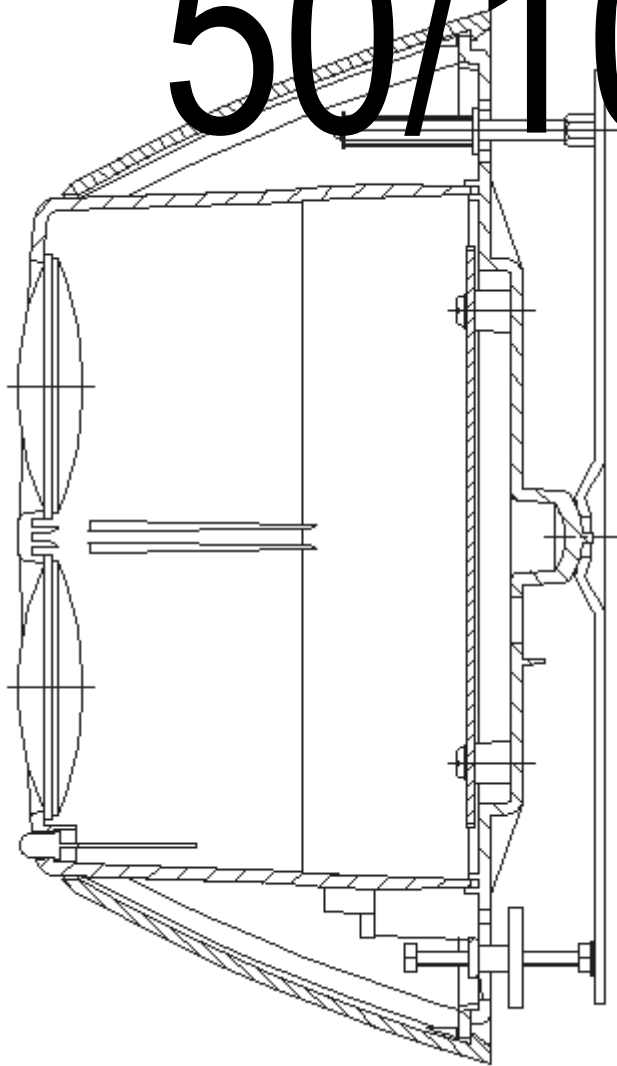


# FIRERAY

## 50/100R



### FEATURES

- Microprocessor controlled
- Range 5 – 50 Metres
- Range 50 – 100 Metres
- Unique simple alignment
- 12Vdc or 24Vdc operating voltage
- Selectable alarm thresholds
- Low current consumption
- Automatic reset
- Automatic contamination compensation



*Fire Fighting Enterprises Ltd.*

## 1. System Description.

Fireray 50/100R Detector comprises a Transmitter and Receiver contained within one enclosure.

The Detector installs to the building fabric between 0.3 and 0.6 metres from the ceiling.

The Transmitter emits an invisible infrared light beam that is reflected via a prism mounted directly opposite and with a clear line of sight. The reflected infrared light is detected by the Receiver and analysed.

The Detector has maximum lateral detection of 7.5 metres either side of the beam.

## 2. System Operation.

Smoke in the beam path will reduce the received infrared light proportionally to the density of the smoke. The Detector analyses this attenuation or obscuration of light and acts accordingly.

Alarm thresholds of 25%, 35%, and 50% can be selected to suit the environment, where 25% is the most sensitive. If the received infrared signal reduces to below the selected threshold and is present for approximately 10 seconds, the fire relay is activated.

There are two modes to the operation of the fire relay. Auto reset mode will reset the fire relay 5 seconds after the received infrared signal has recovered to a level above the alarm threshold. Latching mode holds the fire relay active indefinitely after an alarm condition has occurred. To clear the latched mode power must be removed from the Detector for a minimum of **5 seconds**.

If the infrared beam is obscured rapidly to a level of 90% or greater for approximately 10 seconds the fault relay is activated. This condition can be entered in a number of ways, for example, an object being placed in the beam path, transmitter failure, loss of the prism, or sudden misalignment of the Detector. The fault relay will reset within 5 seconds of the condition being rectified.

