



**INSTALLATION PROCEDURE**

**FOR SRA-24**

**PHOTOELECTRIC**

**REFLECTIVE BEAM**

**DETECTOR**

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# 1. Overview

## 1.1. General Description

The Photoelectric reflective beam detector consists of the SRA-24 unit and a reflector, which face each other at a distance of between 25ft and 100ft.

In the event of fire the smoke generated will decrease the amount of near infrared light energy on the SRA-24, this decrease is electronically interpreted to identify the occurrence of fire. An important feature of the detector is that it monitors the protected space linearly. This enables the detector to identify a fire before it spreads, even when the smoke is scattered over a large area.

The fire detection sensitivity is factory set at 20% beam obscuration and it can be changed to 30% with a sensitivity switch.

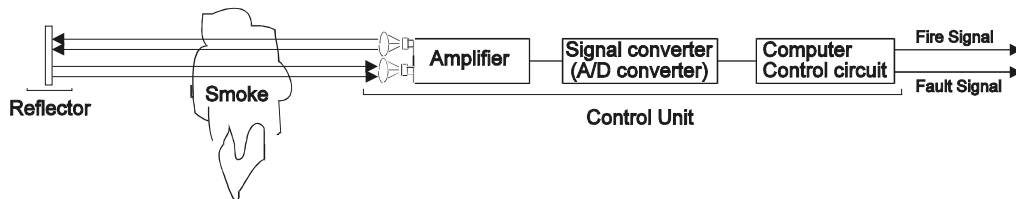
## 1.2. Detection Principle

A near infrared pulsed beam generated by the SRA-24 and is reflected back to the unit, where it is converted into an electrical signal. This signal is then amplified and applied via an A/D converter to a micro-processor. The normal state signal (the initial beam data) once stored in the micro-processor is used as a reference for comparison with subsequent beam signals.

When there is sufficient difference between actual beam strength and stored reference data to indicate the occurrence of a fire, then a fire signal is produced.

The micro-processor also provides compensation for a change in received signal value with time, caused by contamination of the optics or slight alignment changes. The processed signal is adjusted at a rate of  $\pm 1\%$  towards the reference data every hour. When the limit of compensation is reached the micro-processor will automatically produce a fault signal.

Principle of operation



## ***2. Installing The Detector***

### **2.1. Sighting**

Select a suitable position for the installation of both SRA-24 and reflector, such that there are no visible obstructions between them. Remember that the beam detector works on the principle of reduction of light between the SRA-24 and reflector. If there is any possibility of an object remaining within the beam for a few seconds then the sighting of the detector is unsuitable.

**For mounting either the SRA-24 or reflector it is important to establish that the mounting place such as the wall is solid and that the beam detector alignment will be rigid. The wall may appear to be solid, but may be subject to twisting or other changes when the temperature outside the building varies greatly during one day, for instance on cold, frosty days. The installer must ensure that the beam will not be subject to misalignment due to changes in the building itself.**

The spacing and sighting in specific types of locations is covered in section 7.

***The beam detector must not be installed in the following locations:***

- ⊗ Where the ceiling height is greater than 130ft
- ⊗ A roof top or place where open air circulates
- ⊗ Where the distance between top and bottom of the space is less than 18 inches
- ⊗ Where objects such as ceiling beams or girders are within 30 inches of the beam axis
- ⊗ In locations where a large amount of dust, fine powder or water vapor is present
- ⊗ In locations such as kitchens where smoke occurs normally
- ⊗ In locations which are exposed to extremely high temperatures
- ⊗ Where access to the beam detector is impossible for maintenance purposes
- ⊗ Where the rigid fixing of either the SRA-24 or reflector is impossible
- ⊗ Where access to the beam detector to align and set is impossible
- ⊗ Where there is not a clear line of site between the Receiver and Reflector

### **Warning**

**The SRA-24 is not solar blind, therefore the SRA-24 or reflector should not be installed where they can be subjected to direct or reflected sunlight, i.e. via adjacent walls and reflective surfaces. It is recommended that in these locations or where the beam detector may be surrounded by glass, the SPB-24N should be fitted.**

## 2.2. Installation

Please check that the beam detector contains the following components so installation can be carried out:

- 1 SRA-24
- 1 Reflector (**enclosed in packaging**)
- 1 Mask
- 1 Installation manual
- 2 Installation Screws
- 1 SRA-24 mounting plate (termination module PCB on the back)

The termination module is designed to facilitate the installation of the SRA-24 beam detector to fire cables using a standard surface/flush double gang installation box.

## 2.3. Opening The Detector Cover

Removal of the detector can be achieved by unscrewing the outer cover locking screw and pulling the cover forward and then lifting the cover off of the locating slots at the top of the installation plate, the cover is then retained by a anti-drop cable. The fixing plate screws should then be loosened (Figure 4-1 & Figure 4-3) and the beam assembly can then be removed.

