with a 60 degree field of view. It uses thermal imaging technology incorporating 256 temperature sensing elements arranged in a grid (or array) of 16x16 elements located just behind the lens. Each of the 256 elements (or pixels) will detect changes in temperature independently, and as people move around underneath the detector the array will 'see' their body heat as infrared radiation.

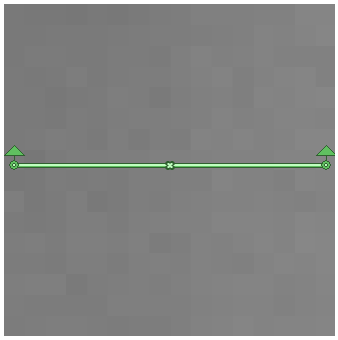

Figure 1.5.1

Each pixel will detect a ½ degree difference in temperature. This means that people can be as little as ½ degree hotter or colder than the background (floor) and they will be tracked through the field of view.

A person will appear in a group of pixels, and because all the pixels will be slightly different temperatures as the array sees the head, shoulders etc., a person will always be detected and tracked even if parts of the person's body are the same temperature as the background (floor).

A target will be created which will then be tracked around the field of view:

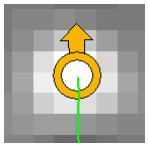

Figure 1.5.2

Further details about the general operating principles of the detector and the use of virtual count lines can be found in IPU 40028 – People Counter Application notes.
For specification of the detector, refer to IPU 40081 Tailgate Detector Product Sheet.

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1.6 Manual Override

In tests, the tailgate detector has been found to be extremely accurate in its interpretation of infrared signals and will correctly identify and track the exact number of people approximately 99.5% of the time; providing that the detector has been installed and configured correctly.

But, because the chance of inaccuracies or false readings is still present, it may be necessary to incorporate a manual override facility within the complete access control system. This is especially important on airlock type installations, as errors in counting and logic interpretation should not be allowed to trap a person inside the airlock, or get the airlock into a state where the system believes the airlock is occupied when it is not, and it won't continue until someone walks out.

The override facility is normally be provided by onsite security or via a security CCTV station that can intervene, remotely operate the exit doors, and reset the system counts, if, and when, required.

With the detector in airlock mode, a single miscount can leave the system believing that there are more - or less - people in the airlock than there actually are which will then prevent the second door from opening, or the first door from closing. In these cases a method for resetting the 'system count' must be provided for.

On installations utilising the detector in tailgate mode a time out setting is provided which goes some way towards making sure that the unit performs correctly. If a person presents their access card and the door is opened for them, but they then change their mind, the timeout prevents an opportunist from taking advantage of that the open door, as they will then generate an alarm output when they cross the counting line. Consequently, if a person presents their access card to unlock the secure door, but then does not proceed through it before the timeout; they will cause an alarm to be signalled if they then proceed. But, by returning to the non-secure side of the door and presenting their access card again, they will be allowed through without causing an alarm. To cope with these issues a clearly visible instruction card may be all that is required.

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2 Positioning the Detector

Four factors need to be taken into account when selecting the mounting location for the detector: -

- Target Initialisation constraints
- The thermal environment
- The optimum line settings that the installation requires
- The optimum position for the detector relative to the door for each of the operating modes

In general, the performance of the detector can be optimised by positioning the virtual count line to avoid areas where: -

- individuals may loiter
- temperature change may occur (e.g. patches of carpet illuminated by sunlight)

The count line(s) within the detector are the key to accurate performance and great care should be taken when deciding on a suitable configuration for these. In most cases, the required count line positioning will dictate the mounting location for the detector, and it is therefore essential that the operation of the count lines is fully understood by the installer to enable them to position the detector effectively.

In the majority of cases, the optimum line settings should be with the lines intersecting the middle of the field of view – immediately below the physical location of the detector, but this is not always possible, or preferred, dependant on the location.

In some cases other ceiling furniture, such as light fittings, signs, sprinklers, smoke alarms etc., will prevent the detector from being installed in the optimum position, and the impact of positioning the detector elsewhere should be visualized and compensated for with careful line placement at configuration time.

Never angle the detector in an attempt to shift the field of view on the ground as this will cause tracking errors and false alarms. Always install horizontally so that the centre of the square field of view is directly beneath the detector.

The detector provides optimum performance in stable thermal environments. Situations where the thermal background in the field of view of the detector can have marked localised temperature differences (hot spots) or can change temperature rapidly, should be avoided, as these circumstances may lead to a reduction in performance. Examples of such situations are areas where intense sunlight falls on the floor within the field of view of the detector, and where the detector is close to doors which separate two areas with very different temperatures, particularly where the floor surface can change temperature rapidly, (e.g. where the flooring material is carpeting or the flooring materials in the field of view are of different types e.g. carpeting over tiles or areas with rubberised floor mats).

Installing the detector at doorways which open to the outside is not recommended, as extreme temperature differences can affect the detectors performance. Such installations should be tested for effectiveness before being made permanent. Note also a successful test during one period in the year does not guarantee adequate performance during other times of the year. It is due to the differing temperatures at different times of the year that installing at exterior doors is not recommended.

Things to observe when considering possible detector location:

- Door type: swing door, sliding door, or other type
- Does door open inwards, outwards, or both directions
- Interior or exterior door

When utilising the detector in one way mode, it should normally be positioned in an open area such as a corridor. Although using one way mode and installing close to a door is possible, it is recommended to install at the approach to the door whenever possible.

In all cases, the required position of the count lines should be decided first, before installing the detector. Any potential detector position should then be discussed and evaluated with regards to allowing the required count line setup. Only then should the detector be installed on the ceiling.

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2.1 Target Initialisation Requirements

Before discussing the best detector mounting locations it is essential that the concept of 'Target Initialisation' is reviewed and understood.

The detector works by recognising a person's infrared signature (body heat) as they enter the field of view. This is then tracked through the field of view until that person leaves and any line crossings are used during this time to output alarms and counts as appropriate (depending on count mode selected). Multiple people can be tracked at the same time in this way, but all must be 'initialised' as valid targets by the detector. This process involves the detector performing some validation on the infrared source that it is 'seeing', and confirmed that it is 'human-like'. I.e. it is roughly round in shape (as seen from above) and is moving in a walking motion.

You can tell when a person has been initialised as a valid target by watching the array view from the setup software – all initialised and therefore valid targets – are highlighted in orange.

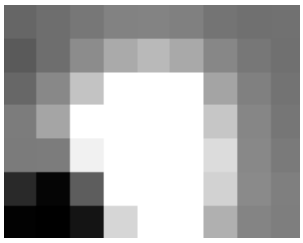

Figure 2.1.1

Figure 2.1.1 shows a person who has entered the field of view of the detector but who has not yet been initialised as a valid target. The white 'blob' is the infrared heat emitted from a person which you typically see when a person is hotter than the background (the floor).

In this particular example, the person was initialised as a valid target in the very next frame, this is shown in Figure 2.1.2, and is symbolized by the orange target superimposed over the top of the infrared source.

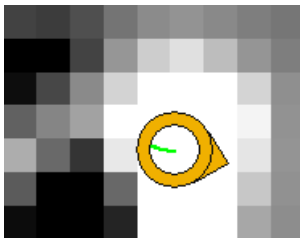

Figure 2.1.2

The important thing about initialisation is that people who are not yet initialised cannot be counted. A person must be initialised as a valid target before a line crossing will be recognised. Therefore, it is very important that the count line is positioned in a part of the field of view where people are already initialised, to ensure that they are not missed by the detector. If a person is missed then it means that that person has inadvertently bypassed the security provided by the tailgate detector unit.

Extensive walk testing is recommended in order to ensure sufficient initialisation for all targets.

In the example shown below, in Figure 2.1.3, the detector is in Tailgate mode, and the count line has been positioned very close to the edge of the field of view. The first person entering the detectors field of view - shown on the left view - was initialised before they crossed the line as indicated by the start point of the green trail line behind the target. This means that the line crossing was recognised and they were counted. But the second person - shown on the right view - was not initialised in time and was therefore not counted. As target initialisation cannot be guaranteed with this line position, the line should be moved further away from the edge and up the field of view.

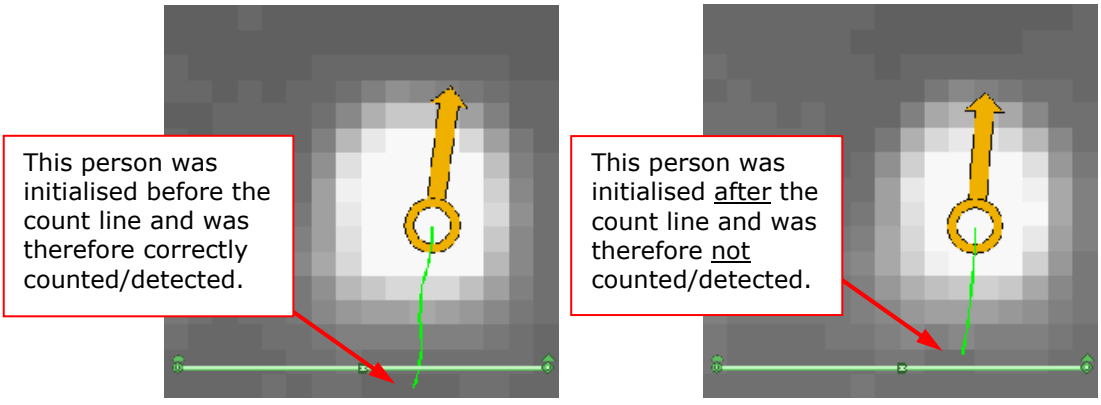

Figure 2.1.3

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In some cases a target will be 'back corrected' by the detector and traced back to where the temperature difference was first detected, as shown in the example below. But this should not be relied upon, as a back corrected initialisation may, likewise, not extend far enough back to before the line.

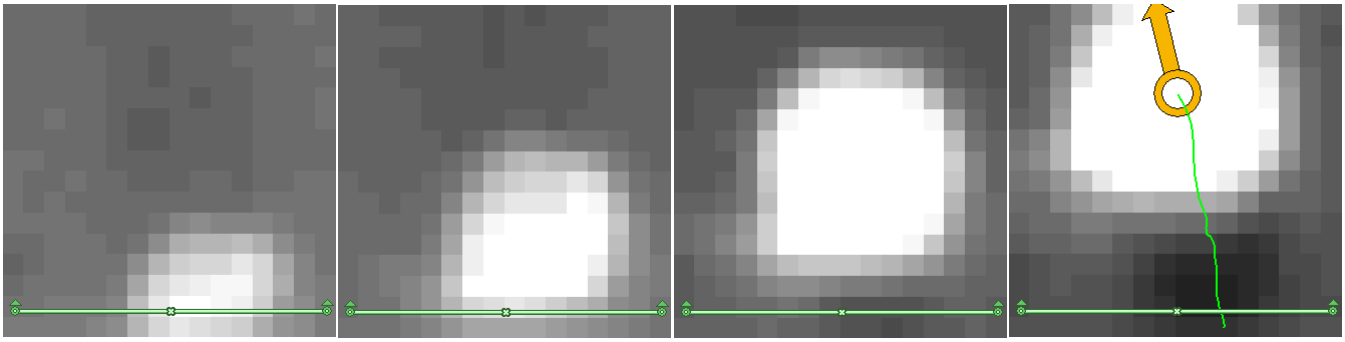

Figure 2.1.4

To help guarantee that initialisation of a target occurs before the target reaches the count line, it is recommended that at least four pixels are left between the edge of the field of view and the count line. If some of the field of view is obscured - and therefore a target is not seen at the edge of the field of view - the four pixels gap should start from the part of the field of view where the target is first seen; see section 7.4.9 for more details. In all cases, sufficient walk tested should be performed in order to ensure correct operation.

2.1.1 The Temperature of a Person

Remember that the temperature of the person is not actually measured by the tailgate detector. It is merely a difference in temperature between the person and the floor which is being detected and then tracked through the field of view. The person can be hotter or colder than the floor.

Moving objects which are hotter than the floor will be shown as white objects and those which are colder are shown as black objects:

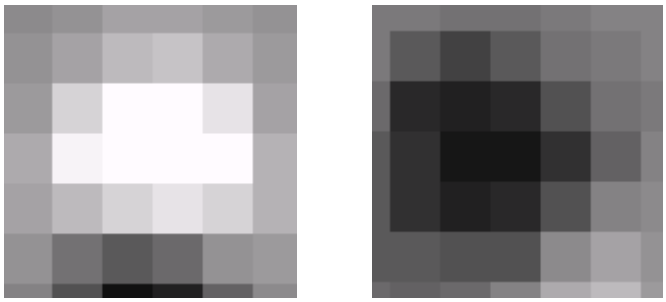

Figure 2.1.5 Hot Target and Cold Target (Not initialised)

Once initialised, targets which correspond to hot or cold objects are tracked around in exactly the same way.

Any concern that a person's body temperature could be very similar to the background temperature, and therefore that person could be 'invisible' to the detector, are negated once you understand that the detector only requires a ½ degree difference in temperature for an object to provide sufficient signal that can be tracked. This ½ degree temperature requirement is always provided by the fact that different parts of a person's body will have slightly different temperatures. Usually a person's head is a few degrees hotter than the rest of their body, but even if they are wearing a hat and the heat is kept inside, this will create a lower temperature, instead, which can then be detected. When mounted indoors, and in accordance with the advice contained in this guide, it is not possible for someone to be 'invisible' to the detector.

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2.2 Other Movement

The tailgate detector works by detecting changes in temperature with regard to a stable background temperature. This means that anything moving through the field of view which has a different temperature to the background will be seen by the detector and could be initialised as a target.

When installing at interior door locations, rapid floor temperature change is extremely unlikely, but other movement could be detected.

The detector will track a person moving through the field of view by following the naturally emitted body heat of that person, but the detector will also detect any other temperature change within its field of view. For example if someone pushes a trolley through the detectors field of view, it is probable that two targets will be initialised – one from the person pushing the trolley and one from the trolley itself. This is because the trolley will also be a different temperature to the floor and so the detector will see it, and initialise a target to track. For this reason care should be taken when specifying the tailgate detector in areas where other things apart from people will move through the secure door and on through the detectors field of view. If things like trollies are occasionally taken through, then this could be managed by treating this as a separate matter with procedures to follow – procedures which encompass the 'Manual Override' functionality mentioned in section 1.6.

A more common source of additional targets is that of movement from the doors. Again, a door will be of a different temperature to the floor and so any movement from the door, within the field of view, will be detected by the tailgate detector unit. This is less of a problem though, because correct positioning of the unit, along with correct setup of the count line(s) will mean that movement of the doors will not be an issue. The method for dealing with door movement is to simply position the count line(s) around the door so that any targets that may be generated from the door movement cannot cross the lines and cause false alarms. The correct detector position and line setup is therefore directly related to the door type, and things like, whether the door swings into the field of view or out of it, for example.

Section 2.3 shows the optimum line configurations required for each door type.

Section 2.4 shows the optimum detector location in order to achieve the optimal line settings required.

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2.3 Optimum Line Positions

Because the tailgate detector is utilised in security applications it is essential that it can operate as effectively as possible. Configuring the correct count line setup is fundamental to the detectors ability to detect everyone correctly, and the detector must be installed in such a location that allows the optimum line settings to be utilised.

In virtually all cases, the count lines should be positioned around the door, covering the full width of the door, so that everyone who walks through the door is counted as efficiently as possible.

Count line(s) should be positioned carefully:

- Not too close to the door that the door itself could be counted
- Not too far away from the door that a person could enter and close the door behind then without crossing the line

If a space is left between the door and the count line that someone could stand in, this would mean that someone could walk through the door and close it behind them without being detected as going through the secure door (because they've not crossed the line).

In an airlock scenario, positioning the lines too far from the door would allow a person to enter through the first door without being counted, and this would allow the second door to open at which point the intruder could proceed on into the secure area.

In a tailgate alarm scenario, an intruder could tailgate a permitted person through the secure door, and wait in the space between the door and the line. Once the allowed person has walked out of view, the intruder could then continue on into the secure area unchallenged.

In both situations an alarm *may* be generated by the intruder, but this is dependent on initialisation considerations and so is not be guaranteed, but, even if an alarm was generated, the intruder may still be able to move away from the area at speed before a security guard has chance to intervene.

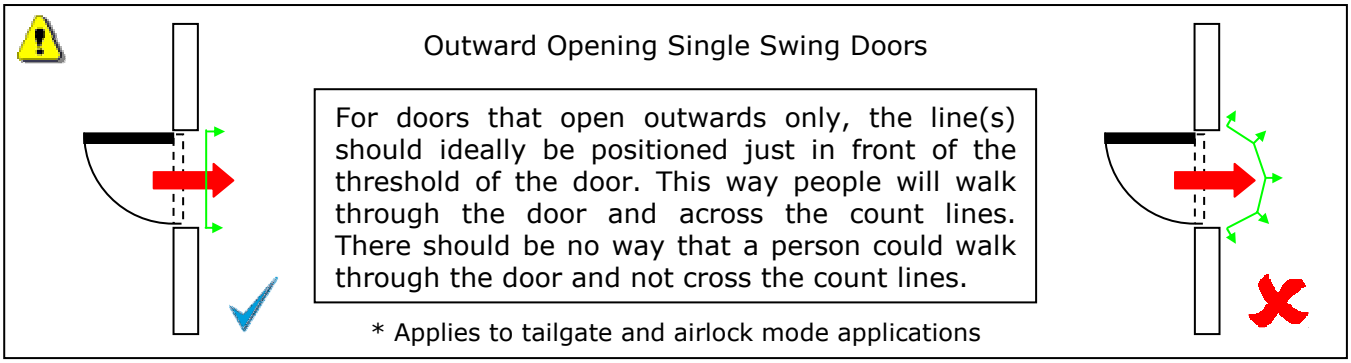

Figure 2.3.1

Any space between the threshold of the door and where the count line is positioned should not be big enough to allow a person to stand there with the door closed.

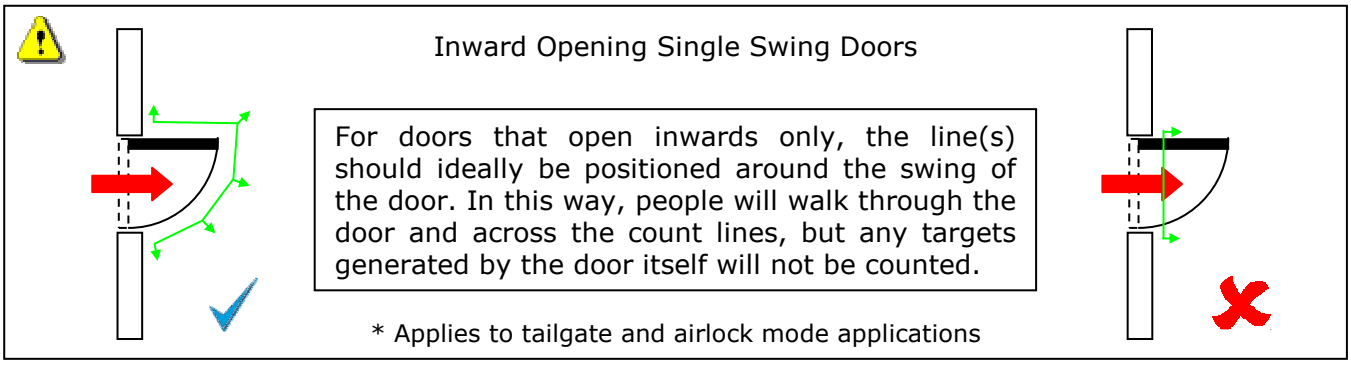

Figure 2.3.2

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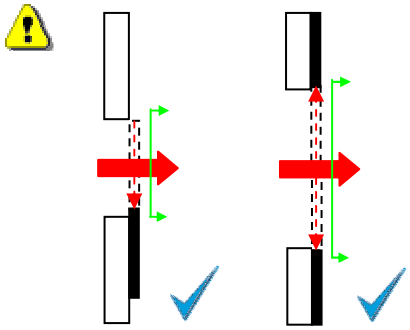
Remember that the swing of a door will normally be detected by the tailgate detector, if within the field of view. Therefore, the count line should be positioned so that any target created by the door is not able to cross it, in order to prevent false alarms from being generated.

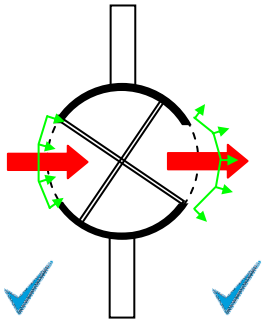


Sliding Doors

For doors that have automatic sliding opening mechanisms, the lines should ideally be positioned in the same way as outward opening doors, just in front of the threshold of the door. People will walk through the door and across the count lines.

* Applies to tailgate and airlock mode applications

Figure 2.3.3

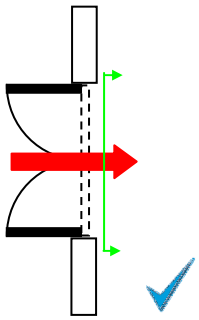


Revolving/Turnstile Doors

For revolving or turnstile type entrances, the lines should ideally be shaped around the main opening. People will walk through the door and across the count lines. This will normally be on the secure side of the door but could be on the other 'non-secure' side, if required.

* Applies to tailgate and airlock mode applications

Figure 2.3.4

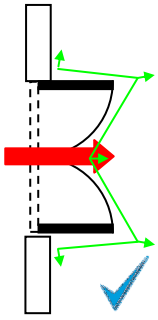


Double Swing Doors Opening Outwards

The count lines on double doors which open outwards should be configured the same as those on single doors – just in front of the door threshold. Line(s) should stretch across the full width whenever possible but with priority given towards the most used door when not.

* Applies to tailgate and airlock mode applications

Figure 2.3.5



Double Swing Doors Opening Inwards

The count lines on double doors which open inwards should be configured around the swing of the two doors but as close to the doors as possible in a 'sigma' (Σ) configuration. This is required to help prevent people from standing in the middle and closing the door without being counted. But it does not eliminate the risk completely!

* Applies to tailgate and airlock mode applications

Figure 2.3.6

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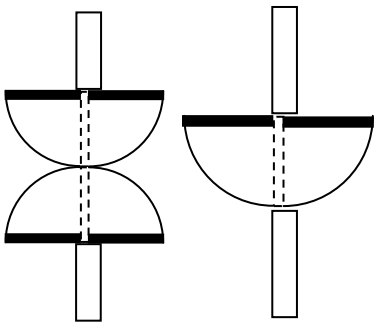
With double doors that open inwards – towards the detector – there is a risk that someone could open one half of the door, walk through it and then step to the side so that they are inside the other half of the door, without ever crossing the count line. They could then close the door behind them and they are then effectively in the secure area. This risk is somewhat negated if the doors are automatic opening doors where each half cannot open independently of the other.



Swing Doors which Open both Ways

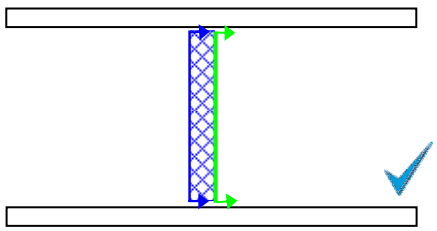
Swing Doors which can open in both directions are not suitable for use with the tailgate detector. If a tailgate solution is required on doors which open in both directions, the doors should be modified to allow opening in only one direction – either inwards or outwards.

Figure 2.3.7

With any doors that open in both directions – towards the detector – there is a risk that someone could open one half of the door, walk through it and then step to the side without crossing the count line. They could then close the door behind them and they are then effectively in the secure area.

Once you have established the count line configuration that will be required, you can then move on to assessing possible mounting locations to see what location(s) best allow the required count line setup. See the next section.

Remember that one way mode works in a slightly different way to the more commonly used tailgate and airlock modes. In one way mode both count lines are utilised together to form a start and end 'counting zone'. In this mode a person will be counted if they cross the first line and then continue on across the second line. The two lines are used in this way to help prevent false alarms that could be caused by people hesitating or dithering on a single count line.



Specific one way mode applications

For one way mode applications the detector should ideally be installed in the centre of a corridor between two solid objects (usually the corridor walls). Although it is possible to use one way mode at doorways, mounting on the approach to the doorway is recommended instead whenever possible.