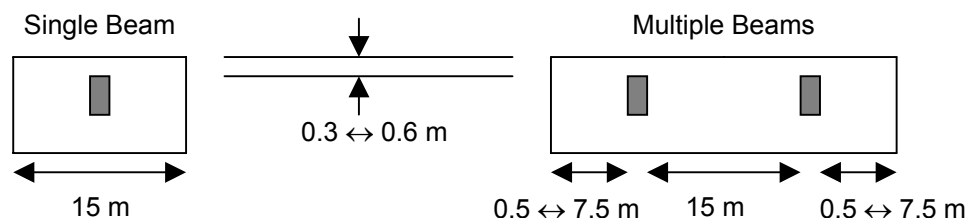
The Detector monitors long term degradation of signal strength caused by component ageing or build up of dirt on optical surfaces. This operates by comparing the received infrared signal against a standard every 15 minutes; differences of more than 0.7dB/Hour are corrected automatically.

## 3. Detector Positioning.

It is important that the Fireray 50/100R Detector is positioned correctly to minimise the detection time.

Experiments have shown that smoke from a fire does not rise directly upwards, but fans out or mushrooms due to air currents and heat layering effects. The time to signal a fire condition depends on the location of the Detector within the premises, the volume of smoke produced, construction of the roof, and ventilation arrangements.

The maximum distance either side of the beam axis is found to be typically 7.5 metres for satisfactory detection under flat ceilings.

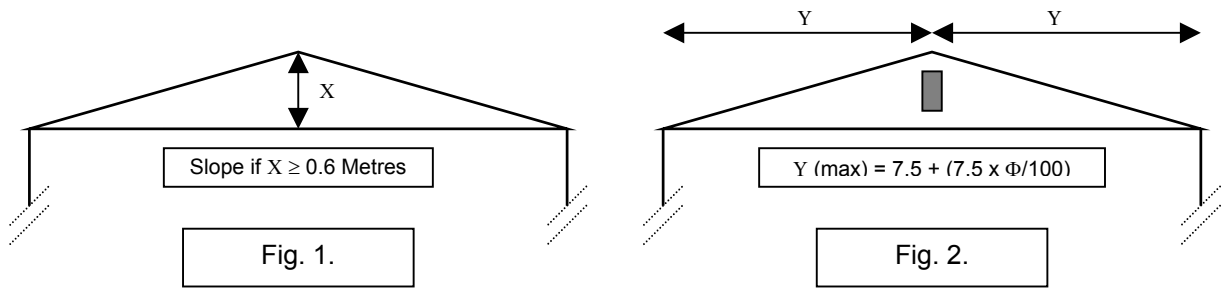


Smoke layering, where smoke does not reach the ceiling level due to layers of static hot air is over come by mounting the Detector at the recommended height below the ceiling of between 0.3 and 0.6 metres, bringing the infrared beam below the heat layer and into the smoke layer.

However in all installations the national fire standards for that particular country must be consulted. If there is any doubt on the correct mounting height, positioning may be determined by smoke tests.

### 3.1. Detector Positioning In Apex Of Sloping Ceiling.

A ceiling is defined as sloping if the distance from the top of the apex to the intersection of the ceiling and adjacent wall is greater than 0.6 metres. See Fig. 1.



When a Detector is positioned in the apex of a ceiling. See Fig. 2. The lateral beam distance covered (Y) can be increased in relation to the angle of pitch ( $\Phi$ ).

For Example:

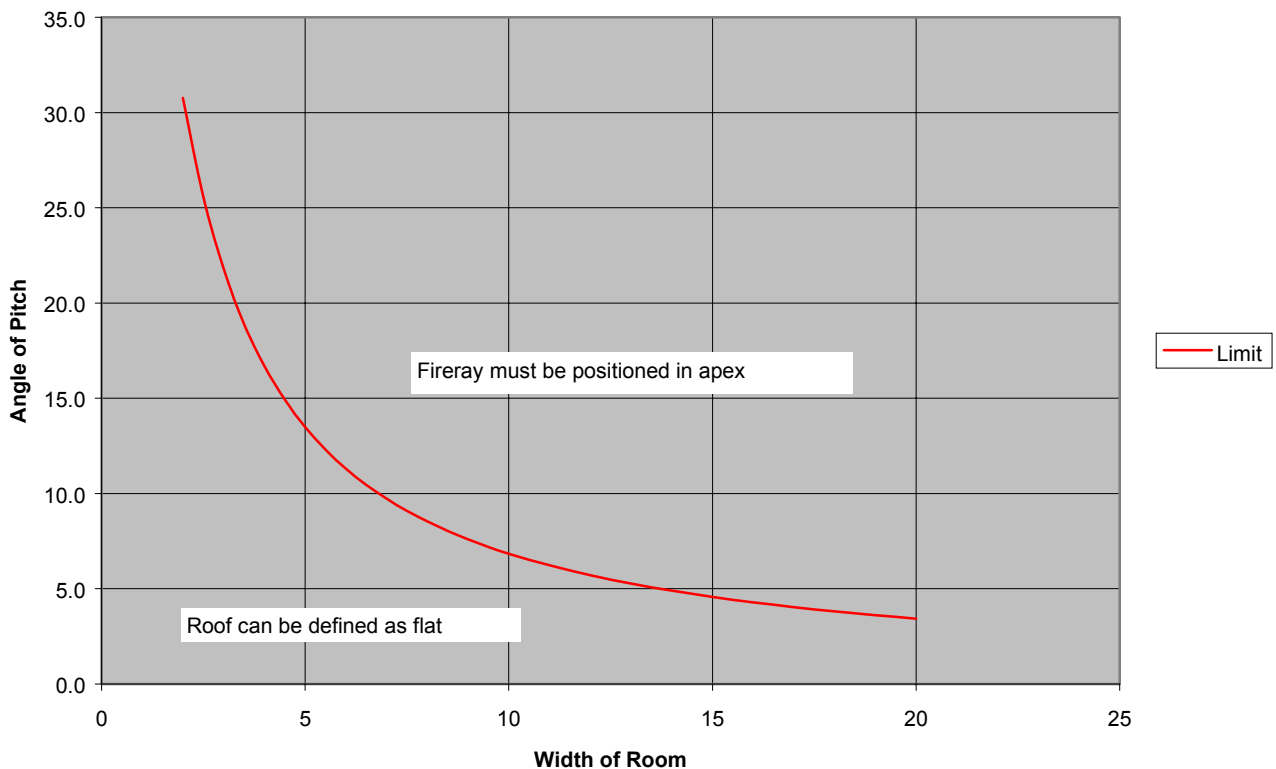
If the pitch angle is 20 degrees the lateral coverage can be increased from 7.5 metres either side of the beam (Y) to:

$$Y = 7.5 + (7.5 \times 20/100) \text{ metres}$$

$$Y = 9 \text{ metres}$$

Therefore with a roof pitch of 20 degrees the lateral coverage can be increased from 7.5 metres either side of the beam to 9 metres either side of the beam, but only for the beam positioned in the apex. All other calculations remain the same.

Limit to when a Fireray must be positioned in roof apex



## 4. Installation.

Pre-installation at Ground Level.

Confirm that all parts have been supplied as listed in the parts list. See page 9.

Select the required alarm threshold using switches 3 and 4 (See fig. 4. for switch configuration settings). The factory default setting is 35% this should be adequate for most environments, if the Detector is to be installed into an exceptionally dirty environment change the threshold to 50%.

Switch 1 selects latching or auto reset for the alarm relay. The factory default setting is auto reset, change this option if required. See fig. 4.

The Detector Head Assembly is now ready for installation.

### 4.1. Detector Head Assembly Installation.

Remove the outer cover before installation; this is only to prevent the cover becoming dislodged during handling.

Determine the position of the Head Assembly, which must be mounted on a solid structure between 0.3 and 0.6 metres below the ceiling, and no closer than 0.5 metres to an adjacent wall or structure. Ensure that there is a clear line of sight to the proposed position of the prism, which is to be mounted on a solid structure between 5 and 100 metres directly opposite the Detector (range dependent on model).