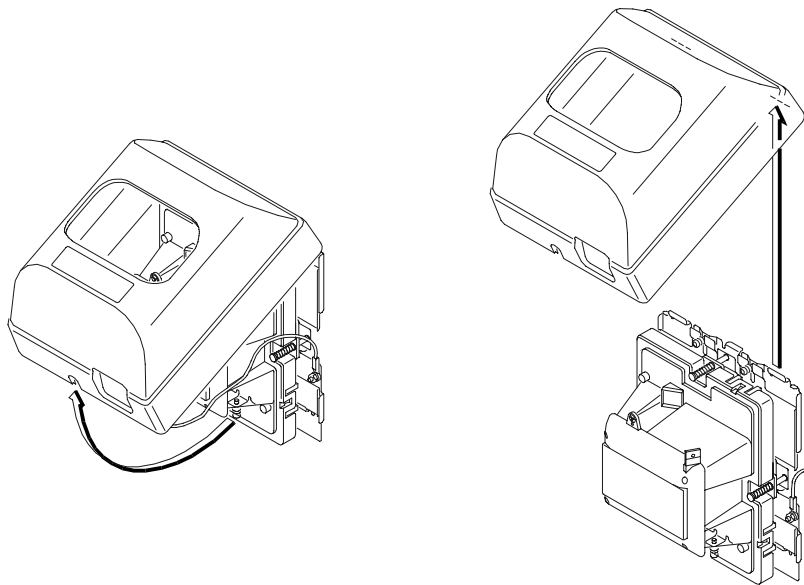


Figure 1 opening the detector housing

## 2.4. Field Wiring

The connection of this unit requires the use of a double gang installation box, either flush mount or surface mount. Many equivalent type are usable providing that it has a minimum depth of 1.2 inches. This item should be firmly fixed to the wall or other suitable mounting point first.

With reference to the wiring diagram Figure 2 & Figure 3 ensure that the field wiring is terminated into the dual gang installation box.

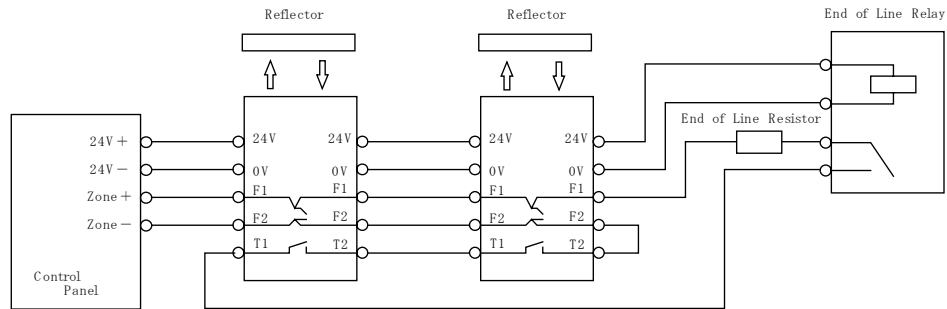


Figure 2 wiring diagram

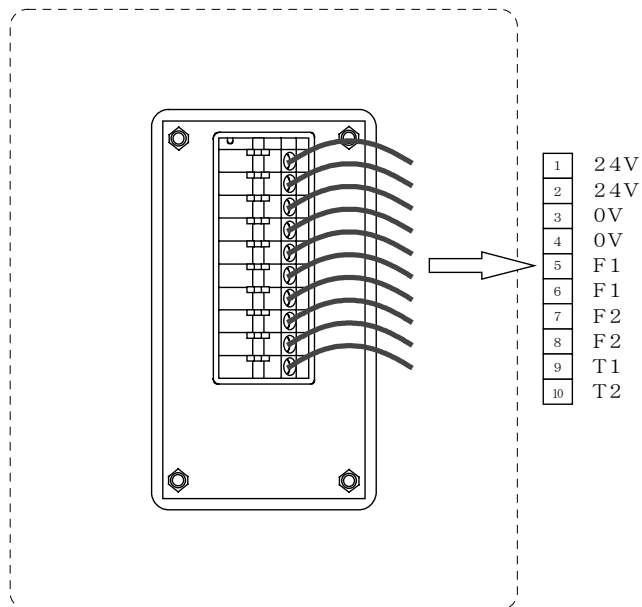


Figure 3 Termination PCB

Install the wires into the 10 position black connector of the Termination PCB (Figure 3).

Install the wires into the PCB then connect the pre-wired ribbon cable assembly to the socket on the back plate (Figure 4-1), the back plate should then be screwed to the back box. Fix the beam assembly to this by fitting the locating slots under the installation screws (Figure 4-2) and pushing the beam up until the locating tabs can be dropped into the back plate (Figure 4-3). The top installation screws should then be tightened, and the cover fitted to the beam detector once the adjustment and calibration procedure has been completed see section 2.6.