* Applies to one way mode applications

Figure 2.3.8

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2.4 Optimum Detector Positioning

The optimum detector position is the location that maximises the available field of view, and allows the best possible line configuration to be employed (as shown in section 2.3).

Ideally, a person will be first seen at the edge of the field of view and not part way into the field of view. This will then provide the maximum amount of initialisation space possible, up to the count line, to ensure that people are not missed.

The best count line position should therefore be visualised on the ground, and the detector positioned accordingly, so that the visualised positions become viable count line proposition.

In most tailgate and airlock applications, the best position for the count line is either at the threshold of the door or around the arc of the door swing, depending on whether the particular door opens inwards or outwards. This ensures that it is not possible to; enter through the door; close it behind you; and to not have crossed the count line. To allow this kind of line setup to work effectively a person must be initialised as a valid target before crossing the count line. The detector therefore needs to 'see' as far out of the door (when opened) as possible in order to allow the maximum amount of space possible in which to initialise a target. See section 2.1 for details of initialisation requirements.

The ideal position for the detector is therefore the closest it can be to the door without any part of the field of view being obscured by the wall above the door. The detector should be able to just 'see' underneath the top of the doorframe. This then provides the most space for targets to be initialised. Tailgate detectors should be installed only at the allowable distance from the door range of A to B, shown below:

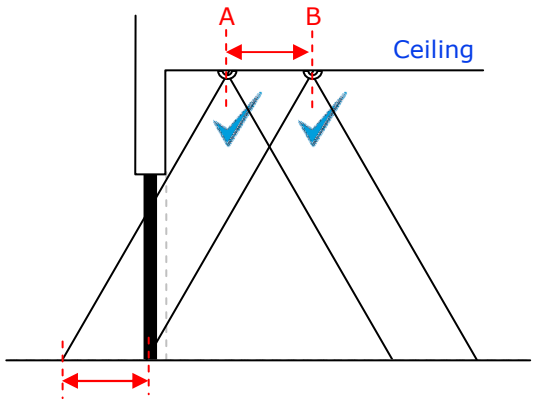

Figure 2.4.1

Position A represents the closest that a detector can be mounted to the door whilst still ensuring that the field of view of the detector is not blocked by the overhang of the wall above the door. When the door opens, the field of view will, effectively, stretch out through the opening. Dependant on the door type, position A may not be recommended and the detector will need to be positioned further from the door – see next section.

The detector should never be installed closer to the door than position A, as this will mean that the field of view will be partially blocked which will result in the size of the available – usable – field of view being reduced:

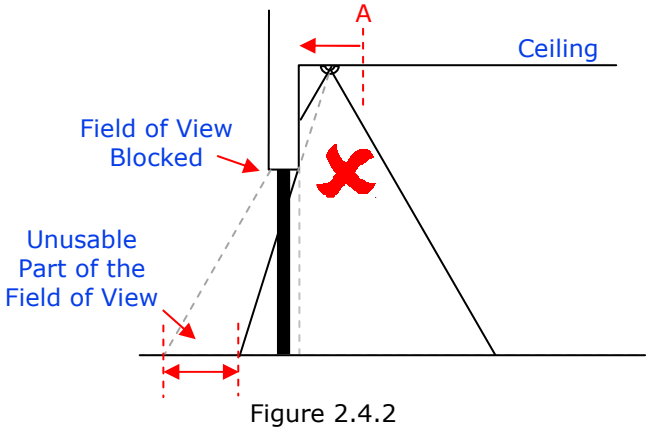

Figure 2.4.2

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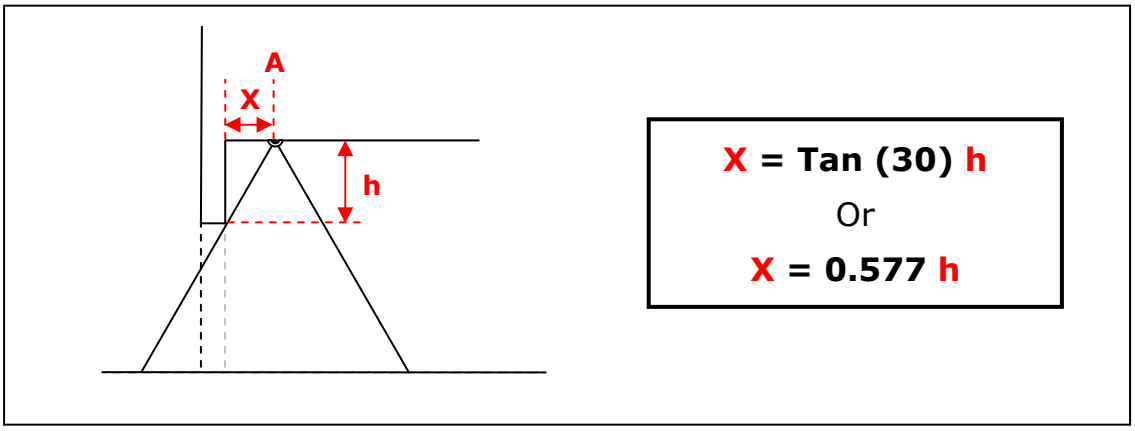
In order to calculate the closest position, A, from the door that the detector can be mounted, use the following formula:



Remember that this position is not always recommended dependant on the type of door, see section 2.5, for specific advice, by door type.

Position B represents the furthest away that a detector can be mounted from the door whilst still ensuring that a person will walk through the door and step into the detectors field of view. It is often referred to as the maximum 'Offset from Wall'. Dependant on the count line configuration required, position B may not be recommended due to target initialisation considerations (see section 2.1, Target Initialisation Requirements), and the detector may need to be positioned closer to the door (closer to position A).

The detector should never be installed further from the door than position B, as this will leave a gap between the door and the detectors field of view, which would allow a person to walk in; close the door behind them; and not be counted.

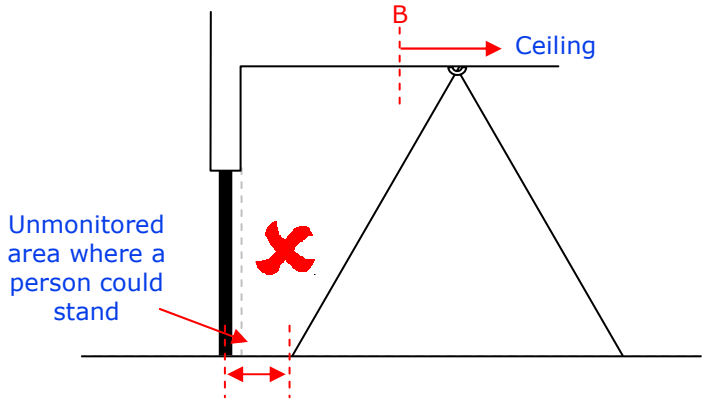
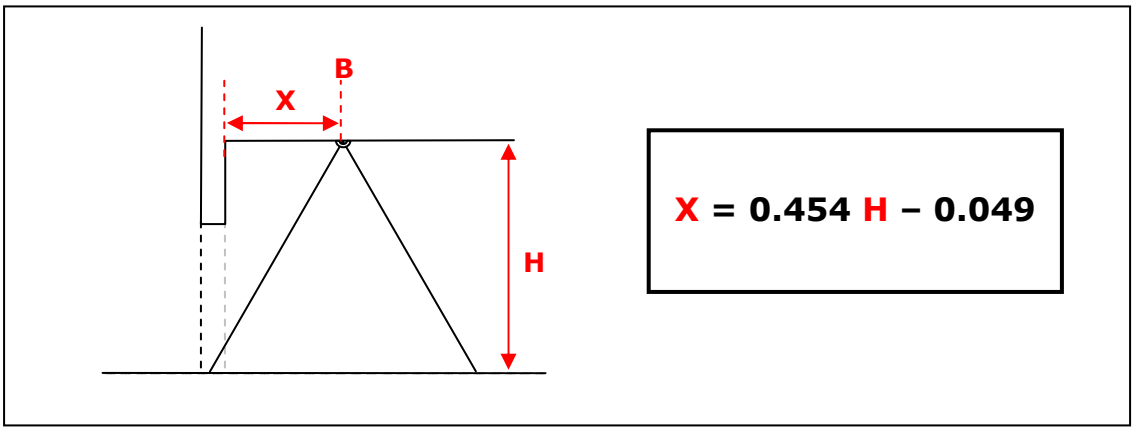


Figure 2.4.3

In order to calculate the furthest position, B, from the door that the detector can be mounted, use the following formula:



Remember that this position is not always recommended dependant on line configuration that is required, see section 2.5, for specific advice, by door type.

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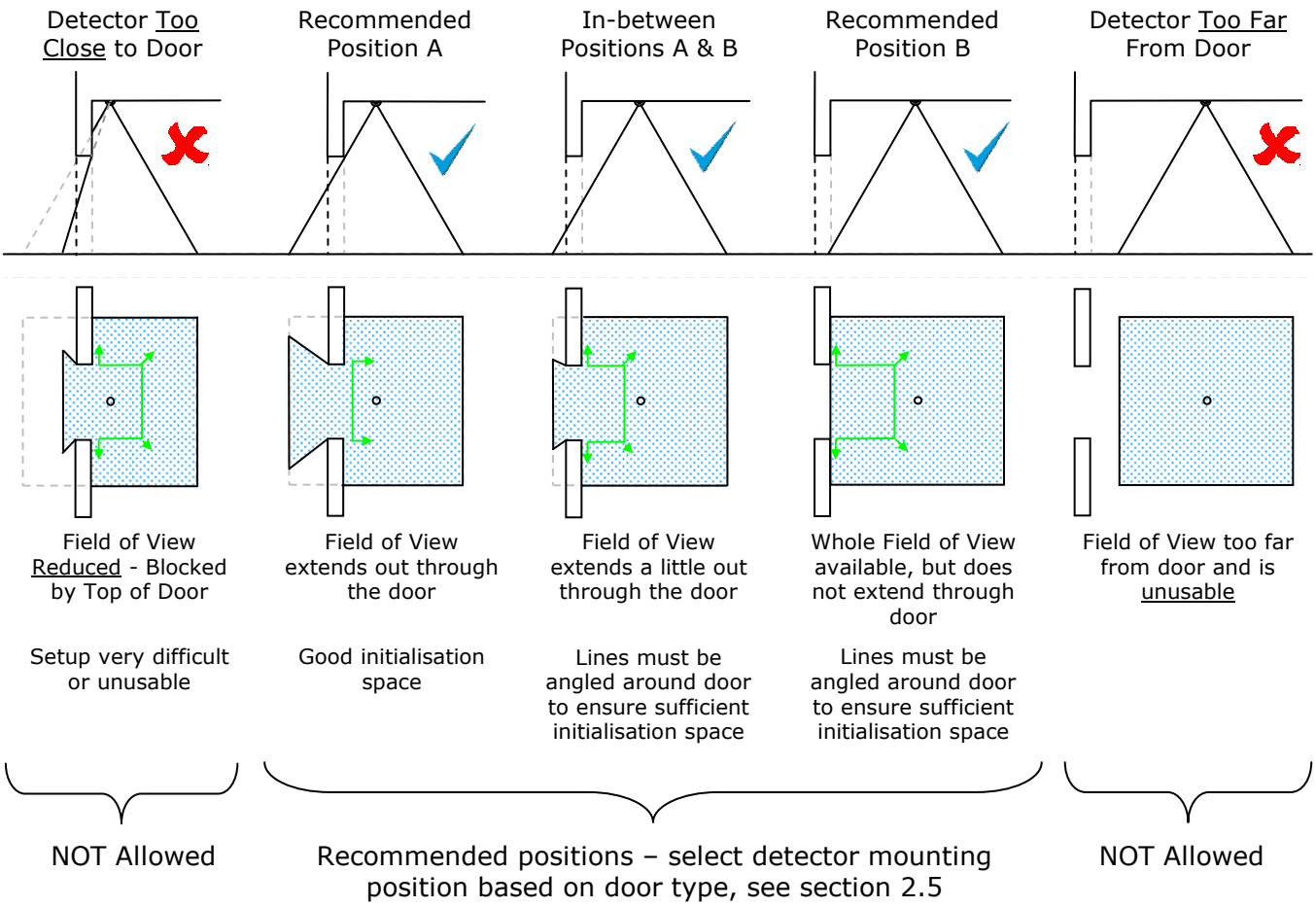

If a doorway is to be monitored in both directions then two detectors will be required – one on each side of the door. These should be thought of as separate installations, but linked together in the access control system logic/programming/wiring.

In airlock applications which are used in a bi-directional mode and detection is required for the second door, a separate detector must be fitted in the same relative position at the other door.

Remember that one way mode operates in a slightly different way to the more commonly used tailgate and airlock modes and as such the detector should be installed with a different approach.

For one way mode applications the detector should ideally be installed in the centre of a corridor between two solid objects (usually the corridor walls). Although it is possible to use one way mode at doorways, mounting on the approach to the doprway is recommended instead whenever possible

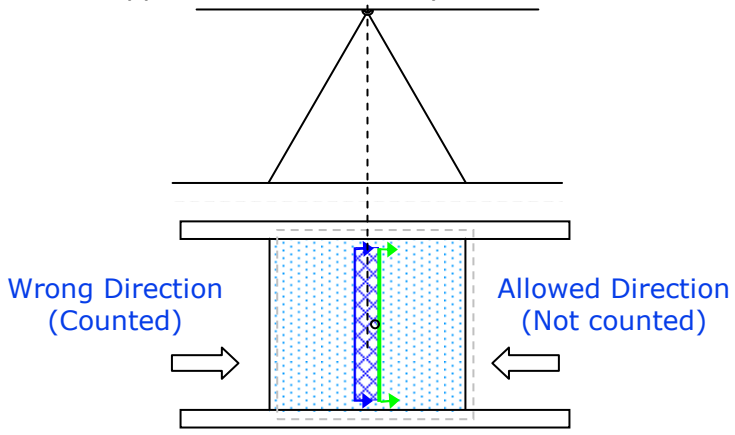

Figure 2.4.4

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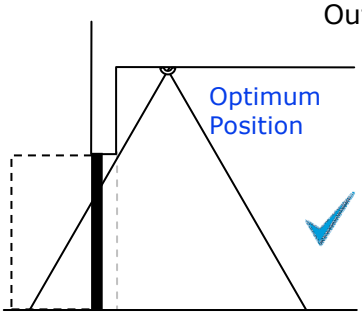
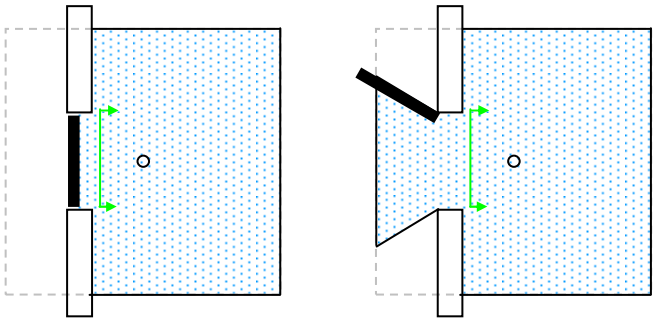
2.5 Door Specific Detector Mounting Locations

In the majority of cases, the optimum line settings will be with the lines intersecting the middle of the field of view – immediately below the physical location of the detector. The only exception to this is when mounting the detector at this position would lead to the top of the door blocking part of the field of view. In this case the detector must be mounted away from the door slightly so as to see under the top of the door when it opens.

Outward Opening Single Swing Doors



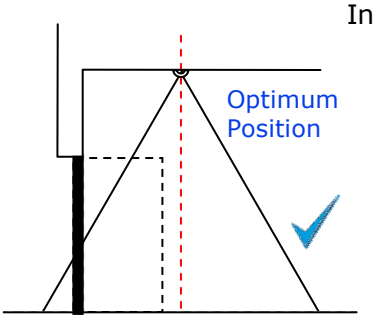
For doors that open outwards only, the line(s) should be positioned just in front of the threshold of the door. As the best position for the lines is directly beneath the detector this means that the detector should be positioned as close to the door as possible without blocking the field of view - in most cases it will not be possible to position the lines exactly beneath the detector.



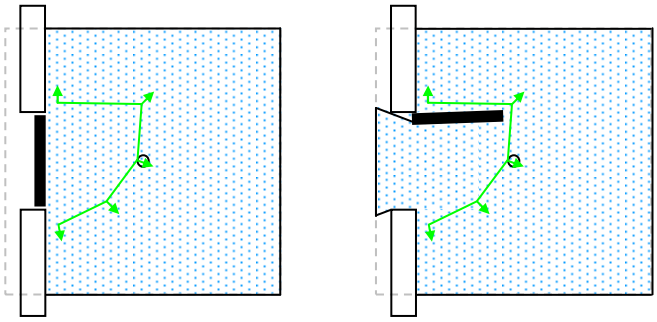
People should therefore walk through the door and across the count line(s) – ensure that there is no space between the door and the count line that a person could stand in without being counted.

Figure 2.5.1

Inward Opening Single Swing Doors



For doors that open inwards only, the line(s) should be positioned outside the arc of the door as it swings open. The best position for the lines is directly beneath the detector, so the detector should be positioned outside the swing of the door as well. The field of view should not be blocked by the wall above the door, and it should be possible to position the lines precisely below the detector.



People should therefore walk through the door and across the count line(s) – ensure that there is no space between the arc of the door and the count line that would allow a person to walk through the door, close it behind them, and not cross the count line(s).

Figure 2.5.2

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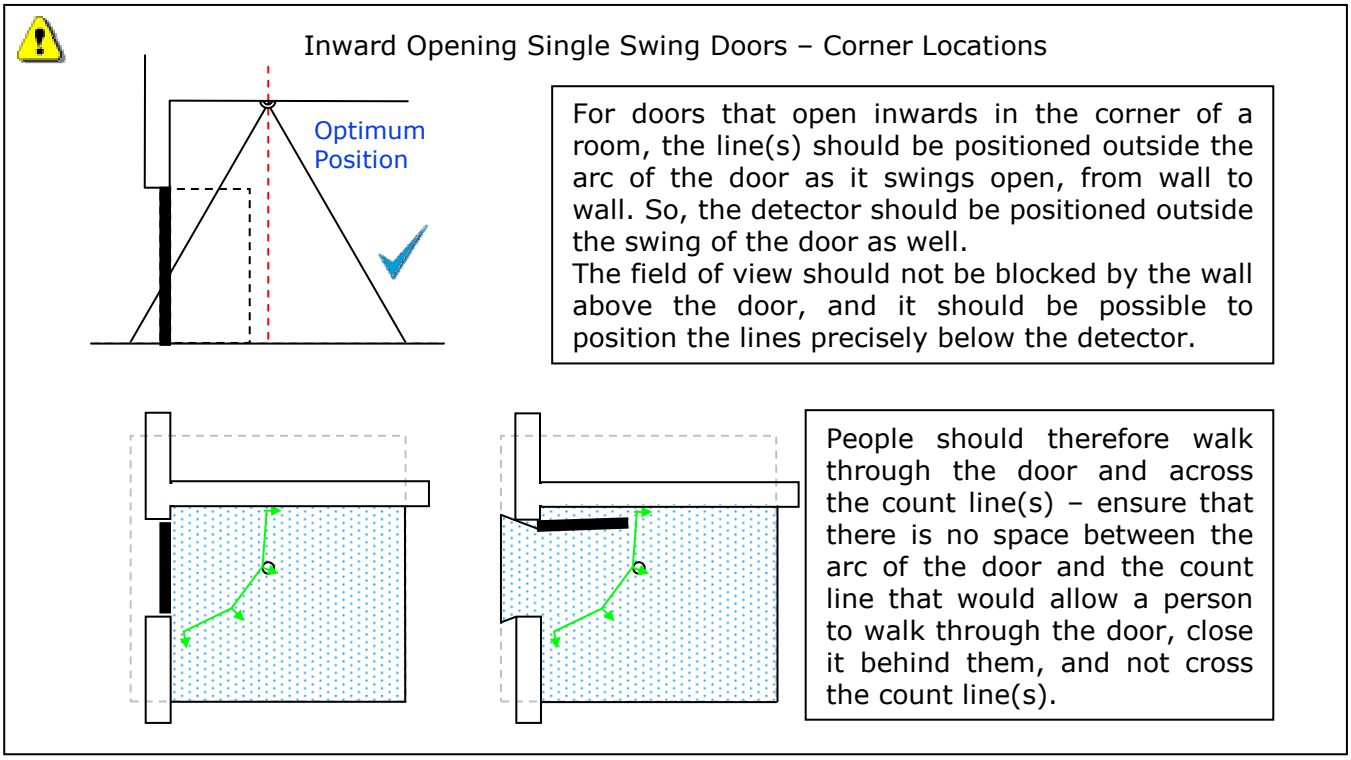

Figure 2.5.3

If the detector is too close to a door which swings into the field of view, then the movement of the door will generate lots of targets moving across the whole of the field of view. It will be impossible to set the detector up satisfactorily until you move it further from the door. The red area shown in the left image in Figure 2.5.4 shows the area which gets obscured by the door as it opens and closes. Notice that the area is bigger than the arc of the door:

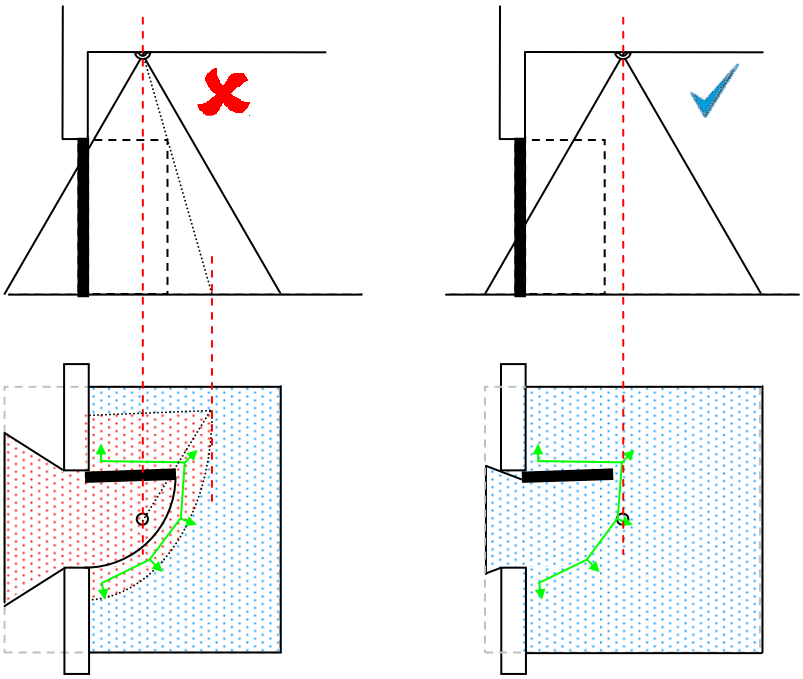

Figure 2.5.4

In the above example, mounting the detector too close to the door will mean that the door itself will generate lots of targets which will be counted across the line. This should be immediately obvious by viewing the thermal array view provided the setup software as the door opens and closes (see section 7.4). Never install the detector directly above the area which the door swings through as it opens and closes.

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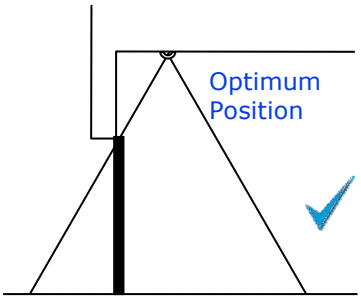
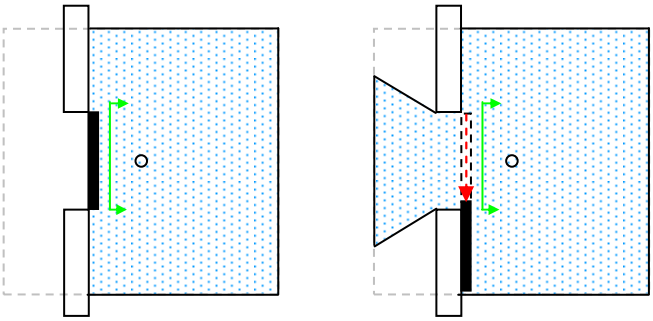
Sliding Doors



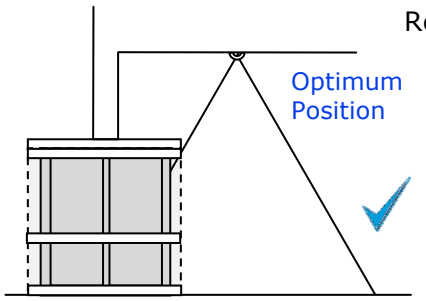
For automatic sliding doors, the lines should be positioned just in front of the threshold of the door. As the best position for the lines is directly beneath the detector this means that the detector should be positioned as close to the door as possible without blocking the field of view - in most cases it will not be possible to position the lines exactly beneath the detector.