Using the template provided mark and install all 4 fixing points to the structure. The rear mounting plate of the Detector Head Assembly is provided with 4 keyhole slotted apertures to allow for easy installation onto the 4 fixing points.

Replace the outer cover.

Terminate the field wiring. See section 8.

### 4.2. Prism Installation.

Due to the principle of the detector i.e. reflective, the prism must **NOT** be mounted on glass or a polished reflective surface.

Mount the Prism on a solid structure between 5 to 50 metres (Fireray 50R), and 50 to 100 metres (Fireray 100R) directly opposite the Detector.

Ensure that there is a clear line of sight to the Detector, taking care that no moving objects i.e. doors, mechanical lifting equipment etc. Which will interfere with the light path between the Detector and Prism.

## 5. Prism Targeting Mode.

Apply power to the Detector. There is a 5 seconds pre-charge delay after power is applied to allow the internal circuits to stabilise correctly. After this period the RED indicator will flash once to indicate that the model is a 50R or will flash twice to indicate a 100R.

Using the mode switch (See fig. 4) select Prism Targeting Mode (Switch will be in the up position).

Find the prism by adjusting the horizontal and vertical thumbwheels until the GREEN indicator is continuously ON. The Green indicator will be OFF when no signal is being received, then will flash at an incrementing rate to determine the target position. The faster the flash the nearer you are to the target (prism).

- **At this point it is essential to test that the prism and not another surface is reflecting the beam.**

This can easily be confirmed by covering the prism with a non-reflecting surface and confirm that the GREEN indicator is OFF.

## 6. Alignment Mode.

Mechanical alignment is provided by two adjustment thumb wheels on two sides of the Detector, positioned just behind the Detector Head cover. Adjustment is achievable in both axes.

### 6.1. Enabling Alignment Mode.

Using the mode switch (See fig. 4) select Alignment Mode (Move switch to the middle position).

### 6.2. Adjustment in Alignment Mode.

The Detector will automatically adjust its infrared beam power and receiver sensitivity to give an optimum receiver signal strength.

The alignment progress is indicated by the colour and state of the indicator lamp on the front of the Detector.

- **FLASHING RED**

The Detector is receiving too much signal and is attempting to reduce the infrared power output to compensate. **Wait** at this point until the indicator lamp is **OFF**, this may take up to 20 seconds depending on the distance between Detector and Prism, the shorter the distance the longer the time.

- **CONTINUOUSLY GREEN**

The Detector is not receiving a signal. **Go back to prism targeting mode.**

- **FLASHING GREEN**

The Detector is receiving a weak signal and is attempting to increase the infrared power output.