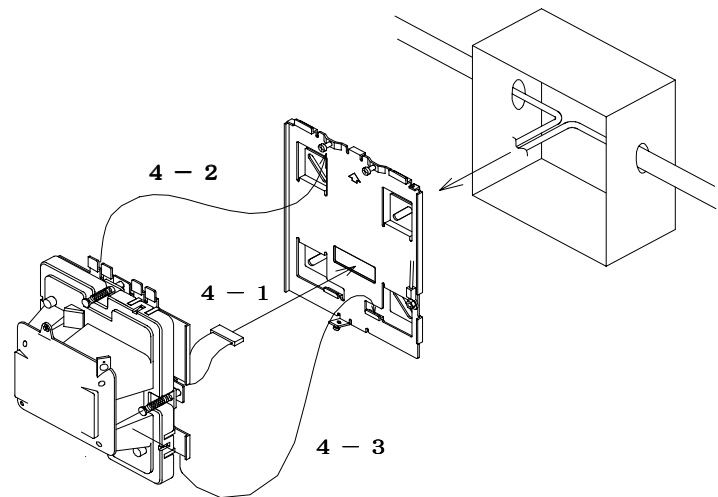


Figure 4 Termination module assembly

## 2.5. Reflector Installation Procedure

Reflector to wall mounting:

The reflector should be mounted using the .2 inch installation holes onto a flat surface with suitable screws, care should be taken not to over tighten these screws as this could damage or distort the reflector.

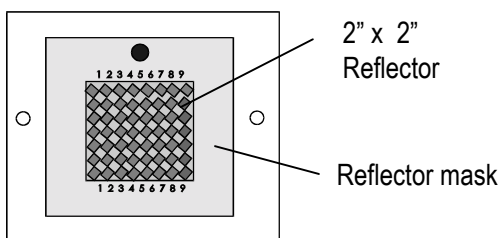


Figure 5

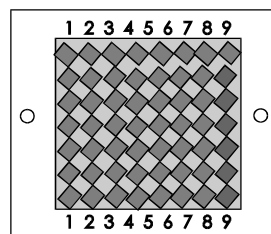
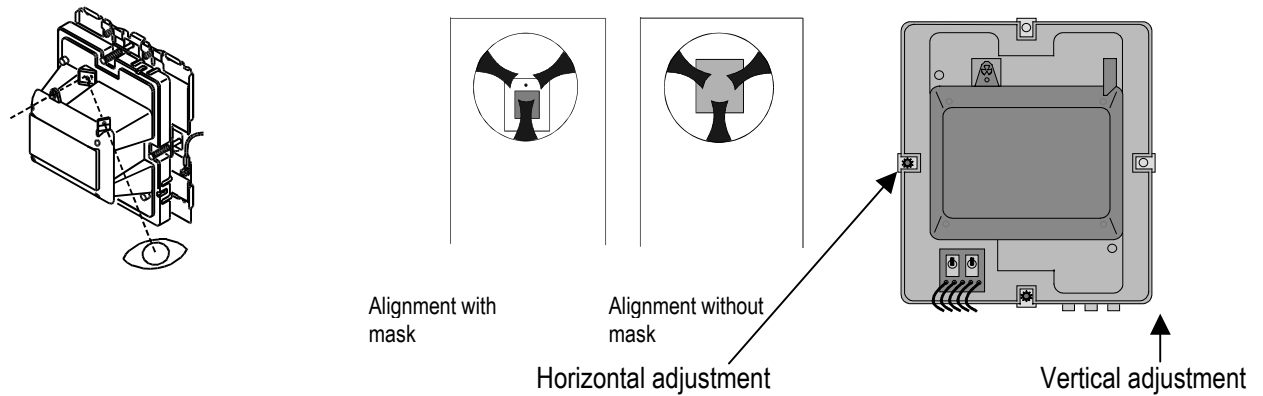


Figure 6

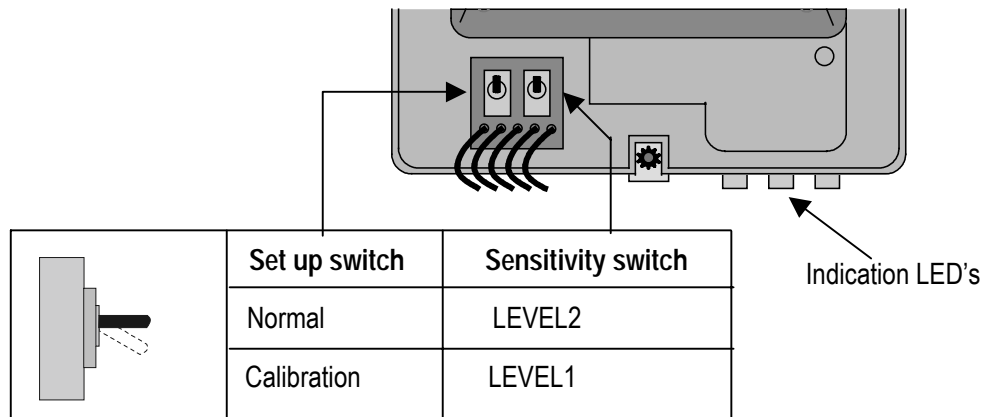
If the SRA-24 is being used over a distance of 25ft-50ft then the mask should be fitted to the reflector (figure 5). From distances of 50ft-100ft then the mask must not be fitted to the reflector (figure 6).