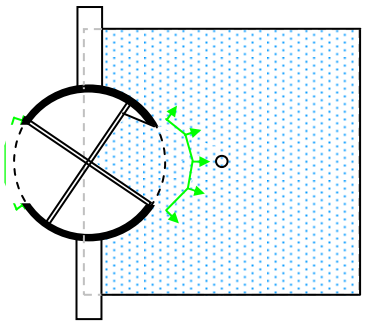
People should therefore walk through the door and across the count line(s) – ensure that there is not enough space between the door and the count line that a person could stand in without being counted.

Figure 2.5.5

Revolving/Turnstile Doors



For revolving doors, the lines should be positioned around the opening to the door and away from the moving part of the revolving door. As the best position for the lines is directly beneath the detector, this means that the detector should be positioned as close to the door as possible without blocking the field of view - in most cases it will not be possible to position the lines exactly beneath the detector.



People should therefore walk through the door and across the count line(s) – ensure that there is not enough space between the door and the count line that a person could stand in without being counted. Also be aware that the movement of the revolving door is likely to be seen in the field of view of the detector.

Figure 2.5.6

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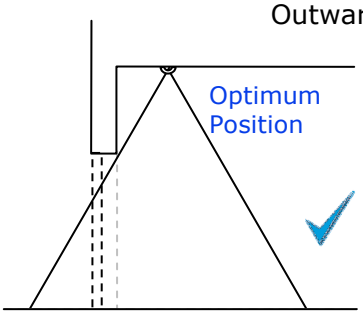
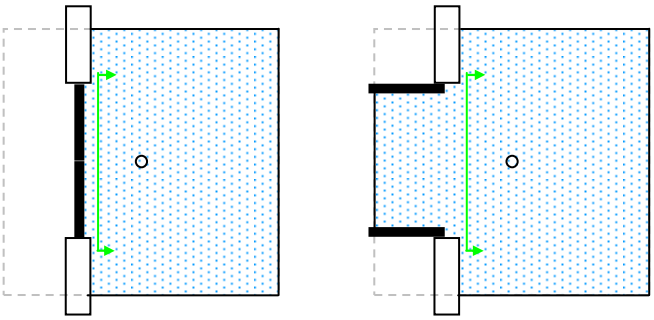
Outward (Only) Opening Double Swing Doors



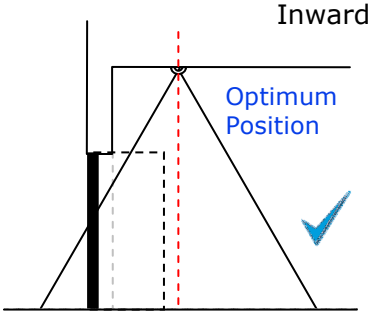
For double doors that open outwards only, the line(s) should be positioned just in front of the threshold of the door. As the best position for the lines is directly beneath the detector this means that the detector should be positioned as close to the door as possible without blocking the field of view - in most cases it will not be possible to position the lines exactly beneath the detector.



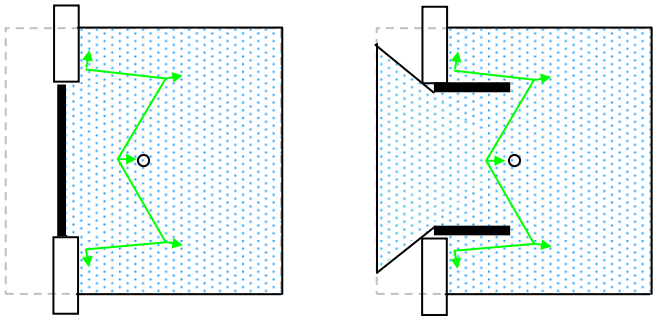
People should therefore walk through the door and across the count line(s) – ensure that there is no space between the door and the count line that a person could stand in without being counted.

Figure 2.5.7

Inward (Only) Opening Double Swing Doors



For double doors that open inwards only, it is important that the detector is positioned outside of the swing of both doors – never position it in-between the doors. The line(s) are then positioned around the swing of the doors but as close to the doors as possible in a 'sigma' (Σ) configuration. The field of view should not be blocked by the wall above the door, and it should be possible to position the lines below the detector



People should therefore walk through the door and across the count line(s) – ensure that there is no space between the door and the count line that a person stand in without being counted.

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2.6 Centre Offset Detector Positioning

In some cases, you can further optimise the detectors target tracking capability, by positioning the detector off centre to the door. In most cases this will not be required and the detector should be installed centrally to the door, but for some other installation types, it can offer a small advantage, specifically by either improving target initialisation or providing better target discrimination at the point of line crossing.

The two main reasons why you may want to offset a Tailgate detector are: -

- Low ceiling height, and therefore small field of view
- Monitoring a door way in the corner of a room

Low ceiling heights will naturally provide detectors with smaller field of views than those installed at locations with higher ceilings. Because of this, it is essential that the field of view is maximised by installing in a proficient and clever way. This means installing in such a way as to ensure that very little of the view is blocked (and therefore not wasted) and that the available field of view allows for efficient initialisation of targets.

If the detector is installed in order to monitor a door in the corner of a room, then it may make sense to offset the detector away from a side wall, in order to allow more of the field of view to be used.

The type of door that the detector is monitoring will also affect how appropriate it is to mount off centre. For doors which open outwards (away from the detector) it is preferable to try and increase the view out through the opening in order to encompass more of the area where a person will usually be first seen by the detector, but for doors that open inwards it is better to off-centre the detector biased towards direction of travel.

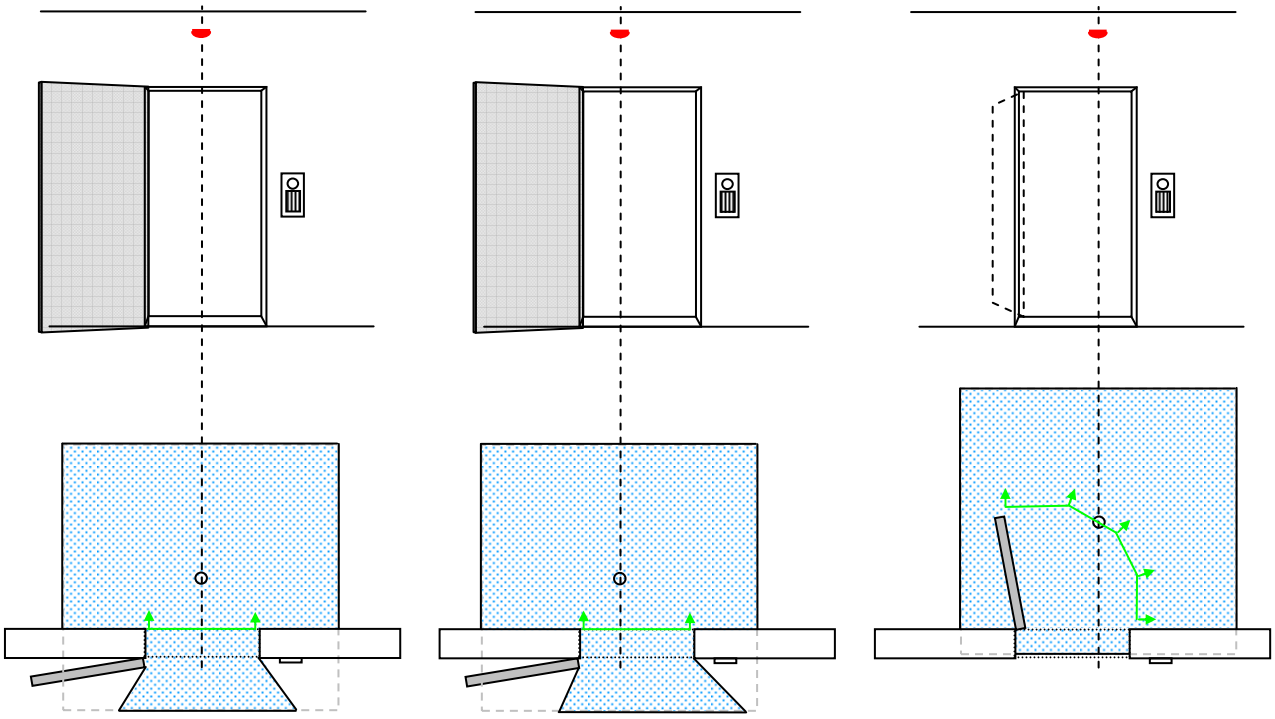

Figure 2.6.1

It is recommended that the detector should be offset from the centre of the door by no more than 20cm in most cases.

More detail is provided in the following sections.

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2.6.1 Centre Offset for Enhanced Initialisation of Targets

Offsetting the detector is one way of maximising the amount of available field of view and providing a potentially quicker initialisation of targets. This is because (once the door is opened) the detector can 'see' out through the opening and slightly around the door frame to the area where a person will naturally be approaching the door from, i.e. the card/biometric reader location. The amount that the field of view extends around the door frame and subsequent increase in speed of target initialisation may be marginal, but in cases where initialisation of targets is a problem, it may be beneficial.

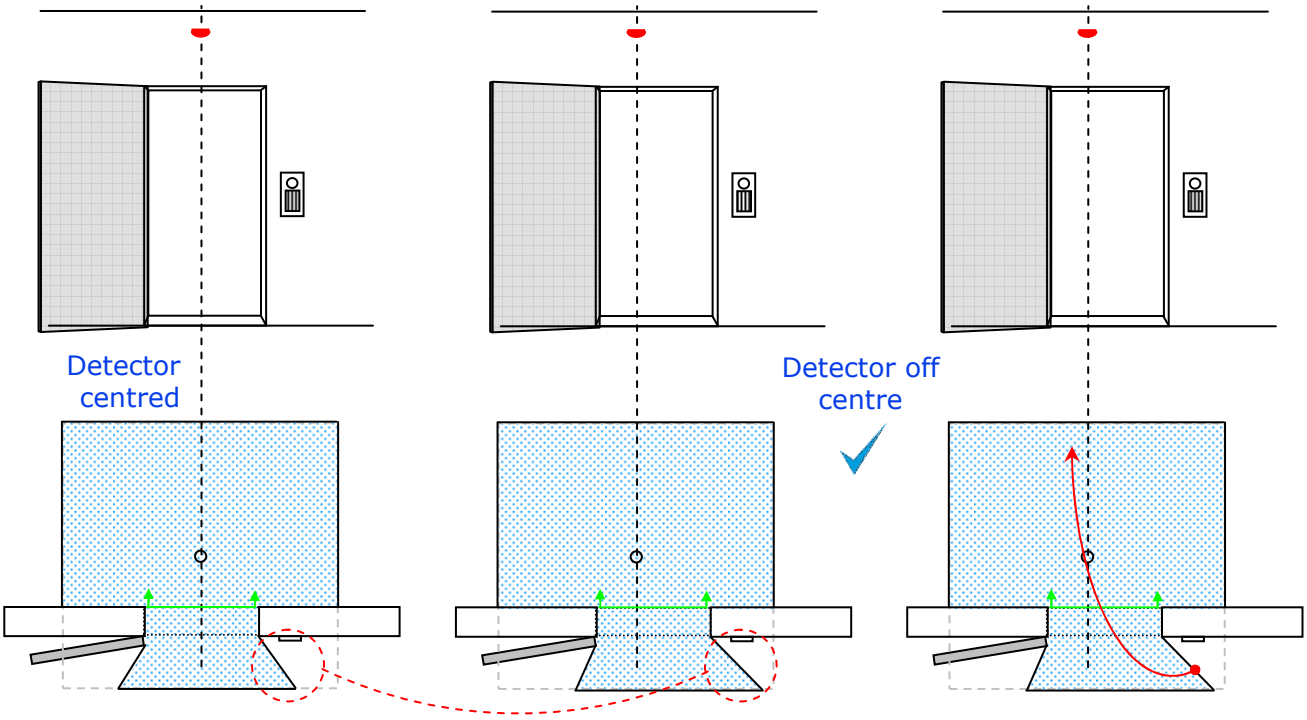

Figure 2.6.2

Extending the field of view out through the open doorway in this way, only works when monitoring doors which open outwards.

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2.6.2 Centre Offset for Enhanced Target Discrimination

As communicated throughout this guide, the optimum position for the count line(s) is as close to intersecting the point directly below the detector as possible (bearing in mind all other considerations). This is because; at the point people cross the lines, the detector can 'see' this from directly above, and consequently, the recognising of each person is the most reliable. Therefore, if people are indeed 'tailgating' each other - even very closely - then this is the point that the detector is almost certain to spot this and generate the required tailgate alarm.

Consequently, by offsetting the detector so that it is positioned directly above the most common path that people will travel through the field of view, this is then the ideal position for distinguishing between individuals:

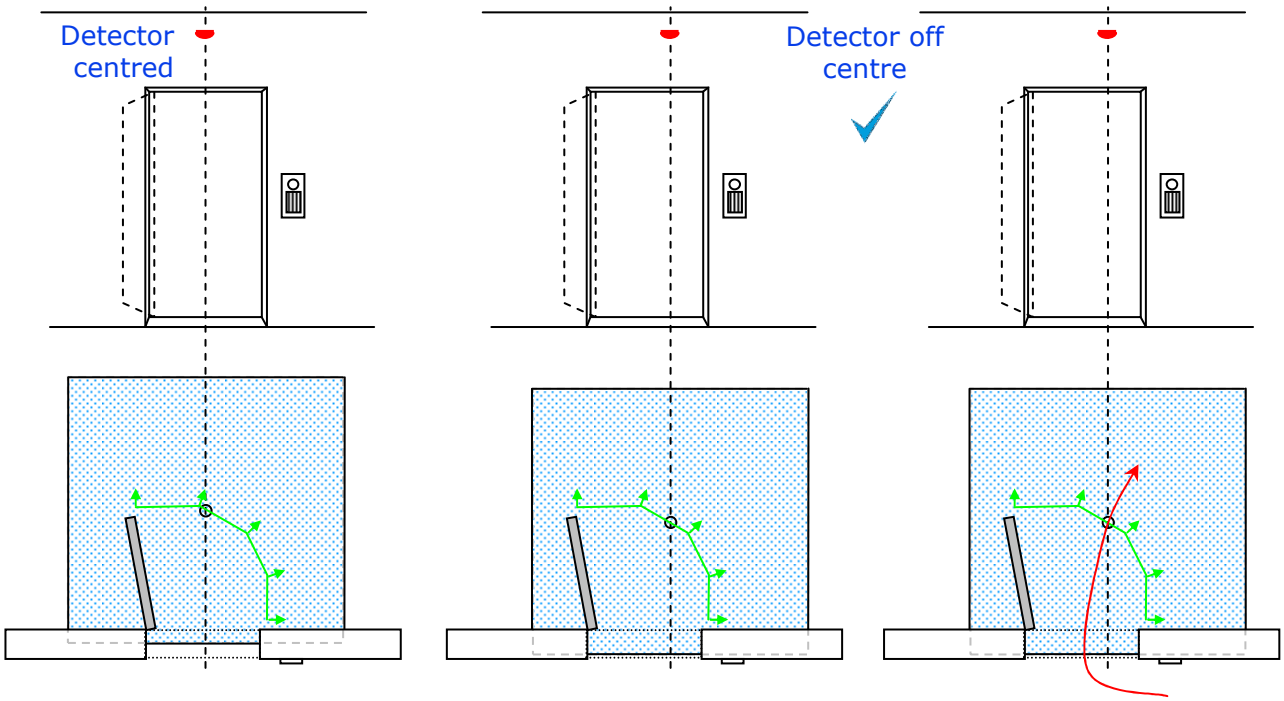

Figure 2.6.3

Positioning the detector in this way in order to heighten discrimination between people walking along a common path, only works when monitoring inward opening doors.

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2.6.3 Centre Offset to Increase Available Field of View

When monitoring a door which is located in the corner of a room, some of the field of view may naturally be lost due to the position of the side wall. In these cases it is possible to offset the detector from the centre of the door, and therefore away from the side wall, in order to increase the size of available field of view.

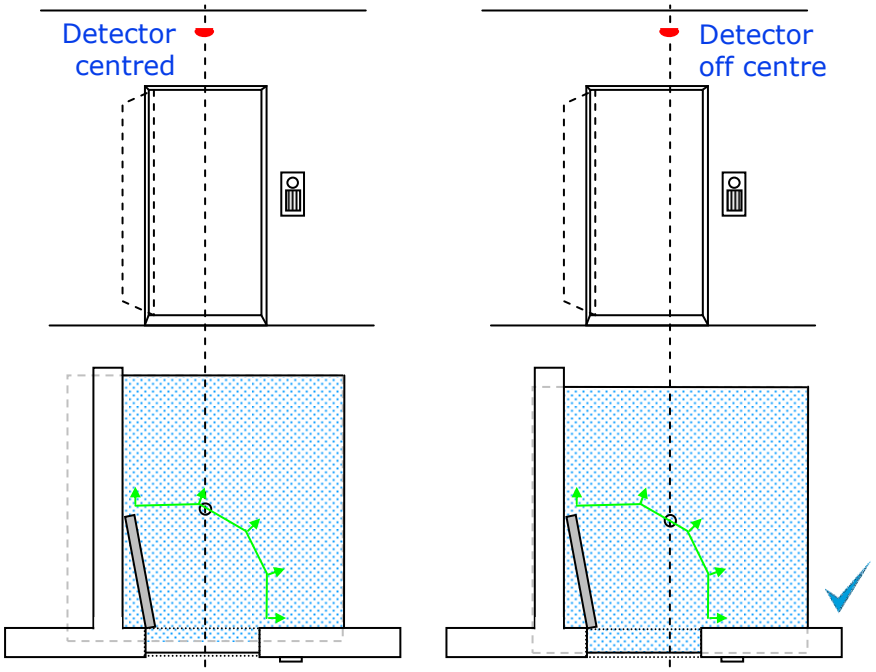

Figure 2.6.4

> Positioning the detector in this way in order to increase the amount of available field of view, works for both inward and outward opening doors.

When utilised at outward opening doors, this idea is mutually exclusive to the idea of enhancing target initialisation as discussed in section 2.6.1. Mounting in this way could reduce the target initialisation, see Figure 2.6.5, below. Enhancing target initialisation should always take priority over increasing size of available field of view.

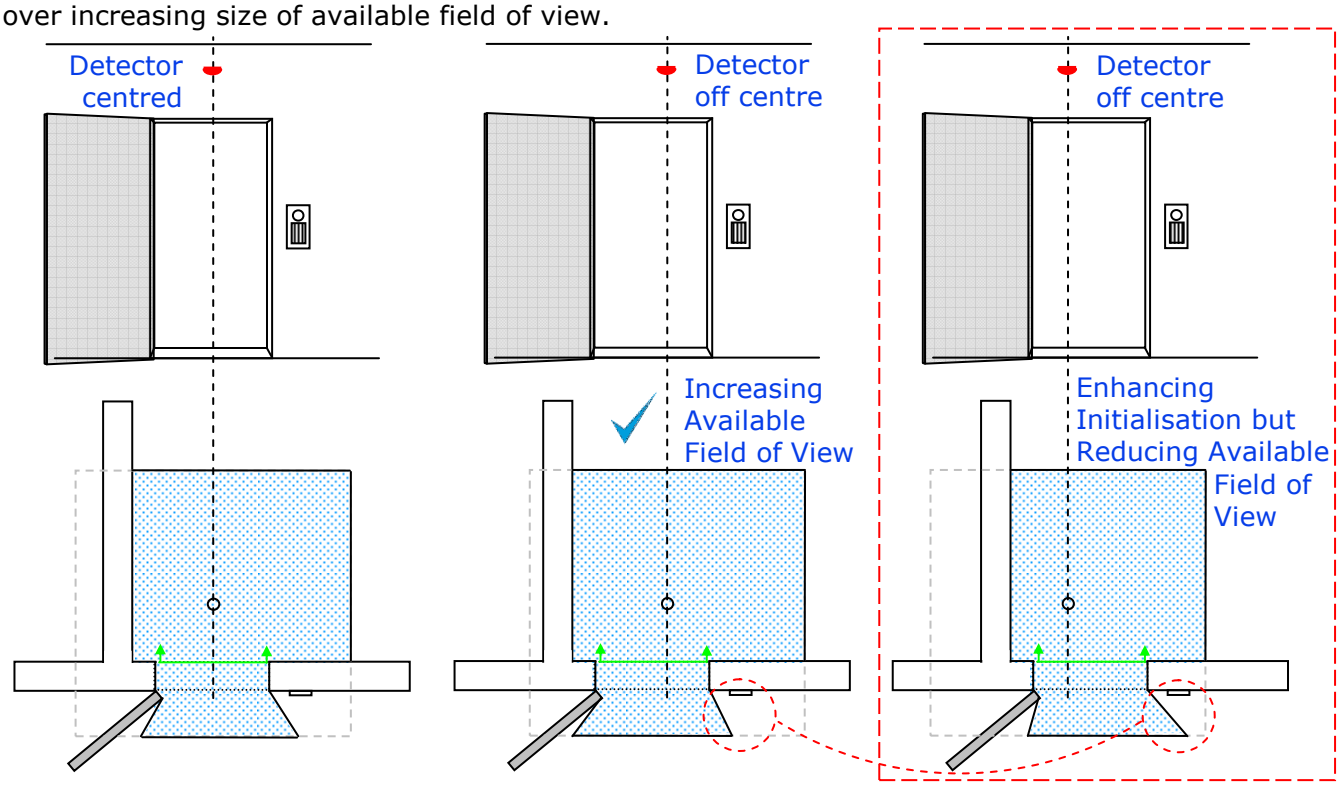

Figure 2.6.5

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2.6.4 Centre Offset on Double Doors

When monitoring at a double door, sometimes a low ceiling height will prevent the full width of the door from being completely monitored. In these cases it may be possible to monitor only half of the double door, and keep the other half closed and only to be used in specific circumstances that fall into the 'Manual Override' category, such as moving furniture or stock etc. when the full width of the doorway is required.

