HOCHIKI CORPORATION	TITLE TECHNICAL DOCUMENTS (OPERATION MANUAL) (Model : SPC-AS)	REF.No.: 7-0-000-1109-721 PAGE: 1 OF 9 DATE: 2007.12.10
ISSUED BY: S.Nakajima		APPROVED: A.Yokojima

1. Overview

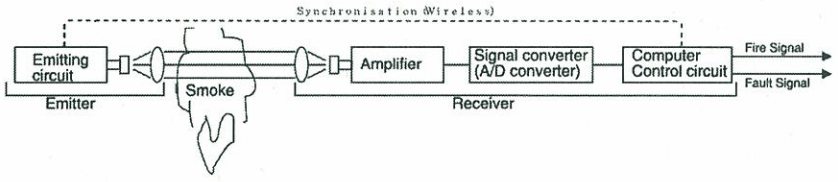
1.1. General Description

The photo-electric beam detector consists of an emitter and a receiver which face each other at a distance of between 5 and 100 meters.
In the event of fire the smoke generated will decrease the amount of near infra-red light incident on the receiver. 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 switch selectable in 3 settings of 25%, 50% and 60% beam obscuration.

1.2. Detection principle

A near infra-red pulsed beam generated by the emitter is sensed by the photo-diode of the receiver, 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. A fault signal together with a fire signal is generated if the axis of the beam is completely obstructed (as opposed to the partial obscuration due to smoke).
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 ±1% towards the reference data every 30 minutes. When the limit of compensation is reached the micro-processor will automatically produce a fault signal.
In order to improve the performance of the detector and to enhance the rejection of noise the emitter and receiver are synchronized together.

Principle of operation



2. Installing the detector

2.1. Siting

Select a suitable position for the installation of both emitter and receiver, such that there are no visible obstructions between them. Remember that the beam detector works on the principle of reduction of light between the receiver and emitter. If there is any possibility of an object remaining within the beam for a few seconds then the siting of the detector is unsuitable.
For mounting either the emitter or receiver 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 beam detector must not be installed in the following locations :-

- ❑ Where the ceiling height is greater than 40m
- ❑ A roof top or place where open air circulates
- ❑ Where the distance between top and bottom of the space is less than 0.5m
- ❑ In locations where a large amount of dust, fine powder or water vapour is present
- ❑ In locations such as kitchens where smoke occurs normally
- ❑ In locations which are exposed to extremely high temperatures
- ❑ Where access to the detector is impossible for maintenance purposes
- ❑ In locations which may be exposed to sunlight exceeding 5000 lux. It is recommended that in locations where the beam detector may be surrounded by glass, then the receiver should where possible be fitted so that it faces a northerly direction (only relevant to countries in the northern hemisphere)
- ❑ Where the rigid fixing of either the emitter or receiver is impossible
- ❑ Where access to the beam detector to align and set is impossible

2.2. Mounting and removing the detector

The detector can be fixed to the metal bracket by hooking the detector body to the four prongs of the mounting plate and then by sliding down firmly until the detector is locked into place and then locking using the locking screw. (See Figure 1).
Removal of the detector can be achieved by slackening the locking screw and pressing the locking mechanism located on the bottom left hand side of the detector housing. Whilst pushing the locking mechanism with either a narrow rod or screw driver the detector is lifted upwards until it disengages from the mounting plate.