## 2.6. Adjustment & Calibration Procedure

The adjustment procedure should be carried out by powering up the SRA-24 and setting the switch to calibrate, at this time the yellow LED will start to flash, Then using the sight holes and alignment adjustment screws, the detector should be adjusted so the reflector can be seen in the center of the sight hole. If the reflector is being used with the mask then the detector must be adjusted until the black dot on the reflector is in the center of the sight hole.



When setting the SRA-24 up the set up switch must be set to calibrate, once alignment is completed as above then the switch must be returned to the normal position.



Set the sensitivity to the correct value using sensitivity switch. The sensitivity setting for the position is shown below.

Switch Position	Percentage Obscuration	Coverage
Level 1	20%	25ft-50ft
Level 2	30%	50ft-100ft

The set up switch should now be set to the normal position, at this time the yellow and green operating LED's will be flashing this should last for one minute as the detector automatically adjusts. When this has been completed the yellow LED will extinguish and the green LED will continue to flash. If the adjustment isn't completed satisfactorily then the yellow LED will flash on its own. The cover should now be fitted and operation tests should now be carried out as described in section 2.7.

The SRA-24 has three LED's mounted underneath the unit, these are yellow, green and red and are illuminated depending on the current state of the SRA-24. Please find below a table showing the various states of the SRA-24 and which LED's will be illuminated.

	LED 1	LED 2	LED 3
SRA-24 state	Green	Yellow	Red
Beam in set up mode	⊗	⊗	
Operating satisfactorily	⊗		
Beam in fault or calibration		⊗	
Beam in Fire	⊗ See Note	⊗ See Note	●

⊗ - LED Flashing (once every 3 secs) ● - LED illuminated

**Note:** The Green and Yellow LED may flash depending on the power voltage in alarm.

## 2.7 Testing the SRA-24

After installing the detector or during periodic maintenance it is important to ascertain that the detector has the correct fire sensitivity. This can be achieved by the use of filters.

Refer to the test filter usage table below.

Sensitivity setting (%)	Type of test	Filter Value
20	Operation	30%
	Non-operation	10%
30	Operation	40%
	Non-operation	20%

### **2.7.1 Operation check**

The red alarm LED should light and an alarm signal should be transmitted to the control panel within 30 seconds after placing the appropriate filter in the front of detector.

### **2.7.2 Non-operation check**

The SRA-24 should not operate within 30 seconds after placing the appropriate filter in the front of detector.

**Note:** In order to avoid the influence of reflection of the test filter itself, insert the test filter within ½ inch from the surface of the detector.

## ***3. Maintenance***

### **3.1. General**

The detector contains an automatic compensation function, which allows the detector to operate correctly even when the amount of signal reaching the SRA-24 has changed (the compensation rate is  $\pm 1\%$ /hour). This means that minor changes due to contamination and beam alignment will not affect the sensitivity of the detector. There is of course a limit that the detector can compensate for and this is -50% and +50% of the initial setting. In order to maintain proper performance the detector should be checked every six months.

### **3.2. Visual Check**

Check the condition of both the reflector and SRA-24 for physical damage or any other condition that might impair proper operation. Ensure that both the SRA-24 and reflector are still firmly secured to the wall or other mounting point.

If necessary clean the lens cover or reflector with a damp soft cloth. Washing liquid, alcohol or detergent must not be used.

### **3.3. Operation Checks**

Perform the sensitivity check function as defined in section 2.7.

### **3.4. Precautions For Insulation Resistance Checking**

If the wiring to a beam detector is to be tested for insulation resistance using a high voltage tester such as a Megger, the wiring to the beam detector must be disconnected from the detector by disconnecting the white terminal connector from the PCB will enable testing to be carried out.

### **3.5. Re-initialization After Cleaning Or Re-adjustment**

Because the beam detector contains sophisticated processing algorithms to take account of fluctuations in the beam intensity and alignment, if during routine maintenance the beam detector lenses have been cleaned or re-aligned then it will be necessary to make the detector read and store its initial value. This can be achieved by moving the set up switch to the calibration position for 10 seconds and then moving it back to the normal position.

## ***4. Summary Of The SRA-24's Functions***

### **4.1. Alarm Signal Output And Indicator Lamp**

When the beam is obscured by an amount that exceeds the sensitivity setting of the detector then a fire signal is produced lighting the red LED on the SRA-24. It should be noted that the SRA-24 has a sophisticated processing and analyzing circuit and therefore a fire will not occur immediately the obscuration exceeds the sensitivity value, but will take typically 11 to 16 seconds to produce the fire signal. The fire decision is based on an averaging technique and therefore the time to fire alarm will vary depending on the level of obscuration and the sensitivity setting.

### **4.2. Fault Signal Output And Indicator Lamp**

#### **4.2.1. General**

The beam detector may produce a fault condition for one of many different reasons, which will depend on whether the detector has just been set up or is in normal operation, when this occurs the yellow fault LED on the SRA-24 will be illuminated and flash.