For outward opening doors, there could be 'gaps' at either side of the field of view where a person won't be tracked, this would mean that people could enter without being detected at all:

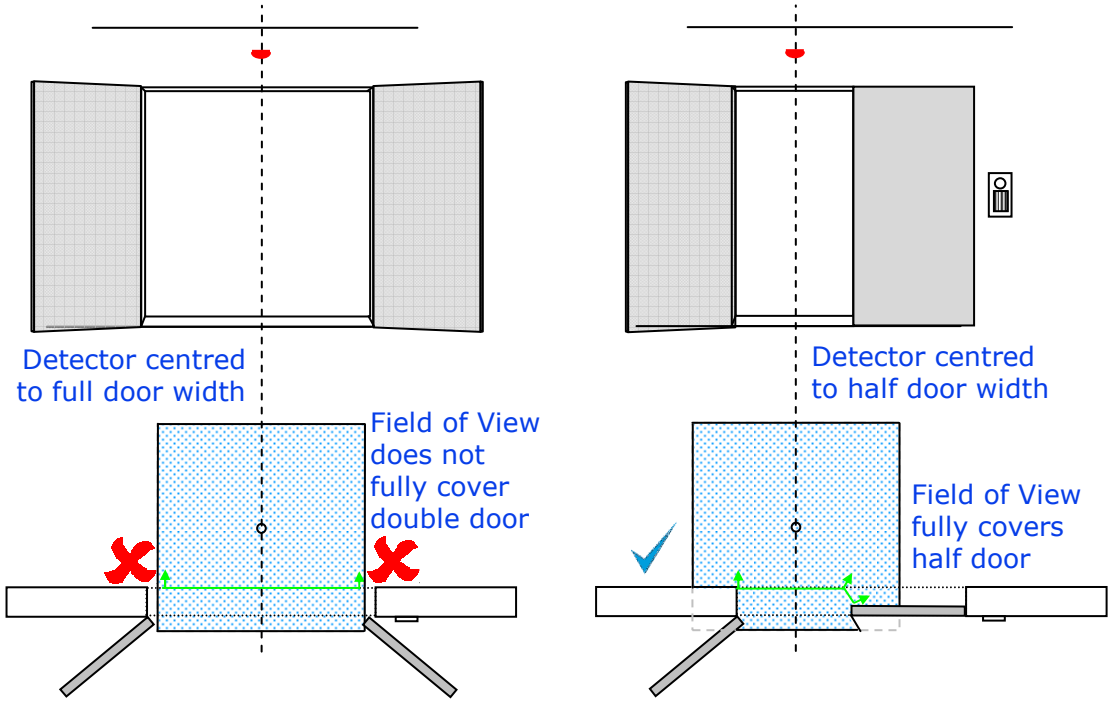

Figure 2.6.6

For inward opening doors, the lines will need to be positioned outside of the swing of the door, and this could leave gaps in the field of view where a person is tracked but not counted. Again this would mean that people could enter without being detected:

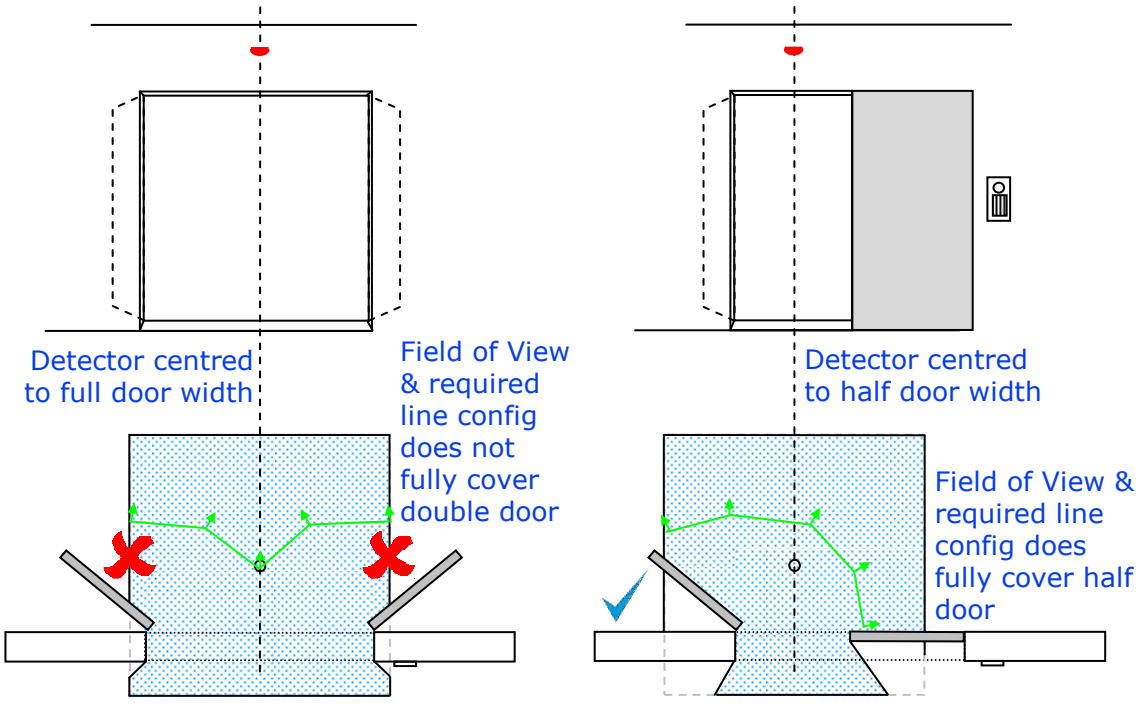

Figure 2.6.7

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2.7 Detector Installation – Tailgate Mode Specific

Correct performance of the detector in tailgate mode requires that all individuals moving into the secure area can be counted and that people stopping near the doorway are avoided.

Therefore, firstly, ensure that the information contained in sections 2.1 and 2.2 is fully understood. Then position the detector as per sections 2.3 to 2.6, dependant on door type, and required line positions.

Remember that for doorways which are to be monitored for tailgating events in both directions will require a separate detector unit on each side of the door, installed appropriately for the type of door, and if a swing door, appropriately for which direction the door swings. For example:

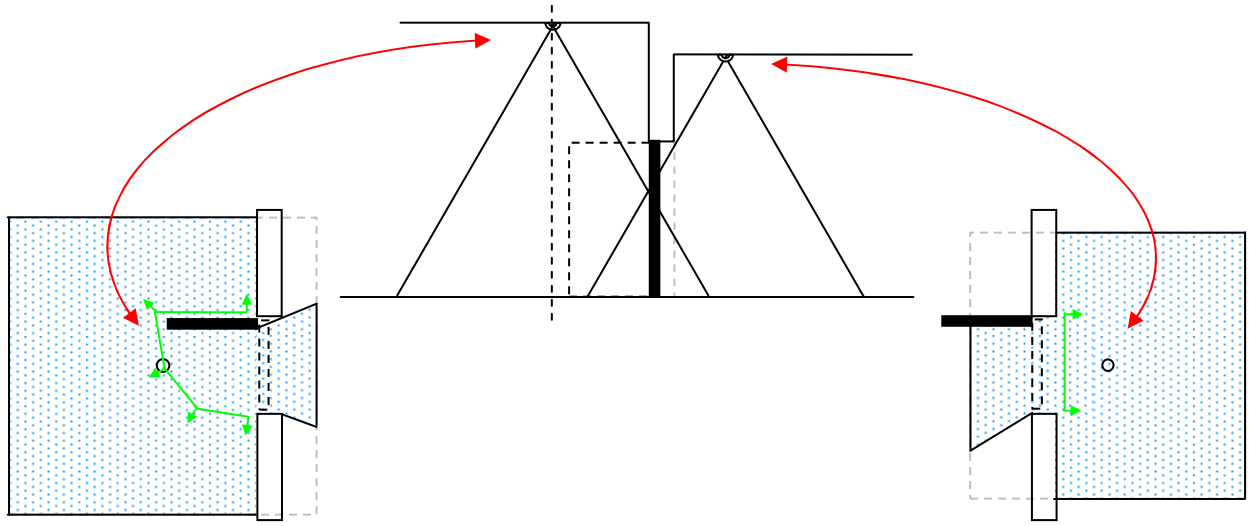

Figure 2.7.1

2.8 Detector Installation – Airlock Mode Specific

Correct performance of the detector in airlock mode requires that all individuals moving into the secure area can be counted and that people stopping near the doorway are avoided.

Therefore, firstly, ensure that the information contained in sections 2.1 and 2.2 is fully understood. Then position the detector as per sections 2.3 to 2.6, dependant on door type, and required line positions.

Remember that for airlock situations where both doorways are to be monitored this will require a separate detector unit at each door, installed appropriately for the type of door, and if a swing door, appropriately for which direction the door swings. Don't worry if each detector's field of view overlaps with the others – the detectors don't emit anything so it will work fine. Just set each one up separately:

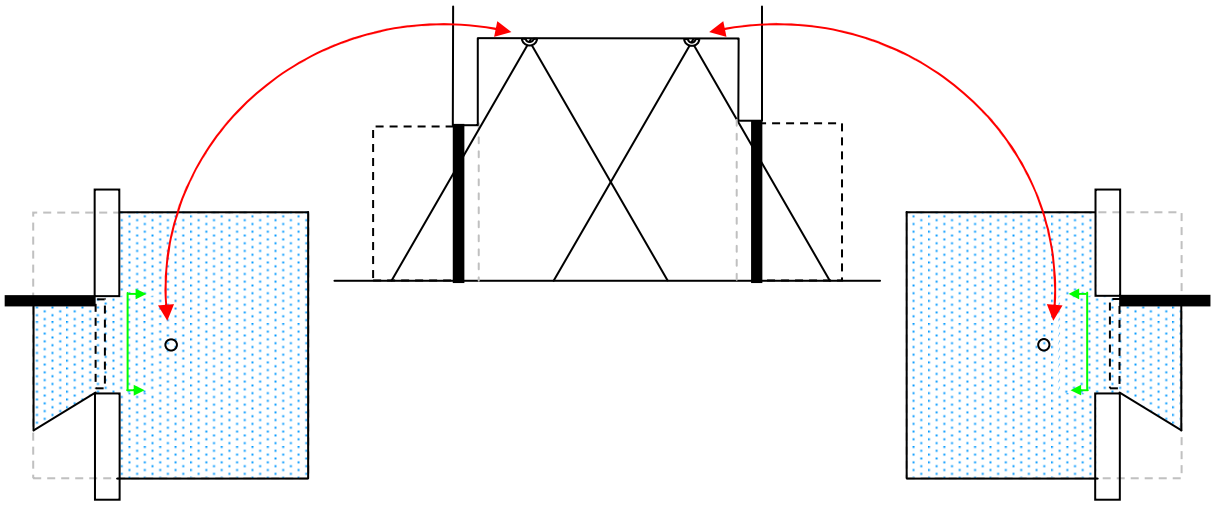

Figure 2.8.1

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2.9 Detector Installation – One Way Mode Specific

Correct performance of the detector in one way mode requires that all individuals moving in the correct (allowed) direction are not counted, but those that go the wrong way should generate a count increment so that an alarm can be triggered.

The detector's one way mode is ideal for detecting movement going in through the exit from an entertainment event, or detecting people going on to an aeroplane that has just landed, for example, and in these cases can be placed in the middle of the corridor, footbridge or gangway. In most scenarios the detector will be installed in an unrestrained area over free flowing people traffic, in this way.

If one way detection through a door is required, this is possible, but it is recommended that the detector is mounted on the approach to the door, in a free flowing area, whenever possible, rather than directly at the door.

The information regarding target initialisation and movement through the field of view contained in sections 2.1 and 2.2 should be fully understood before attempting to install. If one way detection through a door is required then the detector positioning information in sections 2.3 to 2.6, dependant on door type, and required line positions, should also be fully understood, otherwise install in the middle of the corridor as below:

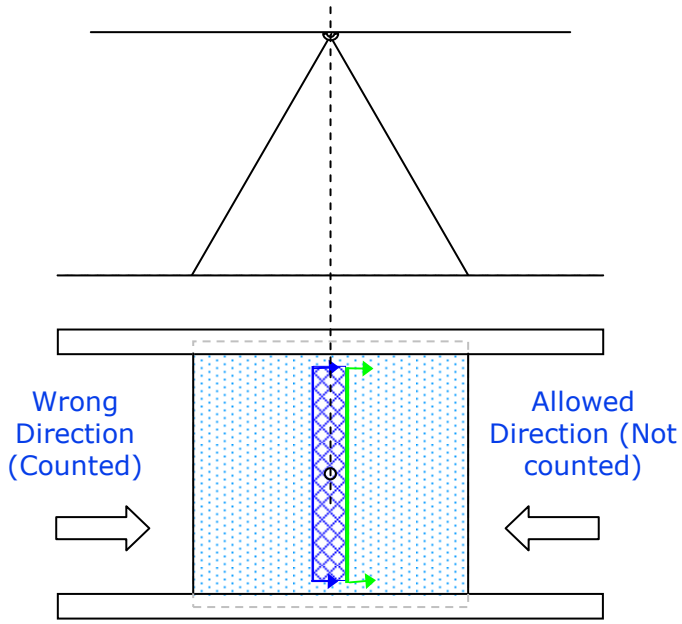

Figure 2.9.1

Ensure that the full width of the corridor is covered by the detector. Because the detector is simply detecting anyone that goes the wrong way, additional units mounted side by side can be utilised if required. Always ensure that there is sufficient overlap of views and lines so as not to leave a 'gap' that people could walk through:

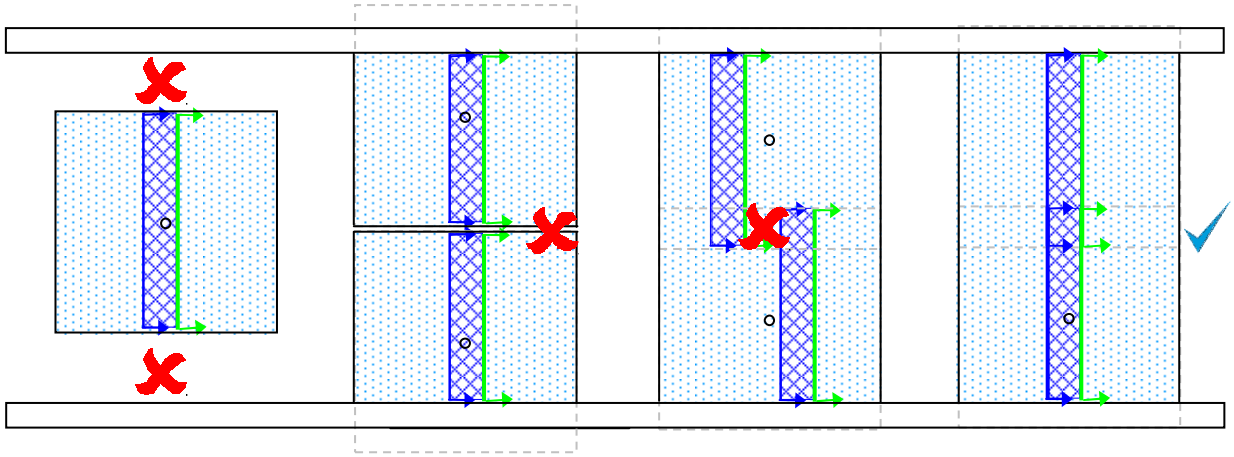

Figure 2.9.2

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3 Installing the Detector

This section describes the installation of the IRS 2100-60.

3.1 Housing

The tailgate detector consists of a two part design consisting of a base that is fixed to the ceiling first and includes the wiring connections to the access control system. A 'head' then connects on to the base and locks in place. Therefore, to install the detector the head must be removed from the base. To do this, twist the head's outer locking ring a few degrees anticlockwise and then pull apart from the base. You may need to grip underneath the base in order to create enough leverage to separate the connection pins from the base plate. When in situ on the ceiling the head can be removed much easier.

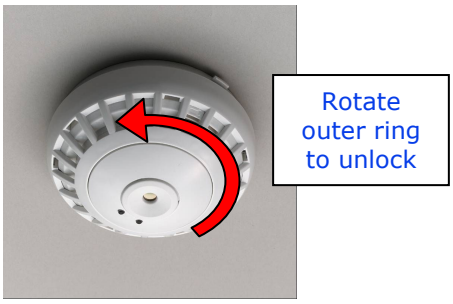

Figure 3.1.1

3.2 Mounting

Three mounting methods are provided: -

- surface mounting or mounting on electrical wall mounting boxes, using the holes in the base plate of the detector that match UK, European, and some US, electrical boxes
- mounting on conduit systems using an optional adapter bar that can be used to mount the detector on UK circular conduit boxes
- mounting on the frames of some suspended ceilings using an optional adapter bar and clip-on stud fixings

Ensure that the traffic flow direction arrow points away from the door or entrance at a 90 degree angle. Note that the traffic direction arrow points in the same way as the LEDs on the head, so the LEDs should be furthest from the door when installed correctly.

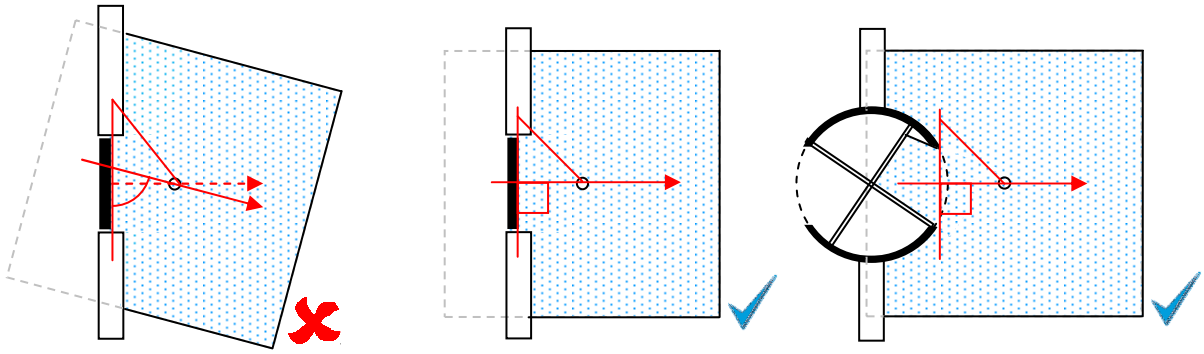

Figure 3.2.1

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Also ensure that the detector is mounted horizontally pointing straight down. Do not angle the detector in order to shift the field of view; instead relocate the detector to the required position so that the field of view is naturally directly below the detector.

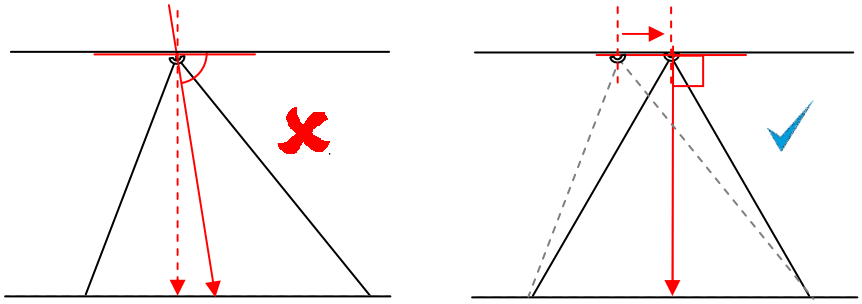

Figure 3.2.2

Never angle the detector for any reason, even if the ceiling, or floor below, is uneven or sloping:

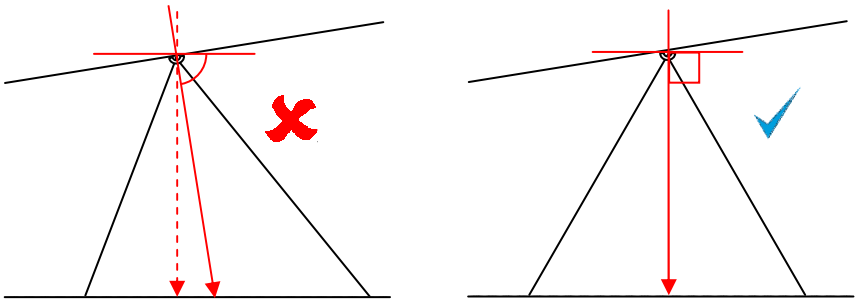

Figure 3.2.3 – Sloping Ceiling

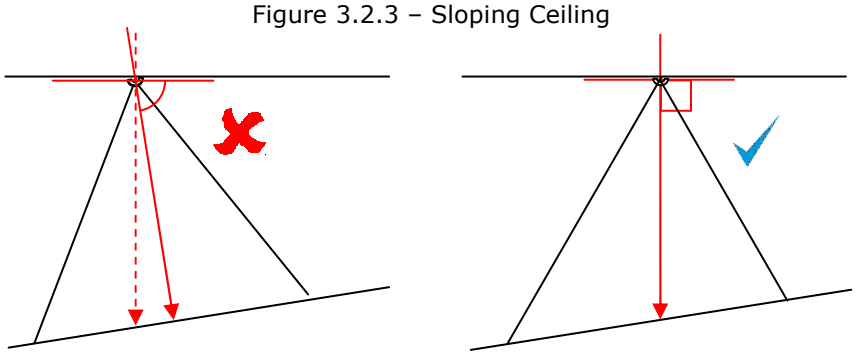

Figure 3.2.4 – Sloping Floor

Install the base on the ceiling in the required position as determined using the information supplied in sections 2.1 to 2.9. Use the main mounting holes (as indicated below) - these allow a small amount of movement so that the detector can be perfectly aligned. Once aligned, the fixings should be tightened and another screw should be inserted into the locking screw position to prevent the base from moving when later installing or removing the 'head'. Ensure that none of the mounting screws can protrude out and touch any part of the detector electronics when installed.

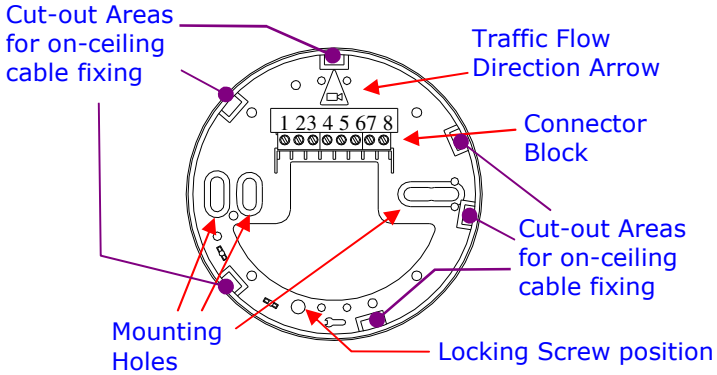

Figure 3.2.5

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4 Field Wiring Connections

Field wiring is terminated at the eight-way screw terminal block in the detector base plate. The terminal connections are shown below.

A number of side cable entry points have been provided for cables up to 6mm diameter, together with a rear cable entry of >1000mm^2. Each cable entry point is equipped with holes for clamping the cables with tie-wraps.

4.1 Power supply

Voltage: 12 to 28 VDC, with a voltage ripple not more than 1V pk-pk, contained within these supply voltage limits.

Typical power supply current: <85mA at 12VDC and <45mA at 24VDC, excluding any additional current required by the input or output circuits.

4.2 Tailgate Mode Connections

When utilising the detector in tailgate mode, a connection from the access control system is required to indicate every valid card authorised by the system. This is an input to terminal 3 on the detector's base plate terminal block.

In tailgate mode, the detector will output an alarm pulse to indicate an entry event without a corresponding valid card input. This is an output from terminal 4 on the detector's base plate terminal block. Alarm output is low and will open relay to indicate a tailgate event.

Terminal	Tailgate Mode
1	Reserved – do not use
2	Tamper output
3	Valid Entry Input 10-28V
4	Tailgate Alarm Output - Relay 1
5	Reserved– do not use
6	Reserved– do not use
7	+VDC
8	0V

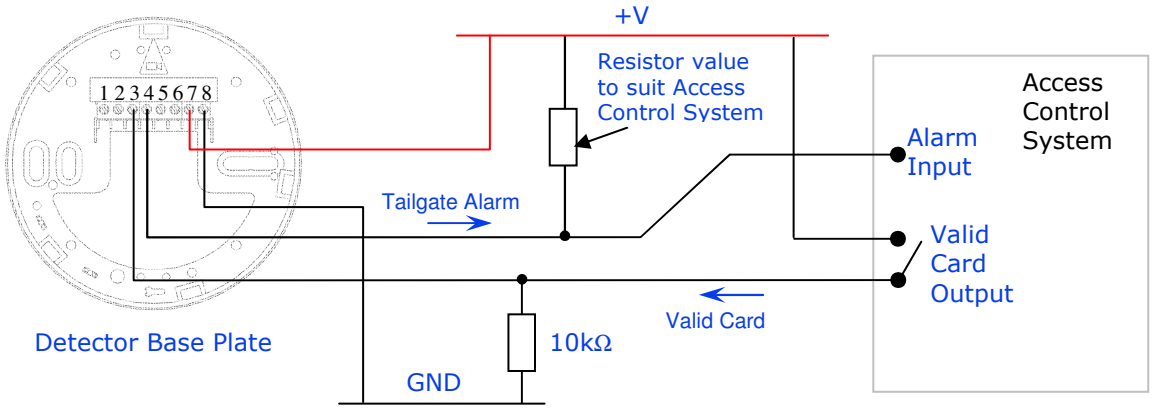

Figure 4.2.1 Connections for Access System capable of accepting a logic alarm input

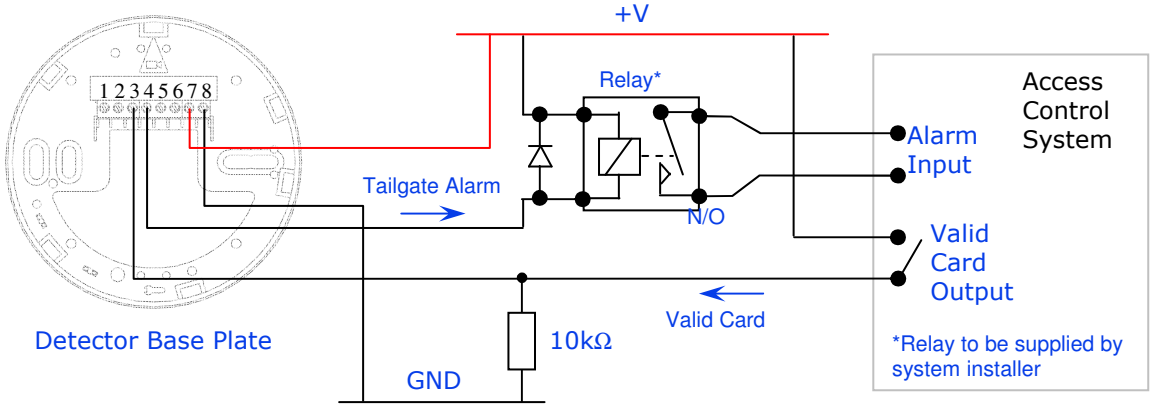

Figure 4.2.2 Connections for Access System not capable of accepting a logic alarm input

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4.3 Airlock Mode Connections

When utilising the detector in airlock mode, two connections from the detector to the access control system are required to indicate every line crossing event. One output will pulse for every crossing of line 1, and the other will pulse for every crossing of line 2. Both are normally closed to 0V.