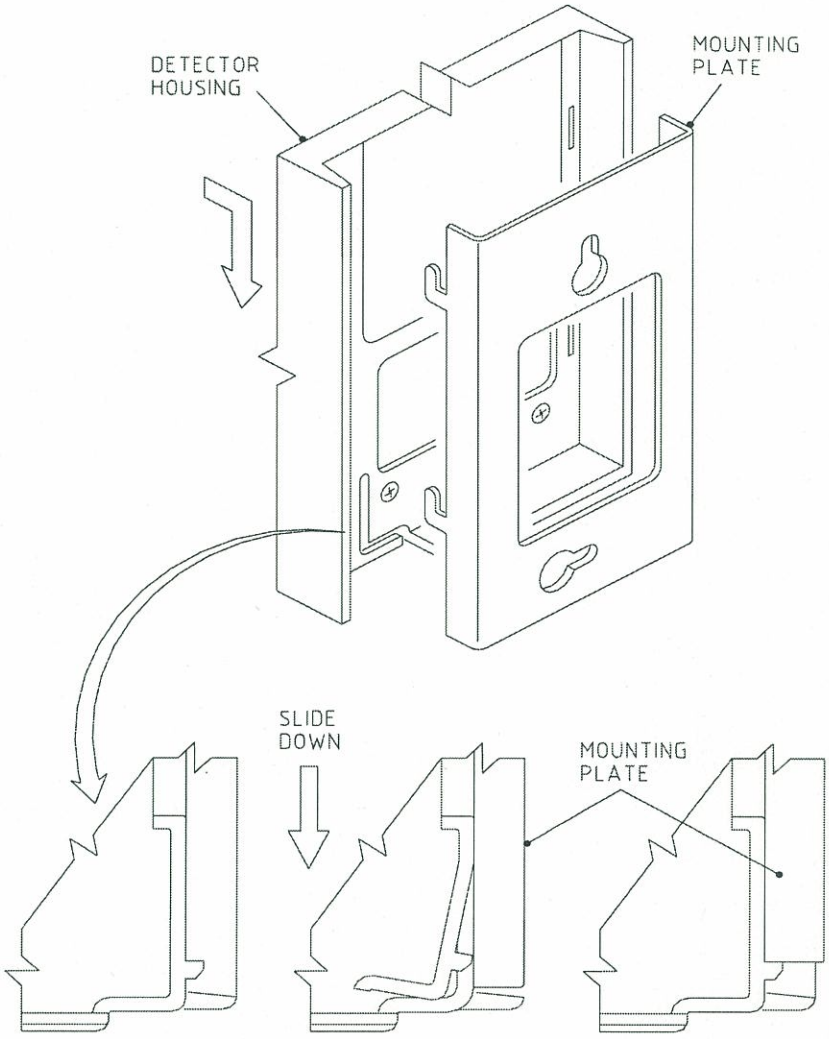


Figure 1 Locking mechanism

2.3. Opening the detector cover

Hold the detector cover between the thumb and fingers near the top of the cover and squeeze the cover firmly so that the top of the cover expands slightly. The cover can then be pulled away from the detector housing. This should be done by pulling the cover at an angle of 45° upwards and away from the detector.

Next hold the detector cover firmly at the bottom and pull away from the detector housing until a click is heard. The cover should now be able to drop down and rest on the cover retaining clips, thus allowing access inside the detector housing. Refer to Figure 2 for more details.

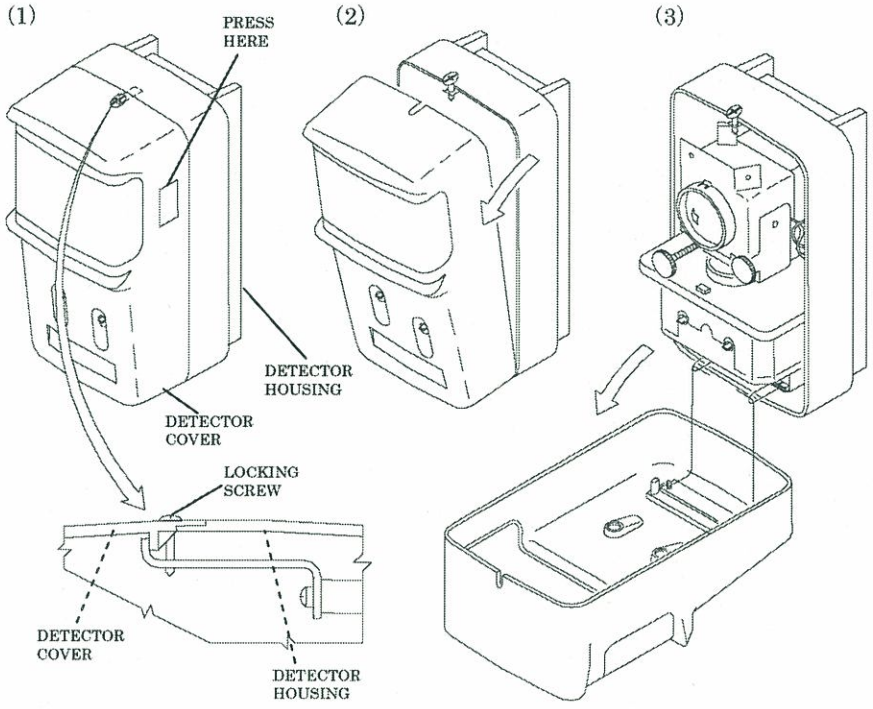


Figure 2 Opening the detector housing

2.4. Closing the detector cover

Move the cover upwards so that the cover engages with the top of the detector housing. Then hook the top of the cover over the metal hook protruding outward from the top of the detector housing. Pull down the top of the cover ensuring that it is flush with the detector housing top. Now push the cover at the bottom firmly towards the detector housing until it locks back into place. Refer to figure 3 for more details.