#### **4.2.2. After adjustment/re-initialization**

The beam detector will produce a fault after or during adjustment for one of the following reasons:

- ⊗ The set up switch was left in the calibrate position
- ⊗ The signal strength is too high or too low.

#### **4.2.3. During normal operation**

The beam detector will produce a fault during normal operation for one of the following reasons:

- ⊗ The limit of contamination has been reached. The detector is only able to compensate for contamination or alignment change up to a certain point.
- ⊗ The obscuration is greater than 90%.
- ⊗ The signal level increased rapidly from initial value.

### **4.3. Indication Of Normal Operation**

When the SRA-24 has been set up correctly then the green LED mounted underneath the case will flash every 3 seconds to confirm that the detector is operating satisfactorily.

### **4.4. Total Obscuration Of The Beam**

If the beam detector is totally obscured, the green LED will continue flash and the yellow fault LED will flash, a fault signal will then be produced at the fire alarm panel.

### **4.5. Automatic Compensation For Change of SRA-24's Signal Strength**

From the time that the beam detector is initialized, the signal at the SRA-24 is checked every 60 minutes for variation and will be altered by  $\pm 1\%$  back towards the original stored value. The beam detector will store the initialization value, when the set up switch is moved from calibrate to normal.

## 5. Specification

Installation Environment	Indoor use only
Principle of Operation	Light beam obscuration (near infra-red)
Rated voltage	24V (nominal)
Operating voltage range	15.0 ~ 33V dc
Peak surge voltage	42V
Current in alarm	50mA
Quiescent current	350 $\mu$ A
Compensation method	1% every hour. towards initial value
Compensation limits	+50% to -50% of the initial value
Fire condition	Red fire LED on SRA-24 illuminated
Fault condition	Yellow fire LED on SRA-24 flashes
Monitor condition	Set up condition: Both green and yellow LED's flash Normal operation: Green LED flashes
Monitor condition flash repetition time	1 per 3 seconds
Minimum time needed to reset from fire	100msec
Minimum time needed before beam can reset after fire produced	3 seconds
Output Contacts	Alarm signal (N/O, dry contact) Fault signal (N/C, dry contact)
Operating temperature range	-0°C to 37.8°C
Maximum humidity	95% R.H. non-condensing
Beam length	25ft to 100ft
Sensitivity	20%, 30% obscuration
Size	Reflector: 7.5" x 7.5" x .1" SRA-24: 6" x 4.8" x 3.1"
Weight (without termination module)	Reflector: 1.6oz. SRA-24: 1.9lbs
Color	White Ivory (Black lens)
Housing material	ABS resin
Reflector material	Expanded Polyvinyl Chloride
Reflector sheet	Aluminum metallic acrylic film
Mounting	Wall mounting
Reflector mounting angle	+/- 10°
Connection method	Termination module: terminal connection
Wiring method	Termination module: 3 or 4 wire configuration

## ***6. Troubleshooting***

The following conditions relate to the SRA-24 itself.

### **6.1. Monitor LED Fails To Flash**

The monitor LED should flash every 3 seconds if it does not the reason may be as follows:

- ⊗ Power supply voltage to the SRA-24 less than 15V
- ⊗ SRA-24 is damaged

Ensure that the SRA-24 has been powered for more than 60 seconds and that the power at the SRA-24 is greater than 15V.

**Note:** If the set up switch position is “Calibration”, or power supply voltage is less than 15V, only yellow LED will flash.

### **6.2. Fire Signal Continues After Reset**

When a fire has occurred there may be certain circumstances that will prevent the beam detector from resetting. These are:

- ⊗ There is an obstruction of the optical path between reflector and SRA-24. Ensure there is no obstruction.
- ⊗ The optical axis has been altered suddenly. The beam will need re-alignment.
- ⊗ Insufficient time between fire and reset. At least 3 seconds are required before resetting the beam after the fire signal has occurred.

### **6.3. Fault Signal Cannot Be Reset**

If a fault has been generated without any obvious reason, it has occurred due to one of the following reasons:

- ⊗ Contamination limit has been exceeded (light received has changed by more than 50%)  
To clear this condition the set up and adjustment procedure should be repeated after cleaning detector and reflector.
- ⊗ Beam detector has totally been obscured or light received has rapidly increased. The reason will be the same as for 6.2 above.