It is then the responsibility of the access control system to perform the logic calculations in order to determine the correct use of the airlock gate.

Terminal	Airlock Mode
1	Reserved – do not use
2	Tamper output
3	Line 2 Count Output – Relay 2
4	Line 1 Count Output – Relay 1
5	Reserved– do not use
6	Reserved– do not use
7	+VDC
8	0V

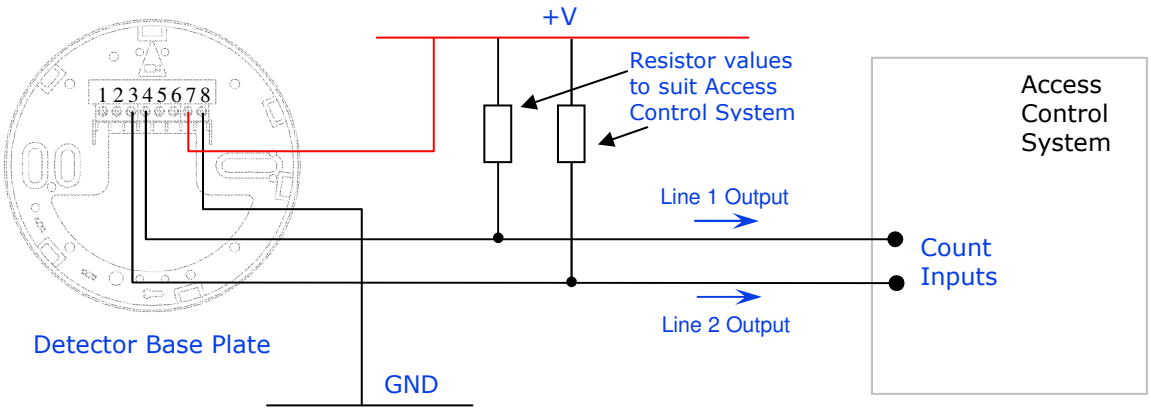

Figure 4.3.1 Connections for Access System capable of accepting a logic alarm input

For systems requiring volt-free inputs, add an external relay on each detector output configured in the same way as the external relay in Figure 4.2.1.

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4.4 One Way Mode Connections

When utilising the detector in one way mode, it simply requires one connection from the detector to the access control system to indicate any 'wrong way' alarm events.

This output will pulse for every crossing of line 1 and line 2 and is normally closed to 0V.

Terminal	One Way Mode
1	Reserved – do not use
2	Tamper output
3	Do Not Use
4	One Way Alarm Output – Relay 1
5	Reserved– do not use
6	Reserved– do not use
7	+VDC
8	0V

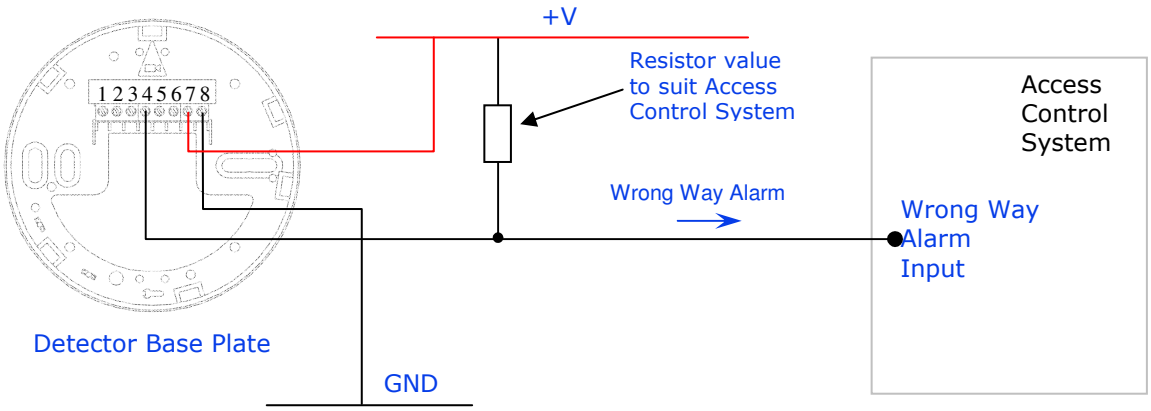

Figure 4.4.1 Connections for Access System capable of accepting a logic alarm input

For systems requiring volt-free inputs, add an external relay on each detector output configured in the same way as the external relay in Figure 4.2.1.

4.5 Tamper Output

A Tamper output can be obtained from terminal 2, of the connector block, when a resistor is fitted between base terminals 2 and 7, as shown in Figure 4.5.1, below.

Terminal 2 is shorted to 0V when the detector head is in place, and is pulled up to the supply voltage by the resistor when the head is removed from the base. The value of the resistor should be selected to meet the requirements of your tamper circuit.

The tamper output operates, and can be used, in any of the three available detector modes.

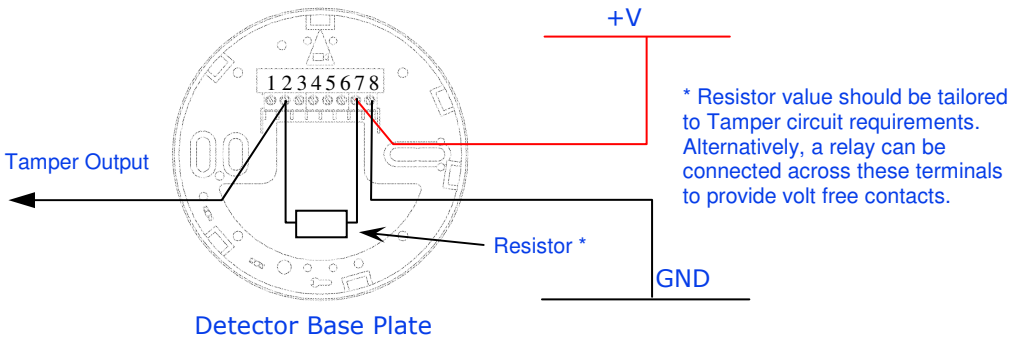

Figure 4.5.1 Tamper Output Connections

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5 Access Control System Requirements

5.1 Valid Entry Input (Tailgate Mode only)

The Valid Entry event input (terminal 3) is only used in Tailgate mode. (In Airlock mode, this pin switches operation and becomes an output for Relay 2). Connect this input to an output on the access control system configured to pulse for each Valid Entry event (e.g. card swipe or biometric input). Note that the pulse should trigger for each valid card, even if multiple cardholders swipe together - it should not trigger if the request to exit is used, i.e. it should be a suitably programmed auxiliary output, not a mirror of the unlock output. Many access control systems can provide this, but some cannot. Others may require additional IO hardware and/or programming in order to output a pulse in this way.

The output must be normally held <1V and switch to >12V for >100ms to indicate a Valid Entry. There must also be a gap of at least 100ms (at <1V) between successive Valid Entry pulses.

This input has an input impedance of >500k ohms and is referenced to the 0V (GND) supply rail. There is no voltage sourced from the output pin – it only sinks current to GND - therefore you must provide an appropriate pull-up resistor to give a 'high' output.

Note: The valid entry input connection, described here, must not be made when the detector is in Airlock mode.

5.2 Output Relays (Tailgate, Airlock or One-Way Mode)

The detector is equipped with two output relays. These are solid state designs, rated at 30VDC, 100mA, with a 120mA current limit, and an "off" impedance of >500K.

Each relay has one contact connected to 0V, and is normally closed, opening for programmable periods of 0.1, 0.25, 0.5, 1, 2, and 5 seconds, to indicate an alarm state or count increment.

In Tailgate Mode, Relay 1 (terminal 4) is used to output Tailgate alarms, (Relay 2, terminal 3 is used as the Validated Entry Event input in this mode).

Both relays operate in Airlock mode, each pulsing to indicate a person crossing its associated line (Relay 1 for Line 1, Relay 2 for Line 2).

In One-Way Mode Relay 1 (terminal 4) is used to output one-way alarms.

The access control system must be capable of accepting these alarm/count outputs and utilising them correctly. For the simple alarm output provided by the detector in Tailgate mode and One way mode, the access control system must merely use this to trigger further events, as is standard operation for these types of control. For example, an alarm condition may trigger an alarm sounder, or a pre-recorded message to be displayed, but it also may be used to alert a CCTV operator, or to page a security guard to attend to the location.

When utilising the detector in airlock mode, the access control system must be capable of performing the simple IN minus OUT calculation in order to determine the number of people in the airlock and to pass that information onto further checks to ensure the airlock rules are being following correctly – i.e. one person rule, two person rule, etc.

When in airlock mode it is advisable to incorporate a manual reset function to the access control systems 'airlock occupancy total'. This will allow any miscounts in the system to be ignored, see section 1.6, 'Manual Override'.

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6 Detector Power Up

6.1 Warm Up Routine

The two LEDs mounted on the housing near the lens will flash different sequences to indicate different events (shown in Figure 6.1.1). When power is applied, the two LEDs will alternate rapidly for ~0.5 second to indicate successful initiation of the start-up sequence. They will then flash once per second, alternately, until the detector has stabilised and is fully operational. This will typically take two minutes.

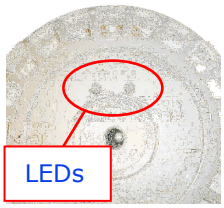

Figure 6.1.1

If you are connected to the detector during this 'warm up' period, using the setup software, you will see an animated egg timer in place of the array view (Figure 6.1.2) - see next section for details of using the setup software.

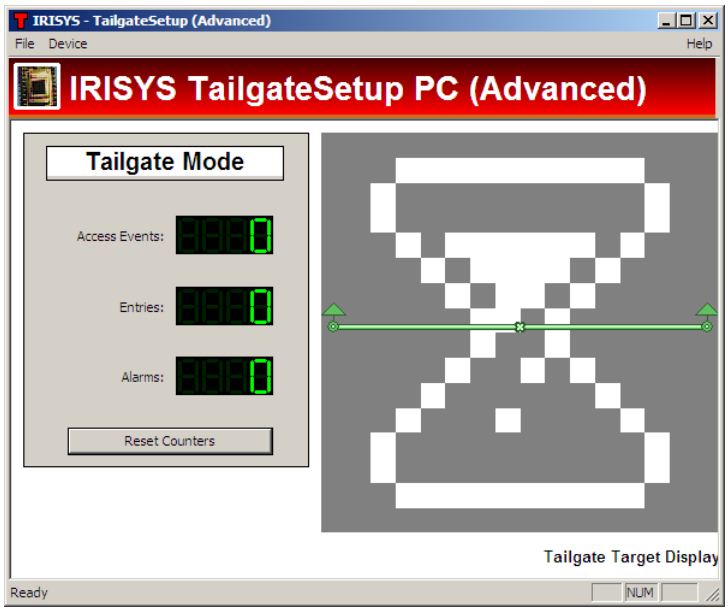

Figure 6.1.2

During the warm up stage the detector will not be functioning. Once the two minute warm up has finished the detector will begin functioning. For this reason it is advisable to connect the detector to a permanent power supply source.

If neither LED illuminates within 10 seconds of switch on, check the power supply. If this is within specification, the detector is faulty and should be returned to your supplier.

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7 Configuring the Detector

Once the detector has been installed, in the required position, and is powered, it must then be configured to interface correctly with the access control system and operate correctly in the installed environment.

This is done using the 'Tailgate Setup' software.

7.1 Software Compatibility and Requirements

The 'Tailgate Setup' software was first written for Windows XP but should also work with Windows Vista. Unfortunately, it is not guaranteed to work with Windows Vista, Windows 7 or Windows 8.

On operating systems where it is not guaranteed to work correctly (and generally in installations which are proving troublesome), running the software in Windows XP compatibility mode will greatly improve the chances of it functioning correctly.

In all cases, it is strongly recommended that the Windows Update function - built in to every version of Windows - is utilised before installing, so that the operating system is fully up to date with the latest Microsoft security patches, critical updates and software improvements.

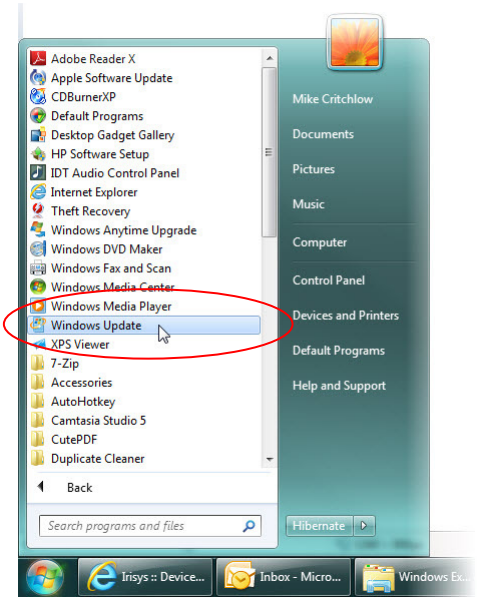

Figure 7.1.1

7.2 Setup Software Installation

The 'Tailgate Setup' software is used to configure the Tailgate Detector, but it must first be installed on the laptop or PC that will be used for the configuration process. The software is available as a free download from Irisys Partner Portal website and you will be given login details in order to access the portal when you purchase your first Irisys product. If you do not have access to the portal then please contact Irisys support.

Once you have performed a 'Windows Update' (see section 7.1, above), simply double click the main executable and follow the on screen installation prompts.

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7.3 Physical Connection

Before running the 'Tailgate Setup' software, you must physically connect the detector to your laptops serial port using the Irisys Set-Up Module, part number IWC2044.

The setup module connects to the small 10 pin rectangle connector on the rear of the detector and allows connection to the laptop via a standard D-Type to D-type serial cable. It provides a temporary connection for configuration purposes and can be removed once configuration is complete. If a permanent connection is required, a smaller version of this setup interface is available for installing in the ceiling void above the detector (part number IWC2023), see document IPU 40065 for installation details.

If you do not have a built in serial 'COM' port on your laptop, the setup module must be used in conjunction with a USB to serial (RS232) adapter.

Various USB to serial adapters are available, but Irisys recommend the FTDI premium range of USB to serial adapter cables. These are available in different lengths of between 10cm to 5m, but more importantly these adapters are known to work correctly with the Irisys range of setup modules, and Irisys now supply these adapters with all new setup module orders.

Some USB to serial adapters are not able to process the high speed serial data with no hand shaking that the setup module outputs, and will needlessly try and buffer the data. This causes unreliable performance.

Whichever USB to serial adapter you decide to use, you must ensure that the latest driver for that adapter is installed correctly. Note that Windows may automatically install a generic driver for the adapter which is not as good as the specific driver for that model adapter, available from the manufacturer.

In order to prevent erratic performance, you must also ensure that the 'buffer latency' setting, in the Advanced Settings for that driver, is set to its lowest value.

See the separate document, 'IPU 40270 Troubleshooting Guide for USB Serial Port Adapters' for more details of working with USB to serial adapters.

7.4 Setup Software

When you first run the 'Tailgate Setup' software, a dialog box will open for you to select the COM port which the detector is connected to. Ensure that the detector is connected to the laptop via the setup module, highlight the correct serial COM port and click the 'Select port' button.

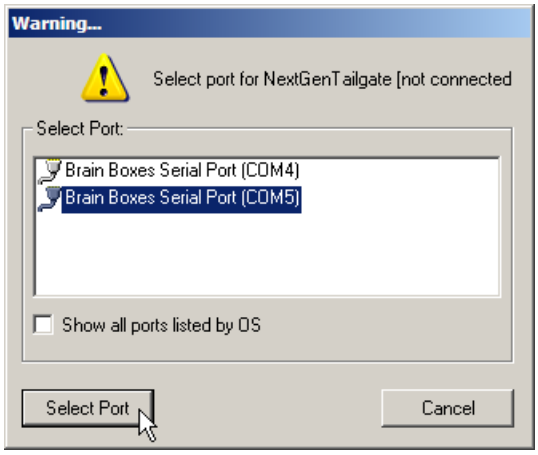

Figure 7.4.1

If your particular COM port is not shown in the 'Select Port' window, click the 'Cancel' button and check for problems. Ensure that any USB to serial adapter drivers have been installed correctly, and try again. See the separate document, 'IPU 40270 Troubleshooting Guide for USB Serial Port Adapters' for more details of working with USB to serial adapters.

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If a connection to the detector can be made, the main application will then open. If a connection error is displayed instead, you should verify that the setup module is connected to the detector and the laptop's serial port, and that you have selected the correct serial port from the list.

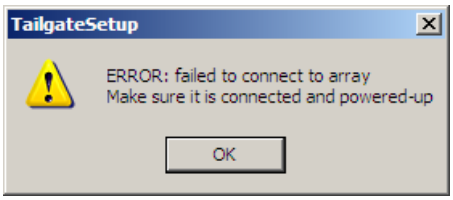

Figure 7.4.2

Again, incorrectly installed USB to serial adapter drivers will prevent a connection from being made, and the software will not open.

As long as the connection to the detector is good, the main application window will open to show the array view from the detector as well as the current operational mode of the detector (Tailgate Mode, Airlock Mode, or One way mode). A new, un-configured, detector will be in Tailgate mode by default.

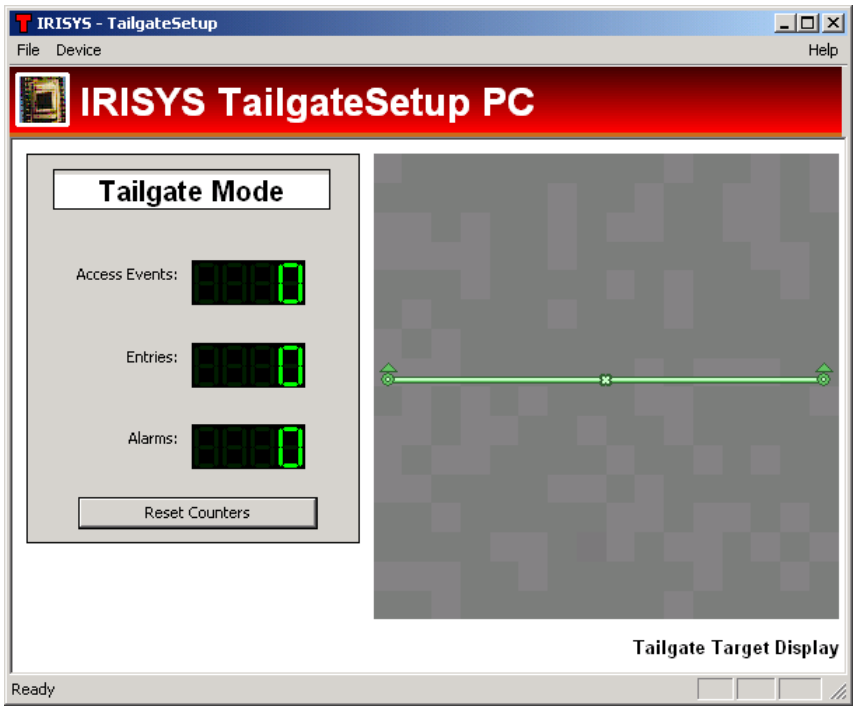

Figure 7.4.3

7.4.1 Detector Warm Up

Remember that the detector is a thermal device and as such it must stabilise, or warm up, to its installed environment. This is done only once, at power up, and takes about two minutes. During warming an 'egg timer' animation will be displayed in the array view. Once the warm up is complete the detector will start working.

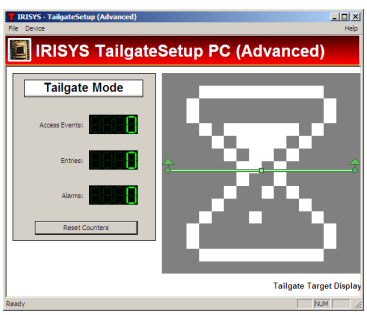

Figure 7.4.4

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7.4.2 Thermal Display

In all modes, the window to the right of the main screen displays the output of the thermal data sensed by the detector. This is shown as an array of grey squares which change to reflect thermal activity.

Once the detector is warmed up, people moving through the field of view of the detector are shown as yellow circles, once they are initialised as valid targets. The arrow attached to the circle indicates the current direction of movement of the person, and the green trail left as the circle moves, shows the path the person has followed.

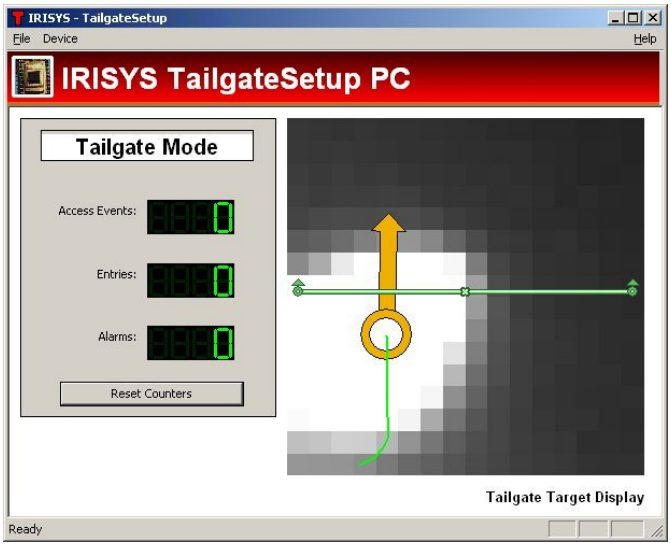

Figure 7.4.5

Remember that the field of view shown in the setup software relates to the LEDs and directional arrow in the base at the top of the screen. Therefore if the detector has been installed as recommended, with the arrow pointing away from the door (and towards you, if you are inside the secure area); anyone walking in through the door will be shown as a target going up the thermal view, and anyone going out through the door will be displayed going down the screen.

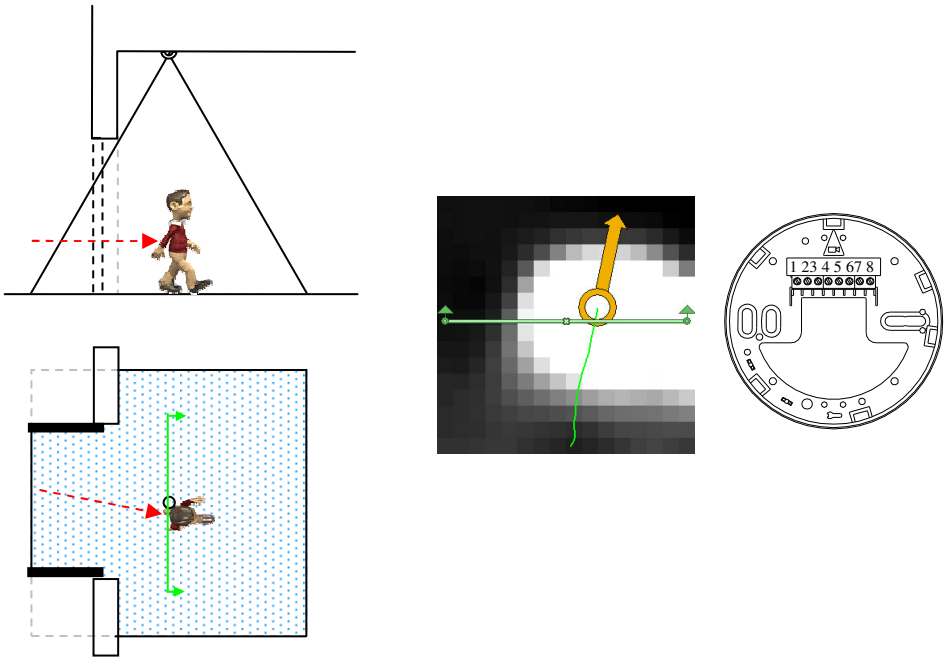

Figure 7.4.6

The count line(s) is/are overlaid on top of the array view and the requisite outputs are given based on the line(s) crossed and the mode that the detector is in. See following sections.