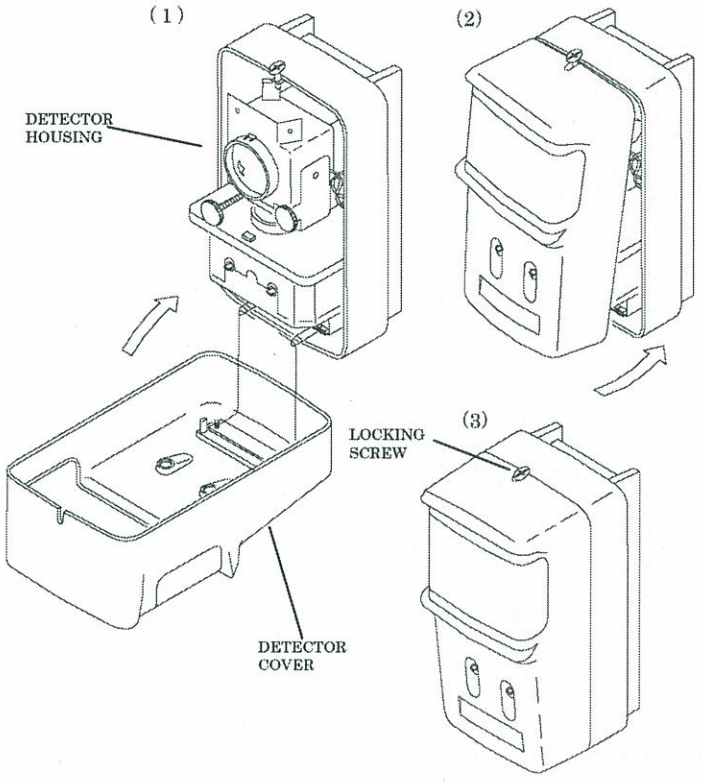


Figure 3 Closing the detector cover

2.5. Terminal layout and part designation

2.5.1. Emitter

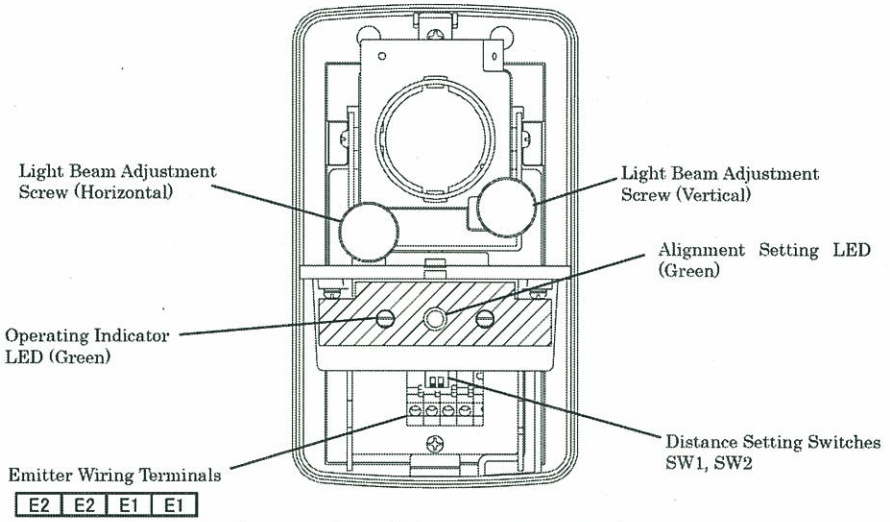


Figure 4 Emitter construction

2.5.2. Receiver

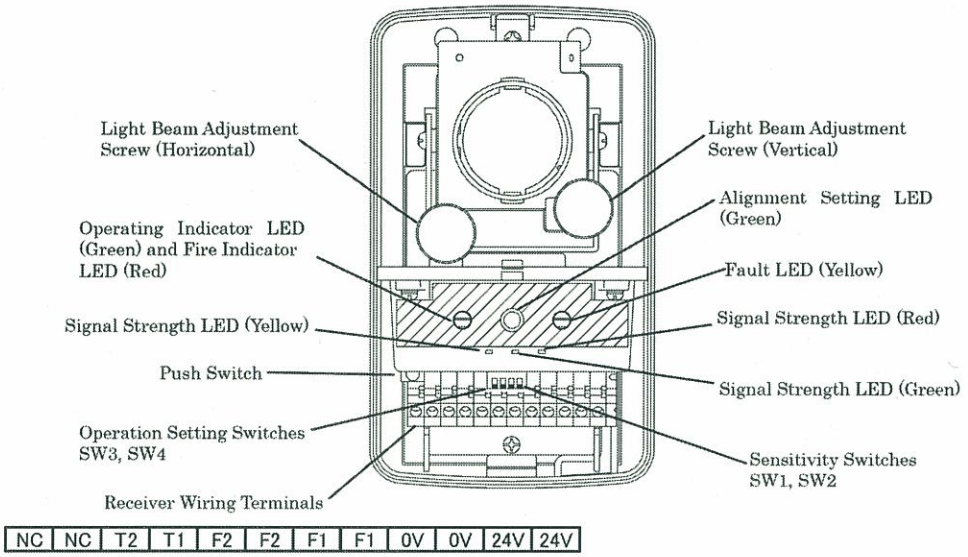


Figure 5 Receiver construction

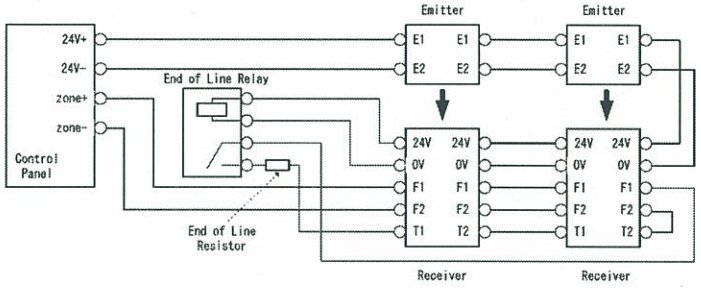
2.6. Installation procedure

Screw the detector mounting plate firmly to the wall or other suitable mounting point. Open the detector cover as described in section 2.3 and then take the wires into the back of the detector through the hole so that they come out below the terminal connector. The wires can be installed either behind the detector or from below the detector, depending on the suitability of the installation. If the wires are to come in from below then it will be necessary to break the knock-out slot from the bottom of the detector body (located near to the retaining clip).

Hook the back of the detector body to the 4 prongs of the mounting plate and slide down firmly, ensuring that the cables are not trapped or damaged by the detector. The detector body should lock into place by the locking mechanism which is located on the bottom right hand corner of the detector and secure using the locking screw. Refer to the mechanical drawing Figure 1.

The wires should be pushed into the holes of the connector whilst the white push key is pressed with a small screwdriver. This will enable the wire to push completely home. Pull the wire to make sure that it is firmly held by the connector.