### **6.4. Beam Detector Generates a Fire But Panel Does Not Register the Condition**

- ⊗ The zone is incorrectly wired to the beam detector. The wiring must be done in accordance with the relevant wiring diagram

### **6.5. Beam Detector Generates a Fault But Panel Does Not Register the Condition**

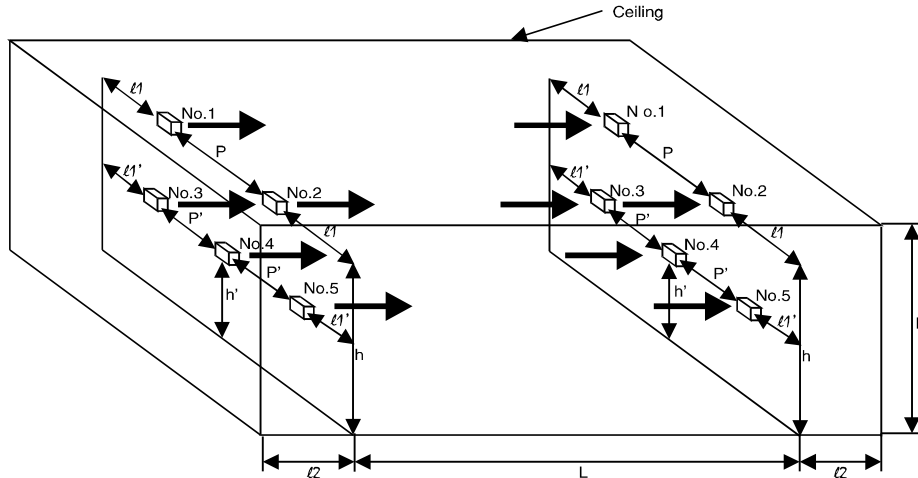
- ⊗ The zone is incorrectly wired to the beam detector. The wiring must be done in accordance with the relevant wiring diagram.

## 7. Installation Guide Lines

The Hochiki SRA-24 beam detector must be installed according to the requirements laid out in National or local standards. The following guidelines for installation are provided to give information in certain installation conditions where no advise or regulations are provided by the relevant standard.

### 7.1. General Installation Conditions

The diagram in Figure 7 relates to the typical installation condition i.e. in a long straight area and details the sighting positions of the beam detector.



H=ceiling height

l1=side wall distance

P=distance between optical axes

h=mounting height

l2=back wall distance

L=distance between Reflector/SRA-24

If  $H \leq 50\text{ft}$  then use beam detectors at locations 1 and 2

If  $H > 50\text{ft}$  then beam detectors should be mounted at locations 1, 2, 3, 4 and 5

For Detectors at 1 and 2

$h \leq 0.8H$

$l1 \leq 30\text{ft}$

$l2 \leq 15\text{ft}$

$P \leq 60\text{ft}$

$L = 25\text{ft to } 100\text{ft}$

For detectors at 3, 4 and 5

$h' = 0.5H$

$l1' \leq 15\text{ft}$

$P' \leq 45\text{ft}$

$L = 25\text{ft to } 100\text{ft}$

Figure 7 General installation conditions

## 7.2. Installation in Saw-Tooth Type Ceilings

In installations where there is a saw-tooth shape to the ceiling the detectors should be mounted with the axis either in condition A or condition B according to Figure 8. If the height of the ceiling 'a' is greater than  $0.2'H'$  do not install with the axis according to line B.

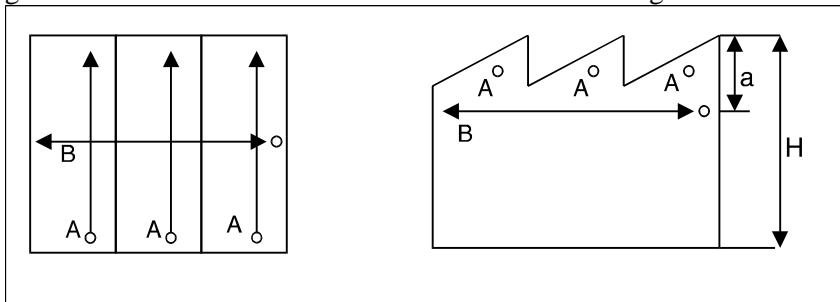


Figure 8 Installation in saw-tooth shaped roofs

## 7.3. Installation In Circular Type Ceilings

The installation in a cylindrical or circular roofed building should be in accordance with Figure 9. In the case of the cylindrical roof position A or B for the detector's axis is acceptable.

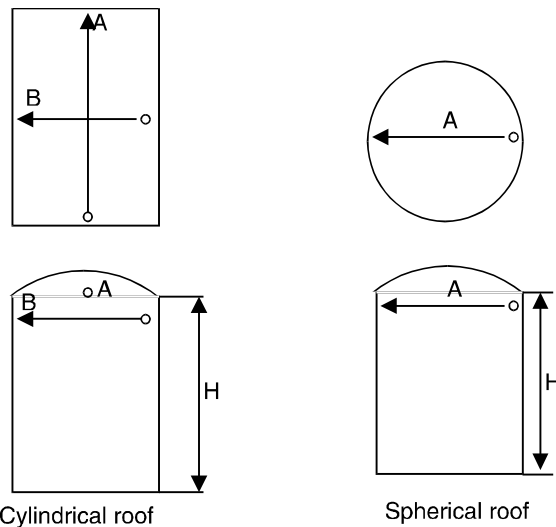


Figure 9 Installation in circular shaped ceilings

### 7.4. Installation In Sloped Ceilings

The installation for a sloped type roof or ceiling will be as shown in Figure 10. Either position A or B is acceptable for installation of the SRA-24.