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By default, the count line will be positioned directly across the centre of the detectors field of view. For detectors installed in corridor situations, utilising the one way mode, this will not need much modification, but for all tailgate and airlock mode applications this configuration should not be left unmodified.

The count line(s) need to be configured to ensure that:

- Everyone who should be counted, IS counted
- Everyone who shouldn't be counted IS NOT counted. This includes objects such as doors which should also not be counted

7.4.3 Detector Modes

The detectors three different modes are shown below:

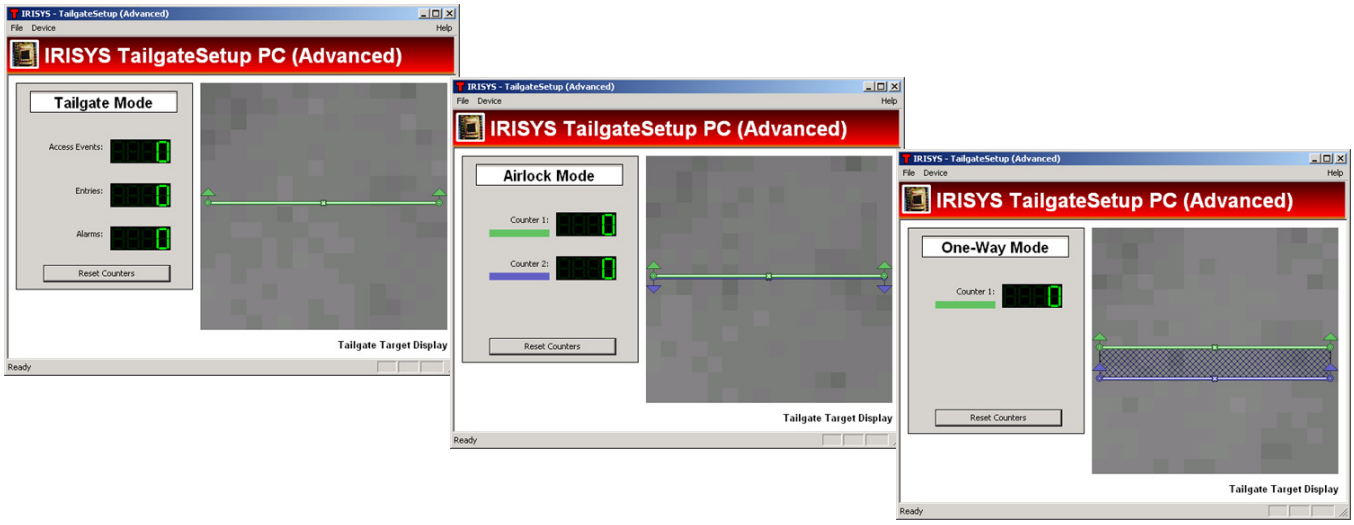

Figure 7.4.7

Note the different line configurations in each mode. Tailgate mode has one (green) line and therefore counts in one direction only. Airlock mode has two lines (green and blue) and can count in two directions but the lines are linked together and cannot be split apart. One way mode has two lines (green and blue) which are apart but still linked, and both count in the same direction. In One way mode the detector only counts (alarms) when both lines are crossed one after the other, in the correct direction.

To change the detector mode see next section.

7.4.4 Detector Settings

The main elements of the detector configuration which must be set correctly relate to:

- The correct operational mode (Tailgate mode, airlock mode or one way mode)
- Ensuring it tracks and initialises targets correctly
- Interfaced correctly to the access control system

To access the detectors settings, select 'Adjust Detector Settings…' from the main 'Device' menu.

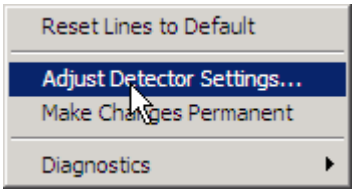

Figure 7.4.8

The Detector Settings window will then open.

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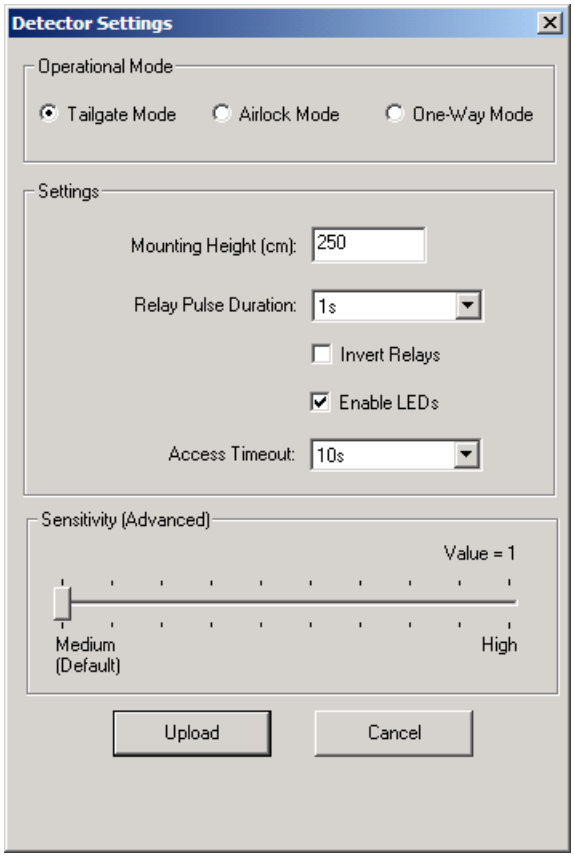

Figure 7.4.9

Here you can select the operational mode, and set some common settings such as the mounting height. The mounting height is always required regardless of the operational mode, and it is measured from the floor to the ceiling. This must be measured as accurately as possible down to the nearest centimetre.

Other settings are discussed in the following sections.

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7.4.5 Tailgate Mode Settings

Tailgate mode is the default mode, and all new detectors will come from the factory configured to work in this mode. In Tailgate mode, you must specify:

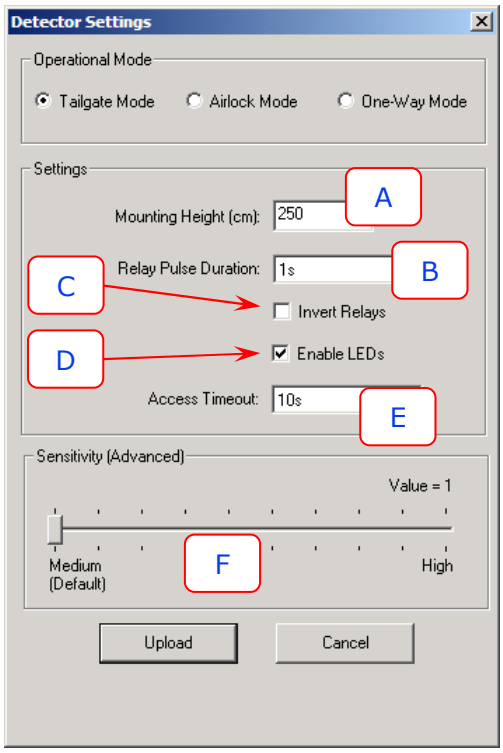

Figure 7.4.10

- The Mounting Height (A)

This is measured from the floor to the ceiling.

- The Relay Pulse Duration (B)

This is the pulse width of the alarm relay output that is triggered when a tailgate event occurs. This should be selected based on what the access control system expects.

- Whether the relays are inverted (C)

The relays will function as normally closed which means that the output will sit 'low' and go 'high' to indicate a tailgate event. If the relay is required to sit 'high' and go 'low' then tick this box to 'Invert Relays'.

- LED functionality - Enable LEDs (D)

By default the LEDs will pulse to indicate certain events, as shown in section 9.4. To disable this functionality simply remove the tick from this check box.

- The Access Time Out (E)

This is the timeout period in which valid cards are eventually ignored. This is to account for the event of a person swiping their card but then deciding not to go through the secure door. The timeout is required so that no one else can take advantage of that event and enter the secure area without a valid card of their own. When configuring the Access Time out setting this will usually be set greater than the door alarm shunt period. Consideration should also be given to allow sufficient time for disabled access.

- Sensitivity (F)

The sensitivity slider is discussed in section 7.4.8.

When all settings are made click the 'Upload' button to save the settings. The main window will then be displayed.

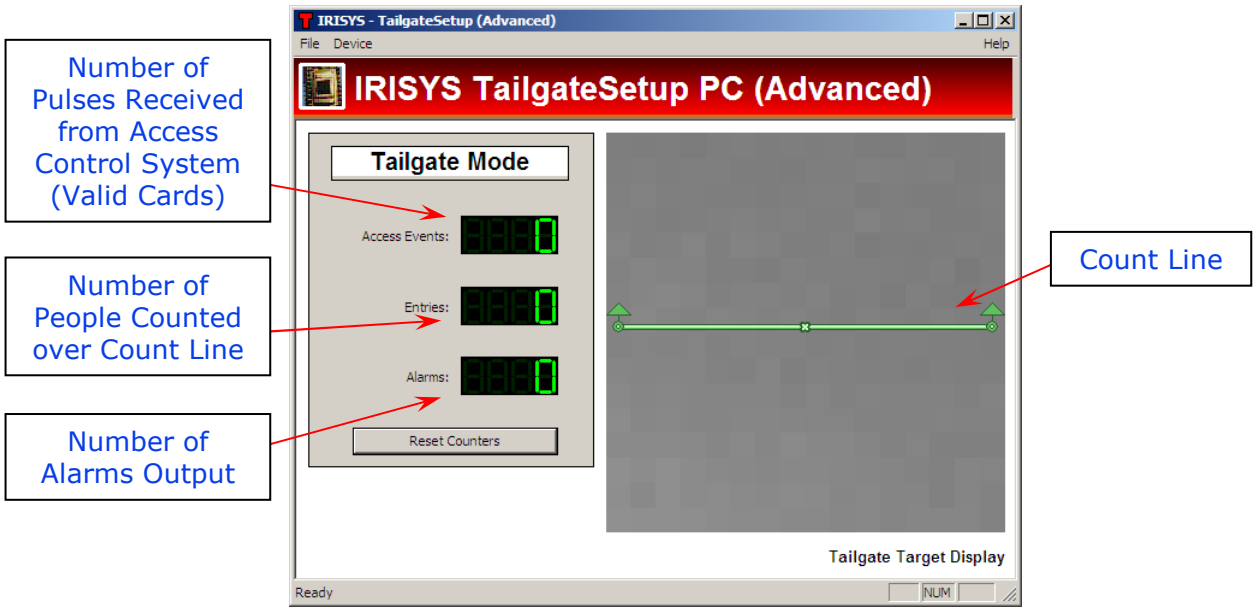

Figure 7.4.11

In Tailgate mode there is a single virtual count line with the direction of motion for correct operation shown by the green arrows at the ends of this line.

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7.4.6 Airlock Mode Settings

In airlock mode, you must specify:

- The Mounting Height (A)

This is measured from the floor to the ceiling.

- The Relay Pulse Duration (B)

This is the pulse width of the relay that indicates a count increment. In airlock mode both relays are used, and both will output at this setting. This should be selected based on what the access control system expects.

- Whether the relays are inverted (C)

The relays will function as normally closed which means that the output will sit 'low' and go 'high' to indicate a tailgate event. If the relay is required to sit 'high' and go 'low' then tick this box to 'Invert Relays'.

- LED functionality - Enable LEDs (D)

By default the LEDs will pulse to indicate certain events, as shown in section 9.4. To disable this functionality simply remove the tick from this check box.

- Sensitivity (E)

The sensitivity slider is discussed in section 7.4.8.

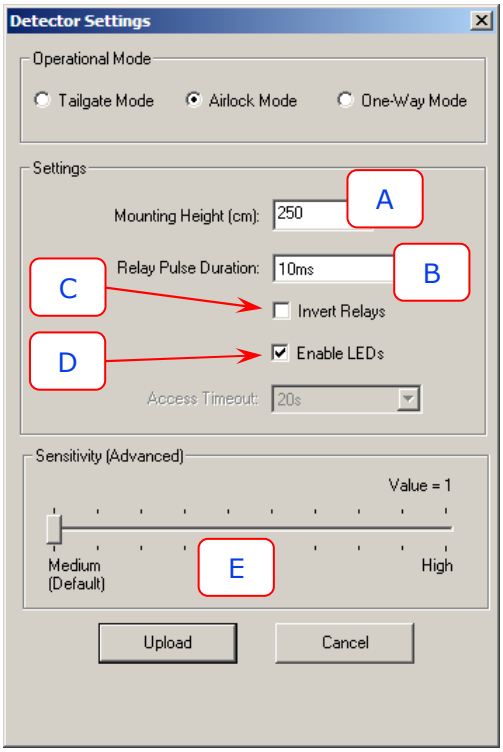

Figure 7.4.12

When all settings are made click the 'Upload' button to save the settings. The main window will then be displayed.

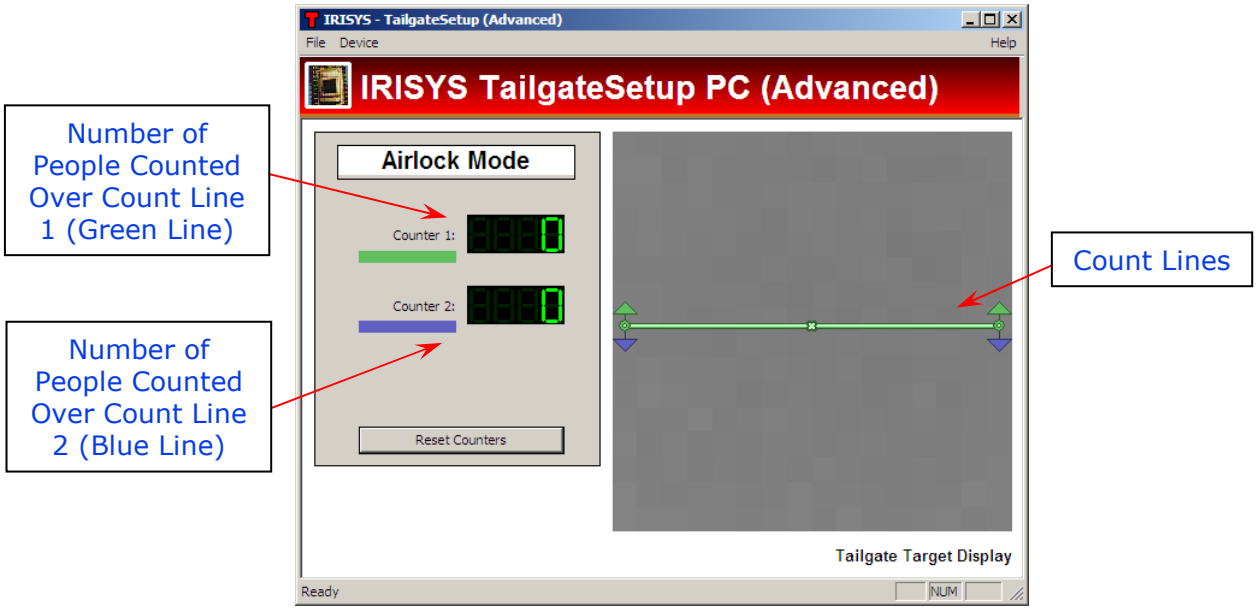

Figure 7.4.13

In Airlock mode, there are two virtual count lines, which are fixed together, and cannot be separated. Each line counts movement across it in one direction only. The direction of motion for correct operation is shown by the green arrows, for line 1, and the blue arrows, for line 2.

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7.4.7 One Way Mode

In one way mode, you must specify:

- The Mounting Height (A)

This is measured from the floor to the ceiling.

- The Relay Pulse Duration (B)

This is the pulse width of the relay that indicates a count increment. In airlock mode both relays are used, and both will output at this setting. This should be selected based on what the access control system expects.

- Whether the relays are inverted (C)

The relays will function as normally closed which means that the output will sit 'low' and go 'high' to indicate a tailgate event. If the relay is required to sit 'high' and go 'low' then tick this box to 'Invert Relays'.

- LED functionality - Enable LEDs (D)

By default the LEDs will pulse to indicate certain events as shown in section 9.4. To disable this functionality simply remove the tick from this check box.

- Sensitivity (E)

The sensitivity slider is discussed in section 7.4.8.

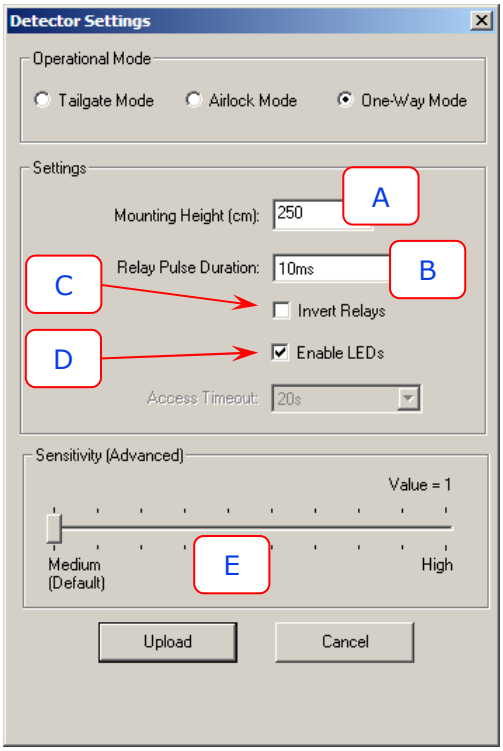

Figure 7.4.14

When all settings are made click the 'Upload' button to save the settings. The main window will then be displayed.

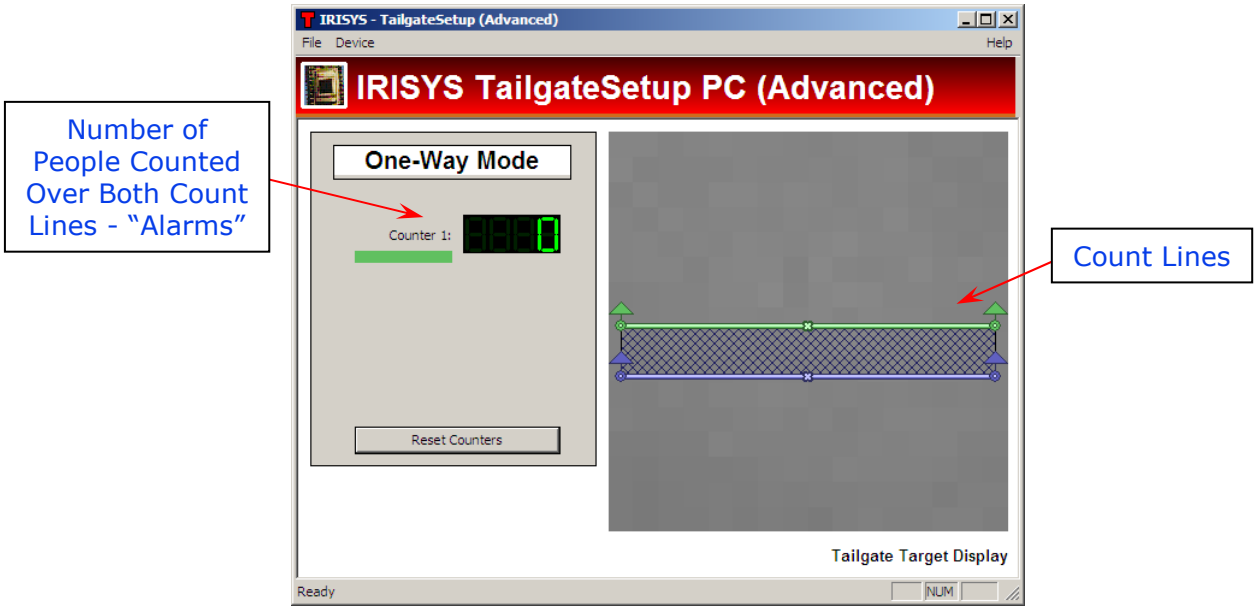

Figure 7.4.15

In One way mode, one broad virtual count line is available, formed by count line 1 and line 2 being joining together. Crossing the full width of this wide count line in the direction shown by the arrows at the ends of the line will create a count output, i.e. a person must cross line 2 and then continue across line 1 to generate an increment. If someone only crosses line 1, or only crosses line 2, then a count increment will not be given. This ensures that any indecisive movement, or momentary change of direction, by people walking through the field of view, will not result in a false alarm condition. The output is only given if the person completely crosses the broad virtual count line. Movement in the other 'allowed' direction is ignored. When used as a "wrong way" detector, this output can therefore be used as an alarm event.

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7.4.8 Sensitivity Slider

The sensitivity slider does not change the sensitivity of the signal strength required to form a target; it changes the sensitivity with respect to the linking of multiple targets.

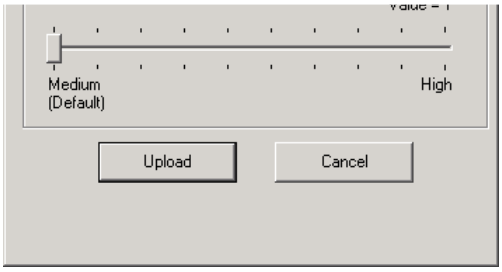

Figure 7.4.16

As people walk through the field of view of the detector, the detector will 'see' a thermal mass in its field of view, and it must determine how many people are likely to make up that mass. It does this by looking at things like the size and the shape of the mass, and it uses this information, in conjunction with the height setting, and sensitivity slider position, to initialise, and track, the targets to correspond with the number of people that it has determined the infrared mass to be.

The detector uses the size and shape of a thermal mass as part of the process to determine how many people it is seeing. It is therefore very important to set the height of the ceiling as accurately as possible when configuring the detector; see section 7.4.4.

When the slider is at its lowest position, the detector is more likely to consider a large thermal mass to be one person (Figure 7.4.17, left image). It will also consider any thermal fragments (smaller thermal masses) to be part of the main thermal mass.

By raising the sensitivity, the detector is more likely to consider a large thermal mass to be two, or even three people (Figure 7.4.17, right image). It is also more likely to treat thermal fragments as individual people.

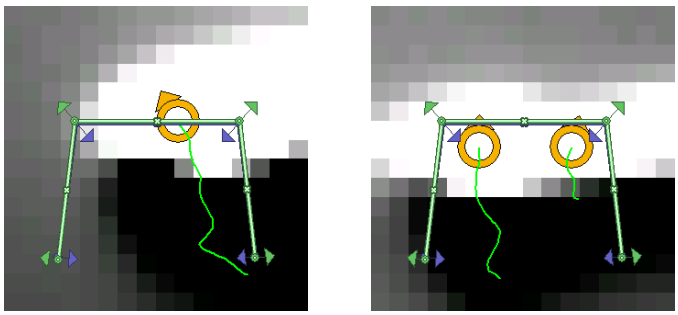

Figure 7.4.17

The default sensitivity slider position will work correctly for the majority of installation environments but the sensitivity may need to be increased slightly in some circumstances.

The sensitivity slider should be kept as low as possible and should only be increased, in small steps, after periods of walk testing has established that it needs to be increased.

Always set the sensitivity slider position as low as possible to start with. It should only be increased (and only then in small steps), after walk testing has revealed that a problem exists when more than one person walks through the detector's field of view. Remember that by increasing the sensitivity slider setting, the detector is more likely to see a person's arms, for example, as being a separate target, which could then generate a false count/alarm. This is likely to happen, when the sensitivity is too high, especially at low mounting heights.

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The detector is intended to prevent opportunist attempts to gain access to secure areas. The detector will probably not detect a determined and co-ordinated attempt by two individuals working together who know how the detector operates and unnaturally group together in order to evade the detector. By increasing the sensitivity to the highest setting this kind of behaviour may still not be detected, but consequently, a single person, who *is* authorised to enter the secure area, may be seen as more than one target which would result in a false alarm event.