ex1)



ex2)

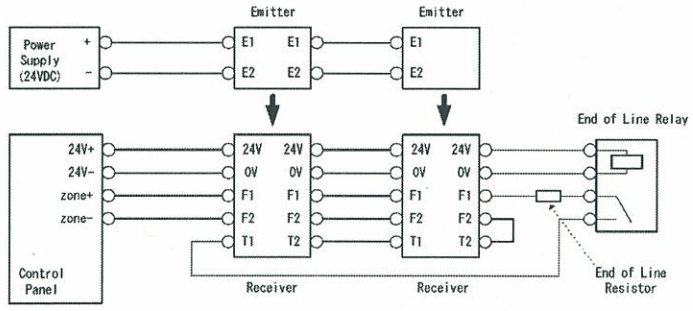


Figure 6 Wiring diagram

The connections for the emitter and receiver are detailed below. The terminal names are marked above the terminals on the beam detector. Refer to section 2.5 for a drawing of the terminal positions.

Emitter:
E1, E2 Zone or Power (in/out) (Non Polarized)
Receiver:
24V, 0V Power(in/out)(Non Polarized)
F1, F2 normally open contact
T1, T2 normally close contact

Now set up the beam as described in sections 2.7.

2.7. Adjustment procedure

The adjustment procedure is carried out by first using the sight holes and alignment adjustment screws. Refer to section 2.5 for details of the position of the relevant parts on the detector when making the following adjustments.

2.7.1. Alignment adjustment

Open the covers of the emitter and receiver as described previously. At the receiver confirm that both sensitivity setting switches SW1 and SW2 are set to OFF (sensitivity off), refer to Figure 5. At the emitter confirm that distance setting switches SW1 and SW2 are set as appropriate according to distance range. Power up the emitter and receiver, and then wait two minutes for the beam detector to stabilize. At this time the green operating LED will flash in synchronization with the green alignment setting LED once every 3second.

Move to the emitter and look through the alignment sight hole. Turn either the horizontal or vertical alignment screws until the receiver can be seen in the centre of the sight hole (Refer to figure 7).