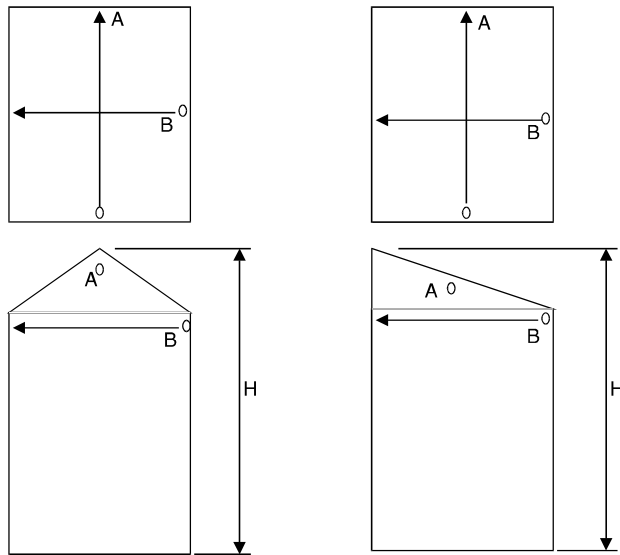


Figure 10 Installation under a sloped ceiling

### 7.5. Installation In a Monitor Roof

The installation for a monitor roof should be performed as in Figure 11. The detector's installation height should be 0.8H or higher. If there is ventilation in the top part of the roof then the detector must be placed below the opening. The detector should be installed in accordance with the following height restriction:  $H - a > h \geq 0.8H$

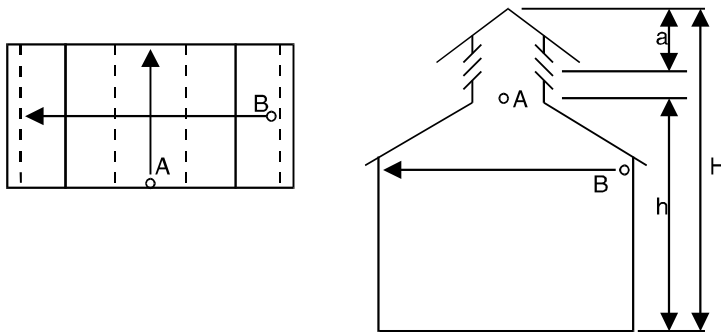


Figure 11 Installation in a monitor roof

## 7.6. Installation In Corridors Or Aisles

### **7.6.1. Closed corridor**

When the detector is installed in a corridor with a closed corner it is possible to use just one detector as shown in Figure 12 providing that the distance L is less than 24ft.

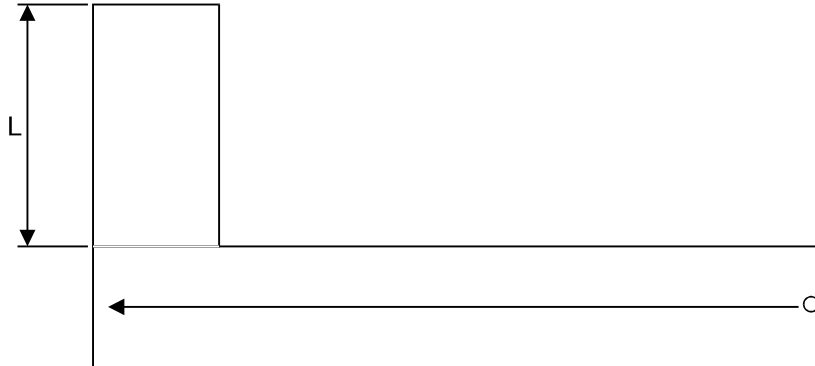


Figure 12 Installation in a closed corridor

### **7.6.2. Corridor with open adjoining aisle**

When the detector is installed in a corridor with an area adjoining which is open as shown in Figure 13, it is necessary to consider the adjoining area as a separate detection area.

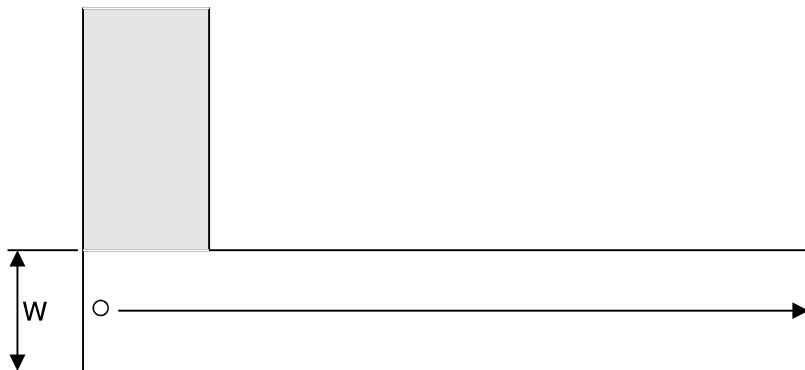


Figure 13 Installation in an open corridor

### 7.6.3. Corridor with corners

When the detector is installed in a corridor with a bend and an aisle as shown in Figure 14 it will be necessary to use at least 2 beam detectors to cover the corridors. If the distance P is greater than 50ft then another beam detector will need to be installed at point C.