Only when two people walking very close are seen as only one target (usually at higher heights), should the sensitivity slider setting be raised. This will then increase the differentiation of two or more people.

7.4.9 Count Line Positioning

As described in section 2.1, sufficient space must be allowed for initialisation time when placing the count lines. This means ensuring that people are being initialised as targets in plenty of time before reaching the count line. In all cases we recommend positioning the count line at least four pixels between the edge of the field of view in order to initialise each person in time:

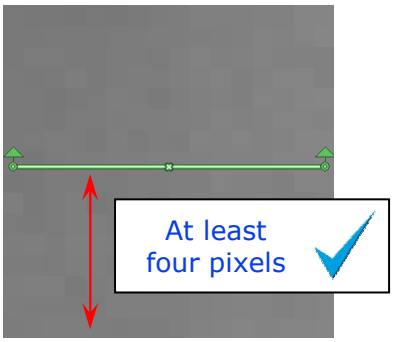

Figure 7.4.18

In given scenarios it may be possible to operate with a smaller distance than 4 squares, but this can only be established by sufficient on site walk testing.

As long as the detector has been positioned as per the placing information in sections 2.4 to 2.9 (dependant on count mode), targets should be initialised very close to the edge of the field of view, and the optimum line positions shown in sections 2.3 and 2.4 can be used without issue. But, in cases where some of the field of view is partially blocked (against installation recommendations), people will be first seen by the detector much further into the field of view. In these cases, the line placement would need to be further into the field of view to allow sufficient initialisation space.

Where cross-walking is likely, a similar space should be left between the entry point into the field of view and the count line (for angled line configurations), especially when configuring a detector in (bidirectional counting) airlock mode.

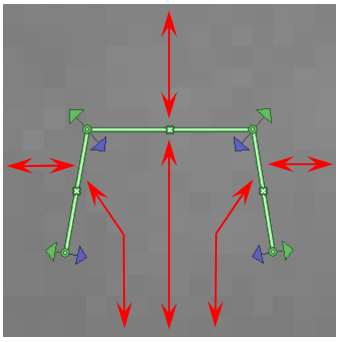

Figure 7.4.19

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Any of the count lines can be changed by dragging and dropping various points on the count line:

- Count lines can be moved up and down the screen
- The ends of lines can be moved to shorten or lengthen the overall line
- Count lines can be angled and formed into a segmented line of up to four segments

The following pages demonstrate these operations.

Moving the whole line.

By placing the mouse cursor over a straight part of the line, it will change to the cross icon shown below in Figure 7.4.20. You can then click and drag the line, and release when it is in its new, required, position:

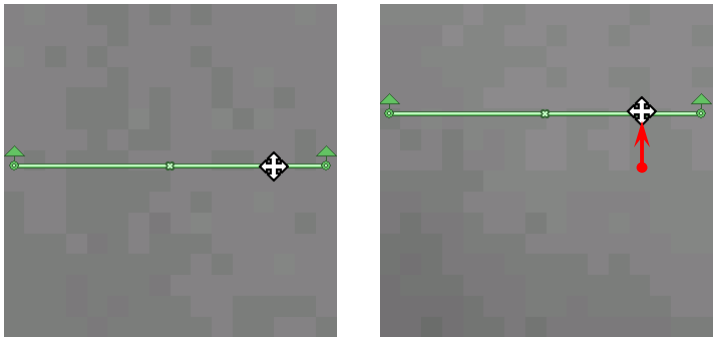

Figure 7.4.20

Using Drag Points to Manipulate the Count Lines.

The round points on the ends of the lines are called drag points, placing the mouse pointer over a drag point changes it to a crosshair, once this happens you can left click on the drag point and move it around. Upon releasing the mouse button, the drag point will be placed in its new position (Figure 7.4.21):

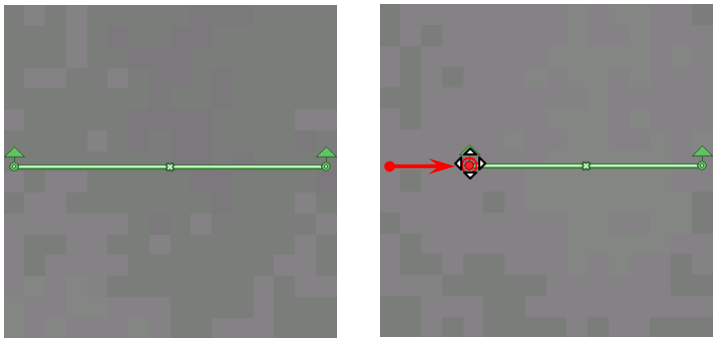

Figure 7.4.21

Creating Extra Drag Points

By moving the mouse pointer over the small 'x' in between two drag points, the mouse pointer will change to a cross. If, at this point, you click and realise the left mouse button, on the cross, it will create another drag point circle, which can be used to create angles and arcs in the line:

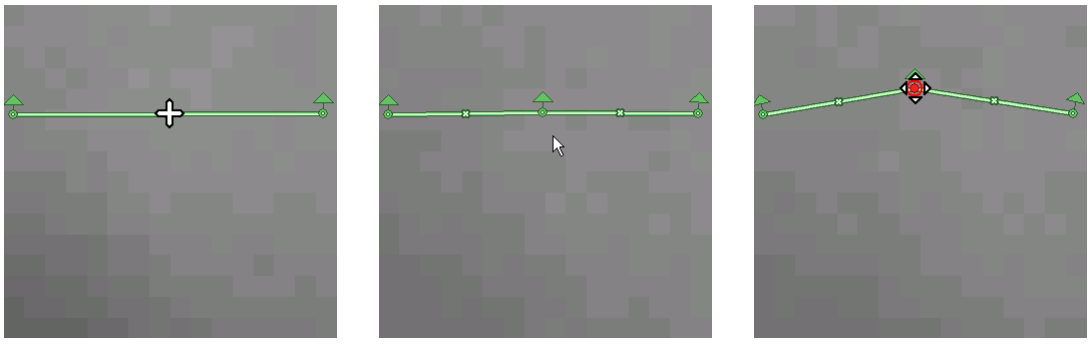

Figure 7.4.22

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Shaping The Count Lines Using Extra Drag Points

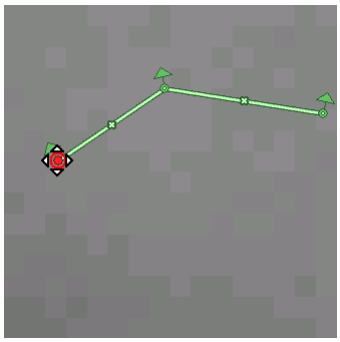

Figure 7.4.23

Any of the 'drag points' can be positioned anywhere within the field of view as required.

You can create three drag points in the middle of the line simply by clicking on the small crosses on each straight line segment. These three drag points, in conjunction with the two drag points on the end of the line, will form a line consisting of four segments. These four segments allow the line to be positioned around the arc of a swinging door, for example, or whatever is required for your particular installation.

Remember that any doors which swing open into the field of view will require the count line to be positioned around, see section 2.3, 'Optimum Line Positions'.

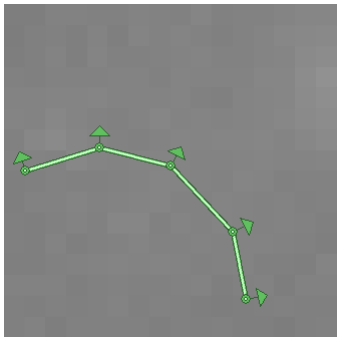

Figure 7.4.24

Deleting A Drag Point

To delete a drag point, you simply click on the point that you want to delete so that it is highlighted in red, and then press the keyboards DEL key:

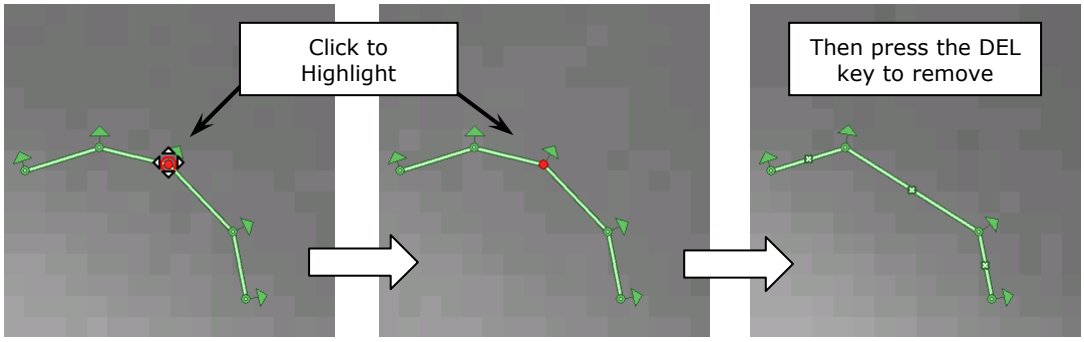

Figure 7.4.25

End drag points can be deleted in the same way:

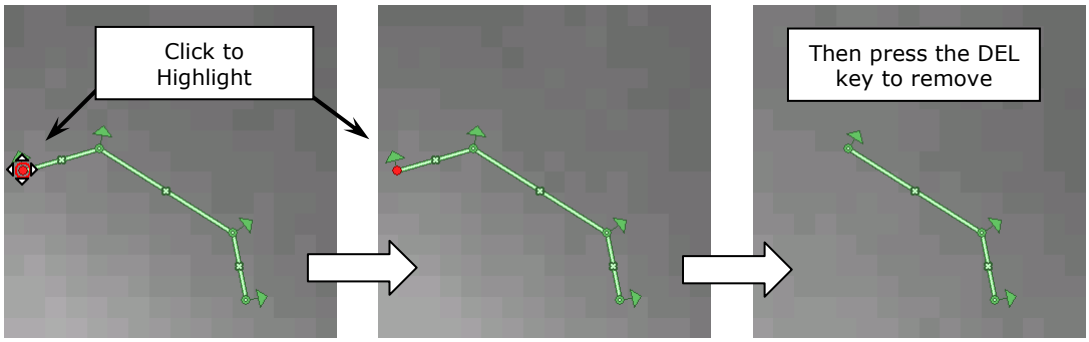

Figure 7.4.26

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The lines can be manipulated in these different ways in all three of the detectors operational modes:

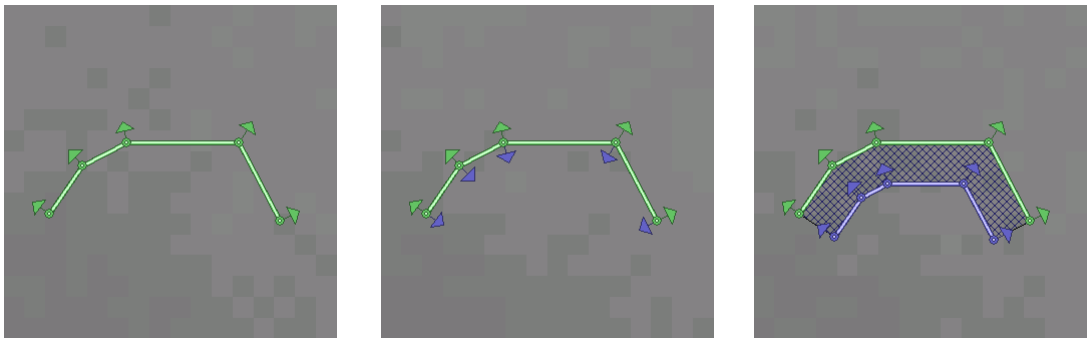

Figure 7.4.27

> Correct positioning of the count line is essential for accurate counting. It is therefore essential that the line positions are walk tested thoroughly to ensure that an acceptable configuration is employed.

Remember that only initialised targets are counted, so by watching the thermal view you will be able to see where targets are initialised, tracked and counted, and by mapping this thermal view to the real world you should be able to see what physical object is causing targets to be generated.

You can then move the count line(s) around so that targets generated by things like doors, and other objects do not cross the count line, but at the same time, anyone entering through the door has to cross the count line.

7.4.10 Resetting the Count Lines

Whilst configuring the count line, it is possible to reset the line in order to start again. Selecting the 'Reset Lines to default' option from the 'Device' menu, will remove any drag points in the middle of the line, leaving only the two end points.

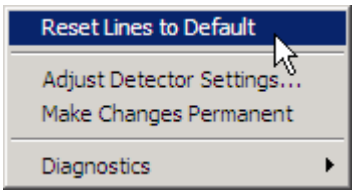

Figure 7.4.28

It will also reset the two end points so that the line is again in the centre of the field of view.

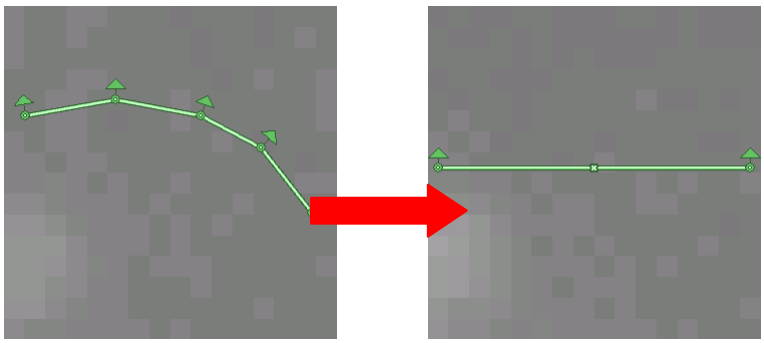

Figure 7.4.29

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7.4.11 Saving the Configuration in the Detector

Once you have set the operational mode, configured the height and interface options, and positioned the count lines correctly (verified by extensive walk testing), you must make the settings you have just made, 'Permanent'.

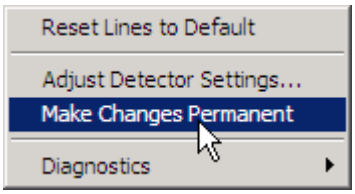

Figure 7.4.30

This means that the settings are saved into the detector's flash memory and will not be lost if you power down or disconnect the detector from its base. It is important to note that if you do not make settings permanent, if the detector loses power it will then revert to its previous settings.

On a successful 'Permanent' a 'Success' message will be displayed:

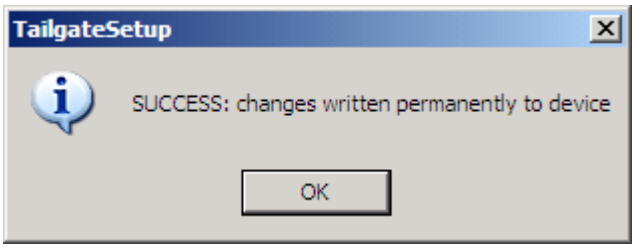

Figure 7.4.31

7.4.12 Saving the Tailgate Configuration to a File

Once you have configured the Tailgate detector and made the settings 'Permanent' as above, it is advisable to save to the settings to a file on your laptop. This file should be kept along with your other details of the installation as a record of what you did on site. This file is required if ever you contact Irisys technical support.

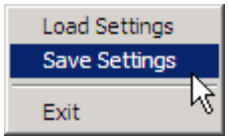

Figure 7.4.32

> The backup file from the detector is always required when contacting Irisys for technical support. Try to get into the habit of saving the file at every installation.

7.4.13 Loading a Configuration File in to a Tailgate Detector

If you have previously saved a detector's settings, as described above, you can later load this file into another unit in order to view the setup again. This also allows you to quickly configure other units which are installed identically to the unit whose settings you have already saved. It is important to note that the units must be identical in order to do this, and in any case, the settings may need modifying slightly if people behave differently at each site, even if the physical installation is the same, but this can speed up the installation time of identical locations.

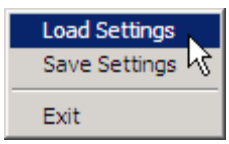

Figure 7.4.33

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7.4.14 Data Capture

The setup software has a built in array recording function intended to allow any problems seen on site to be recorded to a file on your computer. All thermal activity detected by the unit is saved in the file, which can later be played back by Irisys technical support in order to provide any technical support. This option is selected from the 'Diagnostics' sub menu from the 'Device' menu.

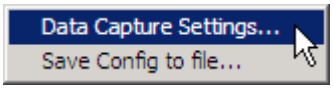

Figure 7.4.34

When selected a separate window will open…

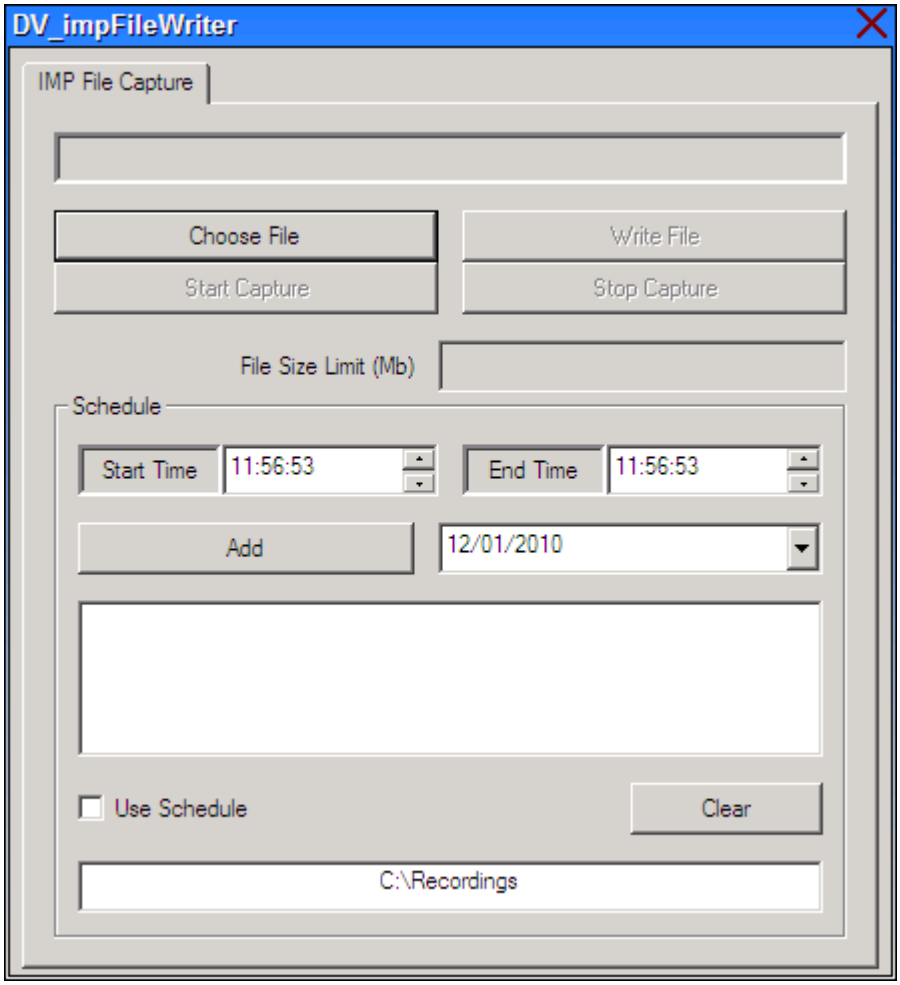

Figure 7.4.35

The imp file writer window is so named because the created file will have an .imp extension. In fact there will be two files created, one with an ".imp" extension and one with an ".imp.tpd" extension. Both files are required in order to play back the thermal recording.

You can use the array recorder functionality in one of two ways. Firstly, you can capture 'live' data, i.e. what is happening 'now', or you can use the scheduling functionality in order to automatically capture data at various times in the future.

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Capture Live Data

To capture live data, you must first click the 'Choose File' button; this will allow you to specify a filename for the recorded data to be saved as.

When you are ready to start the recording click the 'Start Capture' button and recording will commence. Note that you can move the 'impfilewriter' window around in order to view the setup tool's array window underneath, if required. It is this activity from the array that is being saved at this point.

Once you have recorded the sequence that you want, click the 'Stop Capture' button, and then the 'Write File' button to save the file and write the correct sequences to disk:

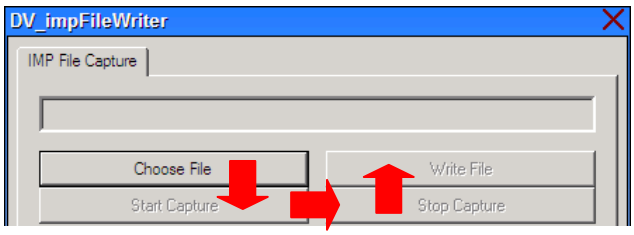

Figure 7.4.36

If you want to record various sequences in to one file you can click the 'Stop Capture' button, and then click 'Start Capture' again to continue. Each separate capture period will be appended to the same file. Once you have all the sequences that you want you must finally 'Stop Capture' and then 'Write File'.

You must remember to click the Stop Capture then Write File button in order to complete a valid capture file. If you forget to click the 'Write File' button, and simply exit the 'impfilewriter', then the file is unusable.

Scheduled Data Capture

To schedule a recording you simply select the correct start and end time and click the 'Add' button to add it to the list. You can have as many scheduled recordings as you want, but you must leave the Tailgate setup software running in order for the recordings to be made.

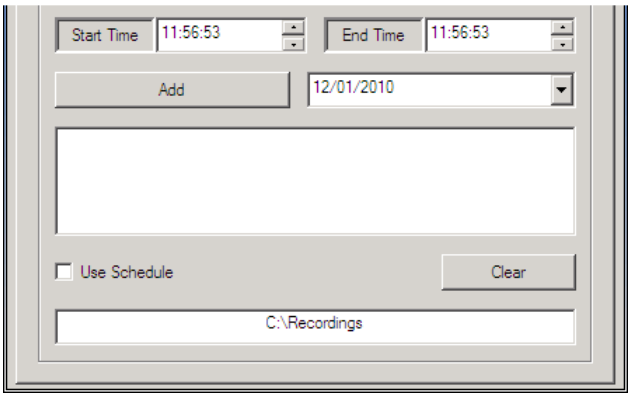

Figure 7.4.37

When you have added the required recording times to the schedule, you must specify a valid (existing) folder to save the recordings in to. Lastly tick the 'Use Schedule' check box to enable the scheduler.

Files will be saved sequentially with the date and time of the recording as part of the filename.

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8 Detector Configuration

8.1 Configuring a New Detector

If you have just installed a detector and are configuring it for the first time then its settings will all start at default values. You should follow the quick guide steps below:

1. Ensure that it has been installed the correct distance from the door as per sections 2.4 and 2.5. If it's not, it will need to be moved!
2. Connect your setup module to the tailgate detector and connect the head to its base.
3. Power up the unit and run the tailgate setup software on your laptop.
4. Go in to the Detector settings dialog box.
5. Set the correct operational mode and enter the height of the ceiling.
6. Set the relay pulse width as required by your access control system.
7. Place a tick in the invert relays checkbox if they are required to sit 'high' and go 'low' instead of sit 'low' and go 'high' (again, dependant on your access control system).
8. Enable or disable LEDs as required. It is recommended to leave them enabled.
9. If using Tailgate mode also set the access timeout. Set this based on the longest reasonable amount of time between presenting their access card and that person walking through the door and across the count line. If the value is too short then there will be lots of false alarms, if it is too long then someone could take advantage of a card-present which was not utilised by the card holder. Remember to consider disabled person access when setting this value.
10. To start with, ensure that the sensitivity slider is set to its lowest setting. Then click the 'Upload' button.
11. If the unit is set to use Tailgate mode, and is connected to the access control system, ensure the interfacing is working correctly by presenting your card and making sure that the 'Access Events' count shown on the main window of the setup software goes up by one only. If it does not change at all, check the wiring; if it goes up by more than one, ensure the contact is 'de-bounced' and check the pulse output width from the access control system.
12. Now position the count line as per recommendations in section 2.3. Remember that the line needs to be as close as possible to the door but clear of the area where the door will move as it opens and closes. See section 2.5 for specific door types and how the line should be configured for each one. Ensure that the counting direction is correct.
13. Now walk through the field of view and across the line and ensure that the initialisation of your corresponding target is before you cross the line. If not move the line further away from the edge of the field of view.
14. As you cross the line ensure that the 'Entries' count in the setup software main window goes up by one and that you get a corresponding output which the access control system registers. In airlock mode do this for both directions. If the access control system receives no pulse at all, firstly ensure that your target was initialised and counted correctly, but then check the wiring to the access control system, and the relay pulse duration setting, as it may need to be increased. If the access control system receives more pulses than targets counted, again check the relay pulse duration as it could be too small or too fast – check your access control system's documentation for the exact pulse width required by the access control system.
15. Now perform extensive walk testing and enter and leave through the secure door using slightly different paths - for example, as well as walking straight in, try walking in and turning immediately to the left, and also immediately to the right. Ensure in all cases that you cross the count line and it counts you. Keep making small changes to the line position until you are happy that it is not possible to walk in through the door and not be counted.
16. Now do the same walking with a colleague one behind the other and ensure that the detector correctly picks out two targets before each crosses the count line. If only one target is seen, or the second target is identified after the line, firstly try moving the line further from the edge of the field of view if possible, but do not leave a gap that a person could stand in and not be counted. Instead try increasing the sensitivity by one point and trying

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the walking again. Vary the distance between each other and keep repeating until the performance is good but always remember that the tailgate will not be able to pick out a concerted effort to bypass the system, so do not try unfair tests such as hugging each other as you walk through the field of view, or one giving the other a piggyback, for example. Remember that increasing the sensitivity too much will lead to one person being detected as two in some cases which will produce a false alarm, so always keep the sensitivity as low as possible, and only increase it when required.