When installing the units in a dimly lit area, it may be difficult to see the receiver and emitter. In this case alignment can be made by turning the alignment adjustment wheels until the alignment setting LED can be seen in the centre of the sight hole.

Close the cover of the emitter, move to the receiver and repeat the alignment procedure.

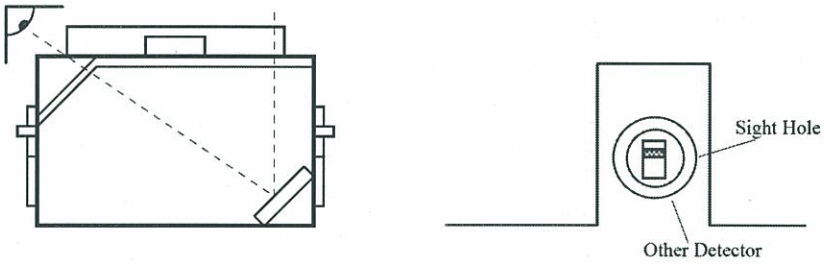


Figure 7 Detector alignment

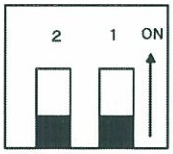
If needed, fine-adjusted the alignment according to the following procedure.

Keep pushing the push switch on receiver (refer to section2.5) for 5 seconds. Then, operating indicator LED(green) and fault LED(yellow) flashes every 3 seconds. This means that receiver is synchronizing with emitter. After the synchronization, in addition to them, either of signal strength LED* flashes. This means that signal strength is automatically setting. When signal strength LED(green) and operating indicator LED(green) flashing and fault LED is turned off, the light beam adjustment screw (horizontal and vertical) can be turn. These screws will be adjusted at the position where signal strength is at a maximum.

*These LED's are small square LED's located in the main PCB and are located below the main alignment and status LED's (refer to section 2.5). If the signal stays always in the yellow LED region then the signal strength is too weak. If the signal stays always in the red LED region then the signal strength is too high. Twice flashing is stronger than once flashing. If the cover will be closed(push switch will keep being pushed) then signal strength will be adjusted automatically, and signal will stay always in the green LED region.

2.7.2. Setting the Sensitivity & Switches for Operation

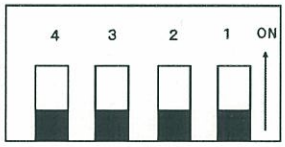
Set the distance range using switches of the emitter SW1 and SW2 according to the distance of emitter to receiver. The range for the positions of SW1 and SW2 are shown in Figure 8 together with a front view of the on and off positions as viewed with the detector in its normal installation orientation.



Range	SW1	SW2
5m～35m	ON	OFF
20m～100m	OFF	OFF

Figure 8 Distance range setting

Set the sensitivity to the required value using switches of the receiver SW1 and SW2 according to the distance and ceiling height. SW3 and SW4 are switches for operation. The sensitivity for the positions of SW1 and SW2, operational mode for the positions of SW3 and SW4 are shown in Figure 9.



Sensitivity	SW1	SW2	Range
Adjusutment	OFF	OFF	-
25%(1.25dB)	ON	OFF	5～10m
50%(3.01dB)	OFF	ON	10～70m
60%(3.98dB)	ON	ON	70～100m

	SW3 Total obscuration of the beam	SW4 Fault signal reset
OFF	Fault and Fire signal *	auto
ON	Fault signal only	manual

*Note :Fault signal will be produced first followed by a fire signal within a few seconds

Figure 9 Sensitivity and operation setting

2.7.3. Signal strength adjustment

After setting the distance range, close the cover of the emitter first. After setting the sensitivity and operation mode, close the cover of the receiver. After that, synchronization of emitter and receiver is automatically set, and signal strength adjusted automatically. During the synchronization and signal strength adjustment, operating indicator LED(green) and fault LED(yellow) is flash once every 3 seconds(not generate fault signal). The initial setting will be completed within 120 seconds after closing the cover of receiver. If the initial setting will be normally finished, only operating indicator LED(green) will be flashing and starting normal operation. When the fault LED(yellow) will be flashing and generate fault signal, it will be necessary to re-check the alignment, distance and setting switches. If the detector goes into fault, the following conditions may have occurred :-

- ❑ The cover of the receiver was closed, but the sensitivity was left OFF
- ❑ The sensitivity has been set but the cover of the receiver was not closed
- ❑ The light level is too low or too high reaching the beam
- ❑ The distance setting switches of the emitter has not been set correctly

In this case, open the cover of detector, and run through the adjustment procedure again until the beam detector will initialize correctly.