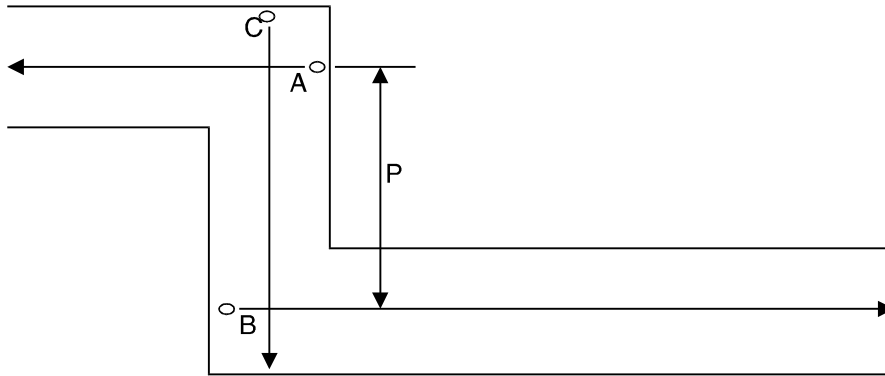


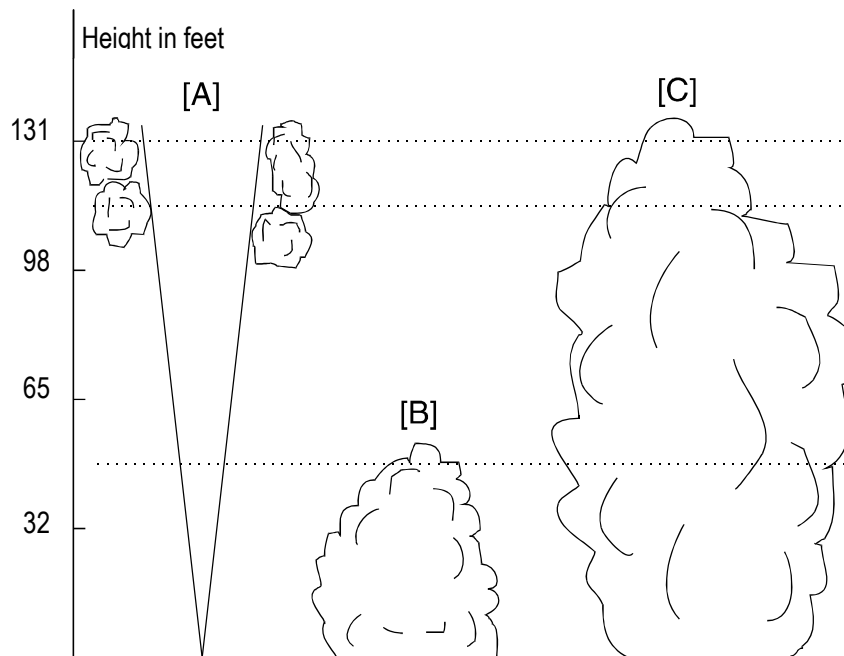
Figure 14 Installation in a corridor with corners

### 7.7. Installation Precautions

The following precautions are necessary when installing beam detectors:

- ⊗ In a room where an air inlet is positioned in the ceiling the beam detector should be placed near to the air inlet.
- ⊗ Select an appropriate installation place where the detector is unaffected by air being drawn into a ventilated opening.
- ⊗ The distance between the SRA-24 and the wall immediately behind the SRA-24 should be less than 24ft.
- ⊗ If more than one detector is installed they must be positioned in such a manner that they cannot affect each other's operation.
- ⊗ The detector should be positioned such that a shutter or hanging wall will not affect it.
- ⊗ The detector should be positioned such that it will be unaffected by moving objects.
- ⊗ The detector should not be installed in a rooftop or place where open air circulates.
- ⊗ The detector should be installed where the distance between top and bottom of the space is greater than 18 inches.
- ⊗ The monitoring distance between the reflector and SRA-24 is 25ft to 100ft and the maximum distance of coverage between the line of the beam is 24ft.
- ⊗ If there is a probability of people walking in the area of the beam then the beam detector should be installed at least 9ft from the floor.
- ⊗ The beam detector should not be installed at a height greater than 80ft unless the fire detection system is connected directly to the fire brigade or via a central station and rapid attendance by the fire brigade is possible. In any case the maximum installation height is 130ft.

## 7.8. Smoke Patterns Appropriate To The Consideration of Beam Detector Installation



[A] This pattern is produced by hotter burning fires and is very narrow at ground level. Therefore, it may be easier to detect at a higher level or at the ceiling.

[B] This type of smoke produced by a smouldering fire will not rise above 50ft and therefore to cover this type of risk it is necessary to install the detector below 50ft.

[C] This smoke pattern will be detected by detectors installed at any height.

Figure 15 Typical smoke patterns

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