17. When you are happy with the performance of the detector, select the 'Make Changes Permanent' option from the 'Device' menu,
18. Now select the 'Save Settings' option from the main 'File' menu and save the settings under a relevant filename for future reference.

8.2 Adjusting an Already Configured Detector

If you have been sent to a site in order to check the performance of an already installed detector, you should locate and fix the reported issue, but also, because you may not know that it has been configured correctly in the first place, you should check the detector position on the ceiling as well as the line placement and all other settings before you leave site. In some cases the reported issue may be because the unit has been installed in the wrong place and therefore relocating and reconfiguring the unit will fix the issue.

See previous section and also fault finding section for more details.

8.3 Guide to Configuring Count Lines

The count line positioning is the key to accurate detection within the tailgate detector. If the count line is positioned in the wrong place in the field of view, false counts and false alarms will be generated, or, more seriously, a person could gain access to a secure area without detection.

By default, the count line will be positioned directly across the centre of the detectors field of view. For detectors installed in corridor situations, utilising the one way mode, this will not need much modification, but for all tailgate and airlock mode applications this configuration should not be left unmodified.

The count line(s) need to be configured to ensure that:

- Everyone who should be counted, IS counted
- Everyone who shouldn't be counted IS NOT counted. This includes objects such as doors which should also not be counted

It is recommended that the first thing you do is discover where the doors are within the field of view and what effect they have on the detector. To do this simply open the door and watch what happens on the detector's array view. You should stay out of the field of view as best you can so that only effects caused by the door are seen. If the door is a motorised automatic type, simply trigger the opening mechanism, but if it is a manual door, stand outside and push/pull it open without entering. Depending on whereabouts within the field of view the door is, you should see a distinct change in the array view, this will be either a white or black object moving through the field of view. Also, don't worry if the effects cause a target to be initialised. This is perfectly normal and is to be expected – remember that anything which is a different temperature to the floor may well generate a target. We will adjust the count lines to ensure targets acquired from the doors are not counted.

Every type of door will (potentially) generate different effects and targets depending on where they are in the field of view and the directions which they move. Doors which swing in to the field of view, towards the detector, for example, could be seen quite extensively in the lower part of the field of view, almost up to the middle, but doors which swing away from the detector may only cause a very small effect at the very bottom edge of the field of view. Automatic sliding doors will also generate effects at the very bottom edge of the field of view, and in these cases it is normal to see targets moving to the side as the doors open and then back to the middle as the doors close.

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As long as the detector has been positioned as per the recommended advice in sections 2.4 to 2.9, any effects or targets generated by the doors themselves should not be near the centre of the field of view, in fact all will be in the bottom half of the field of view. If any targets are seen crossing the centre point of the field of view then this would imply that the detector has been mounted too close to the door, or has been angled towards the door. In these cases the detector should be repositioned as per the instructions in section 2.5. Additionally, by default, the line(s) will point away from the door.

As long as any door-targets do not cross the centre point of the detectors field of view you can now position the lines around the door area so that targets acquired from actual people have to cross it as they enter and leave.

Once this is done the walk testing can begin to ensure that people are being initialised, tracked and counted correctly. The only way to ensure that the detector has its count lines configured correctly is to perform extensive walk testing.

Preferably, walk testing should encompass two distinct types of traffic:

- The installer should perform a number of set test walks through the entrance/area
- Regular members of staff/office workers from the site, should walk through the entrance/area normally

In both cases the installer should be able to view the setup tool software to see where the targets are being initialised and tracked and changes to the detectors line configuration and sensitivity slider settings should be made as appropriate.

The main thing to ensure is that the count line is positioned so that any person, who needs to be counted for the system to work, must cross it. A typical setup is to angle the lines around the entrance in order to allow sufficient initialisation time and count everyone who goes straight on, and also left or right.

The screen shot below shows a relatively uncommon configuration for the purposes of this example:

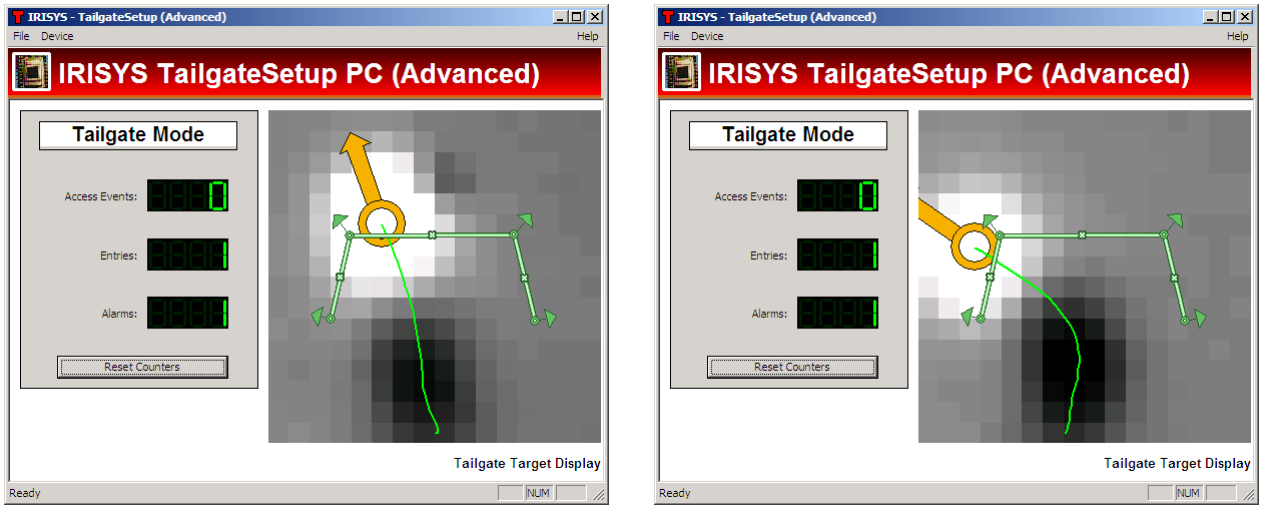

Figure 8.3.1

You can see that two people have entered and have crossed the line correctly, as you would expect. However the line configuration is not correct. If we keep watching we can see a problem.

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In this case someone has walked in and turned left, and has completely missed the count line. This means that this person was not counted at all and the system is ineffective.

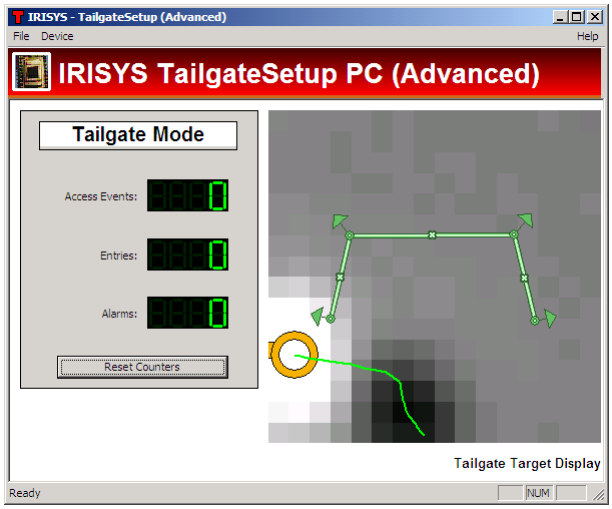

Figure 8.3.2

From this simple example, we can actually work out that the installation is comparable to the below example:

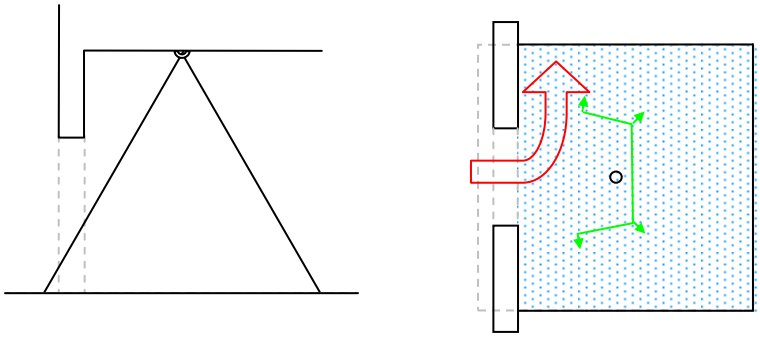

Figure 8.3.3

The red arrow shows the path that the previous person in Figure 8.3.2 took, in through the door and immediately left, missing the line completely. Although we don't know if it is possible to walk in and go right as well, it is most likely unless the detector is mounted in the corner of a room. As an installer on site you would be able to see and understand the installation without having to guess, but even with just a simple screen shot, you can see that we can gather some basic information of what is required. In this case, the line needs to be repositioned so that it is impossible for someone to be able to enter and not cross the count line. The ends of the lines must be moved so that they meet the wall at either side of the door.

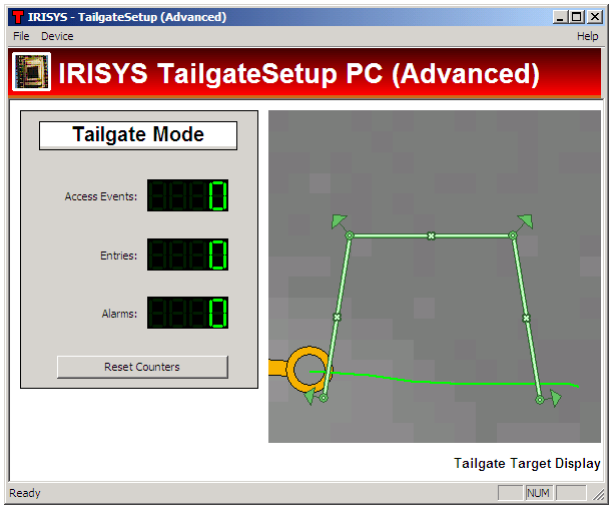

Figure 8.3.4

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By walking past the door you can see that there is no way around the ends of the line in this configuration. This means that everyone who walks into through the door must cross the line and will be counted. Remember also, that any person who starts from the 'secure' side of the line will not generate an unwanted (false) count if they walk through the field of view and past the door.

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9 Fault Finding

The tailgate detector provides a number of different mechanisms which can help you to locate and repair faults, whether they are counting accuracy and false alarm issues, interfacing problems, or hardware failures.

9.1 Counting Accuracy/False Alarms

On some occasions, a detector may be inadvertently installed in a location which is simply not suitable for the technology and this was not realised at the time of installation. Areas which open to the outside, for example, may work fine during milder periods of the year, but not at other times when the difference between the inside and outside temperatures is more extreme. In situations like these, the Tailgate detector will not work correctly and therefore there is nothing that can be done to fix it. The Irisys range of people counter products (IRC3000 series) may be an alternative technology option to consider, in some cases.

Additionally, the detector also requires a certain amount of physical space so that people can be seen walking through the field of view and across the count line(s). If the area beneath the detector is too small (usually in a small airlock) then the detector will not work correctly, and again this should be highlighted at time of installation. See section 1.3.5, "Airlock Mode – Size of Airlock Considerations" for more details.

As long as the environment is satisfactory, then it should be possible to configure the detector to count correctly and accurately for the vast majority of times. Always remember that nothing is 100% accurate for 100% of the time and so on occasion it can be confused and count incorrectly. The detector should not be sold/installed in an application which requires 100% accuracy, or for use with no procedures in place to deal with false alarms or inaccuracies!

Firstly check that the detector is the correct distance from the door based on the door type. See section 2.5 for details of optimum locations at specific doors. If the detector is not in a good location then move it and re-configure.

As long as the detector is optimally placed, check the settings next. Ensure that the ceiling height has been entered correctly (to the nearest centimetre) and that the unit is in the right operating mode for the environment. In all cases, the setup software is your friend as it shows you exactly what the detector is doing at any times. It is up to you to interpret the targets being seen so that you know who and what they relate to. Always watch the thermal view and the actual location at the same time, as best you can. As people walk through the field of view, compare where they are in relation to the door, with where they are shown on the field of view. You should very easily be able to work out which target relates to the person you've just seen walk in through the door and through the detector's field of view, but also watch out for any other targets as the door opens or closes and be sure to keep the lines outside of the area of the field of view where they are seen. If the targets originating from doors can cross the count lines then that will be your problem right there. Therefore always ensure that the lines are in a good location across the field of view and are not too close to the doors. Equally don't position the line(s) too far from the doors either, as this could open up opportunities to an intruder.

If the unit has been reported as over counting, or producing false alarms, ensure that the doors are not being counted, and ensure that the sensitivity slider is not set too high. If the unit has been reported as under counting, check that the lines are in the right place allowing for initialisation of targets, and that the sensitivity slider is set correctly.

The tailgate detector should accurately initialise and track targets corresponding with people walking normally but remember that trolleys or other items are being taken through the detectors field of view could cause extra targets to be initialised and events such as these should be considered outside of the detectors scope of operation and managed via procedures and manual intervention. Additionally, if someone walks through the detector's field of view waving their arms or holding their arms out to the side, so that additional targets are initialised, and they use this as evidence of a faulty detector, explain that this is not normal behaviour and would not occur in general use. It could also be argued that security should be alerted to such strange behaviour!

If target initialisation and tracking seem ok, but false alarms or count inaccuracies in the overall system are still evident then this could point to an interfacing issue, see next section.

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9.2 Interfacing Issues

The tailgate detector needs to be interfaced with the access control system in order to form the full system. Interfacing simply means connecting together the tailgate detector to the access control system and setting relay pulse durations (widths) so that each can send the required relay pulses to the other. In airlock mode and one way mode the detector outputs pulses only, but in tailgate mode the detector both outputs pulses and accepts pulses from the access control system.

In Tailgate mode you should watch the setup software display and check that the 'Access Events' count goes up by one each time a card is presented to the reader. If it does not change at all, check the wiring and make sure you've connected it correctly with an additional relay if required (see section 4.2); if it goes up by more than one, ensure the contact is 'de-bounced' and check the pulse output width from the access control system. Remember that this pulse cannot be derived from the door unlock signal – it needs to be a separate signal which outputs for every valid card presented.

In all modes you will need to make sure that any count or alarm outputs are recognised by the access control system. Again, ensure that the wiring is correct and as required by your access control system, with additional relays if required (see sections 4.2 to 4.4). If the access control system receives no pulse at all, ensure that any targets that should initiate an alarm or count are initialised and counted correctly, then check the relay pulse duration setting, as it may need to be increased. If the access control system receives more pulses than targets counted, again check the relay pulse duration as it could be too small or too fast – check your access control system's documentation for the exact pulse width required by the access control system.

9.3 Hardware Failures

With the tailgate detector there are very few things that can fail and as such most issues are not hardware failure related but usually setup or interfacing related.

If a detector looks dead this could simply be a problem with the power supply. Check the wiring and verify that the voltage is between 12 and 28V DC. If you switch on the power supply, after about 10 seconds you should see the two LEDs on the unit alternately flashing, and this will confirm that power is ok. Note that during this warm up period, the detector will not be functioning so no count or alarm outputs will be given.

The LEDs will also flash to indicate operational events, see section 9.4 for more details.

9.4 LED Indicators

As well as indicating the warm up sequence, the two LEDs will also indicate other events during normal operation, dependant on mode selected, as below.

Tailgate Mode		
LED	Short Flash (250ms)	Long Flash (1s)
1	Target crossing the line	Tailgate Alarm Output
2	Valid Card input received	-

Airlock Mode		
LED	Short Flash (250ms)	Long Flash (1s)
1	-	Target crossing line 1
2	-	Target crossing line 2

One way Mode		
LED	Short Flash (250ms)	Long Flash (1s)
1	-	Target crossing line
2	-	-

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F.A.Q.s

Q. What access control systems will the tailgate detector work with?

A. The tailgate detector will work with most access control systems, with some operational modes being easier to integrate than others. Some controllers may require additional input boards or programming dependant on their age and what they are currently being used for.

Q. What voltage do the tailgate detectors use?

A. The power supply needs to be between 12 and 28V DC.

Q. In Tailgate mode, why does the input signal need to be separate to the door unlock signal?

A. To allow a stream of people to walk through unhindered, they should be able to swipe their card and not have to wait for the door to close and open each time. If you really want to force people to wait in this way then you could use the door unlock signal, but it would not be a popular system!

Q. My access controller requires a volt free contact, what settings should I use to enable this?

A. The tailgate detector does not directly support volt free contacts, so you will need to add additional relay contacts into your overall system. See Figure 4.2.2 in section 4.2.

Q. When I attempt to connect to a tailgate detector in order to configure it, it displays an error "failed to connect to array", what can I do to fix this?

A. Firstly make sure that power is on to the unit and you can see LED activity – check voltage levels if not. The most likely cause of this problem is the use of an inadequate USB to serial adapter. This can sometimes be fixed by updating the USB driver and/or lowering the buffer latency setting for the adapter, but in some cases a different USB adapter must be used, preferably from a different manufacturer. See the separate document IPU40270, 'Troubleshooting Guide for USB Serial Port Adapters'.

Q. I have connect to the tailgate detector but I get intermittent errors and/or an erratic thermal array view, what can I do to fix this?

A. As above, the most likely cause of this problem is the use of an inadequate USB to serial adapter. This can sometimes be fixed by updating the USB driver and/or lowering the buffer latency setting for the adapter, but in some cases a different USB adapter must be used, preferably from a different manufacturer. See the separate document IPU40270, 'Troubleshooting Guide for USB Serial Port Adapters'.

Q. I can see targets generated on the thermal array view when the door opens and/or closes. How can I fix this?

A. This is perfectly normal and should be expected. The door targets should only be seen in one half of the field of view and you should be able to simply move the count line(s) around the area on the thermal view where the door targets are seen so that those particular targets do not cause false counts or alarms. But, if the targets are seen traversing the middle of the field of view, from one half to the other, then this would indicate that the detector is placed in the wrong position, too close to the door, and will need to be moved.

Q. How do I use the tailgate detector to monitor for tailgate events in both directions – there's only one line and one valid access input?

A. For most tailgating applications you would position the tailgate detector on the secure side of the door, i.e. the other side of the door from the card reader. For tailgating in both directions you therefore need two units, one each side of the door.

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Glossary

Access Control System	This is the system in use at a door (stand-alone controllers) or in a building (networkable controllers). An access control system incorporates an access control point (door, turnstile, etc.), a locking mechanism of some kind, and to gain access, instead of a key, a reader of some kind is used. The reader can be a card reader, a code entry keypad, RFiD reader or other biometric device. The access control system evaluates the entered reader information and possibly other information in order to allow or decline access through the control point. A tailgate detector effectively becomes a component in the full access control system.
Active Infrared	Active Infrared devices emit their own infrared signals and then detect the infrared that bounces back. Irisys tailgate detectors do not use active infrared; instead, *passive infrared* is detected.
Adjust Detector Settings	Menu option allows the detectors settings to be accessed and modified.
Array	This is the 16x16 component that is built into each tailgate detector, which detects the temperature change. The output from the array is shown to the user/installer, from within the setup software – see also *thermal array view*.
COM Port	Usually a 9 (or 25) pin D-type connector found on some PCs specifically for communicating with external serial devices. Required to communicate locally with Irisys detectors for configuration purposes. See also *USB to serial adapter*.
Count Line	One or two count lines are provided (dependant on the detectors operational mode). A person is said to have been counted when they cross a count line. This count is then used to indicate an alarm or output a relay pulse for use by the main access control system.
Device Settings	The individual settings for each unit, accessed from the *Adjust Detector Settings* menu option. Things like the operational mode can be set as well as unit height, sensitivity slier and interfacing options can be configured.
Field Of View	What the detector sees through its lens; a square area on the ground. A mounting height graph is available which shows the size of the field of view at a given height.
Firmware	This is the low level software which is involved with very basic operations of the detector. E.g. the processor firmware which handles the target *tracking* and counting.
Flash memory	This is the non-volatile area of the detector's memory that is not lost when the detector is powered down or reset. User configurable settings are stored in flash memory.
FOV	See *Field Of View*.
Fragmentation	Fragmentation is observed as a person's target dividing into other seemingly random targets as that person moves through the field of view. This can occur if the detector is mounted too low, or the sensitivity slider is set too high, for example.
Height	Setup Software setting. Each detector requires this setting in order to track targets correctly and accurately.
Infrared	The region of the electromagnetic spectrum bounded by the long-wavelength extreme of the visible spectrum (approximately 0.7 μm) and the shortest microwaves (approximately 0.1 mm). Irisys people detectors detect infrared in the waveband 7-12μm.
Initialisation	The process involved between a person walking into the *field of view* of a detector and the detector recognising the source of *infrared* radiation as a person and generating a *target* on the *thermal array view* which is linked to that person.
LEDs	Light Emitting Diodes. These are the red lights that flash on the detector under certain conditions.
Load Settings	Setup Software Menu option. Allows previously saved configurations to be loaded into a detector.
Mounting Height	Distance from the ground that the detector is installed. Valid range for standard 60° unit is 2.2m – 3.5m.
Mounting Height Graph	Used for calculating the coverage of a single unit. See document IPU40150.
Passive infrared	Passive *infrared* devices detect the presence of people by detecting the naturally emitted *infrared* radiation. This is the basis of operation of all Irisys detectors.
Permanent All	Setup Software Program option. This fixes the current settings into the *flash memory* of the detector so that they are not lost following a reboot or power cycle.
Relay Output	Type of pulsed output accepted by some access control systems.
Reset Counters	Setup Software option. Used to zero the onscreen count totals and/or access events and alarms.
RS232	Name of standard PC *COM port* serial connection.
Save Settings	Setup Software option. Allows the current set-up to be saved into a file on the PC. All options will be saved. The configuration file can then be loaded at a later date into a replacement tailgate detector or a similarly mounted detector.
Serial	A type of communication protocol. The common standard provided on most PCs is known as *RS232*. *CAN* is also a serial protocol.

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Settling Time	The tailgate detectors detect changes in temperature so must settle into their installed environment upon switch on. Settling time is approximately 2 minutes dependant on ambient temperature.
Setup Module	All detectors require configuration before they work effectively. This is performed via a *serial* setup cable in order to communicate via USB/Serial.
Target	Every person seen by the detector will be interpreted and displayed as a separate target in the *thermal array view*.
Thermal Array View	The view provided by the setup software which allows the installer to view the temperature changes and corresponding targets from the tailgate detector, as well as configure the count line positions and other settings.
Tracking	The following of each target through, and around, the detectors *Field Of View*.
USB	Universal serial bus.
USB to serial adapter	Required when local *serial* communication to the *detector* is required, but there are no *serial* ports on the configuration PC. A *serial* connection is provided via a *USB* port.
Wide Opening Network	This functionality is built in to the Irisys range of people counter products, and not the Tailgate detector unit. It always multiple counters to be connected and mounted together to form a small network, usually to count across a wide doorway. In areas where a single tailgate detector is not sufficient, a wide opening network of Irisys people counters can operate functionality the same as a tailgate detector in airlock mode. See also section 2.9 for details of using tailgate detectors operating in one way mode as a basic wide opening network.

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