- **OFF**

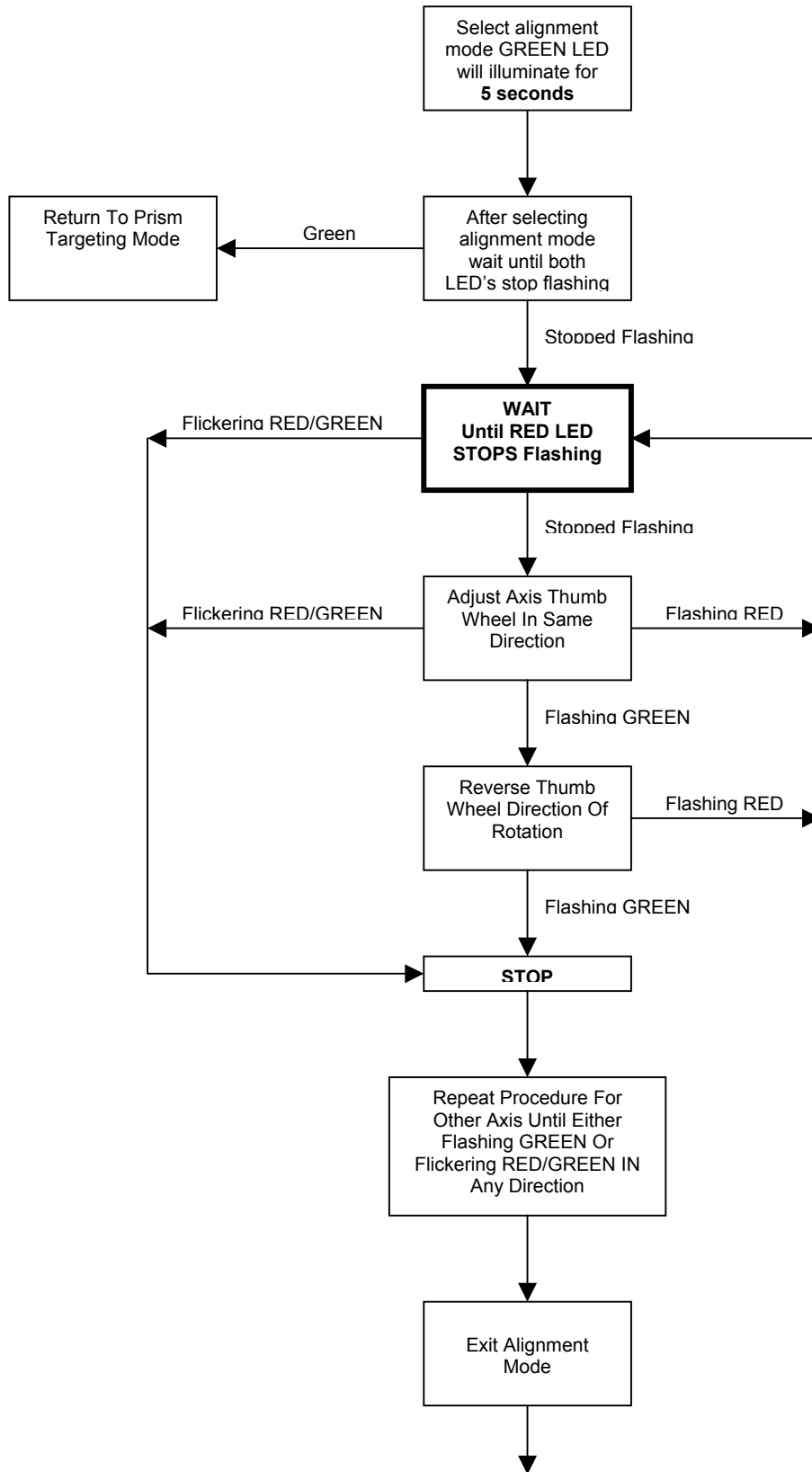
The Detector has optimised the infrared power and receiver gain for the current orientation of the Detector and Prism. **This does not mean that the Detector to Prism alignment is at its optimum**, i.e. if the power is too high, a misaligned Detector may be receiving a fringe reflection from another object.

- **FLICKERING RED/GREEN**

This state can occur sometimes. It means that the infrared power is stepping through the optimum setting.

Continue to flow  
diagram for procedure.

6.3. Alignment Process Flow Diagram.



## 6.4. Exiting Alignment Mode.

Using the mode switch (See fig. 4) select Run Mode (Switch will be in the down position).

On exiting alignment mode the Detector will perform an internal calibration check, if this fails which would be due to bad alignment or either electrical or optical noise the indicator lamp will remain GREEN, in this case the alignment procedure must be repeated.

If the internal calibration check completes satisfactory the GREEN indicator will turn OFF and the fault relay will be reset. The Detector will be in normal running mode.

## 7. System Testing.

After successful installation and alignment the System will require testing for both alarm and fault conditions.

### 7.1. Alarm (smoke) Test.

Taking note of the threshold selected during installation (default 35%).

Select obscuration mark on filter to correspond with the Detector alarm threshold (see fig. 3).

Place the filter over the receiver optics (Top of Detector Head – opposite end to the status indication LED's) at the correct obscuration value determined by the threshold selected. I.E. if a threshold of 35% has been selected position the filter just past the 35% obscuration value on the filter (see fig 3.).

Take care not to cover the transmitter optics.

The Detector will indicate a fire within 10 seconds by activating the RED indicator and closing the fire relay.

### 7.2. Fault Test.

Cover the Prism totally with a non-reflective material and confirm that the Detector indicates a fault condition after approximately 10 seconds. The lamp on the Detector turning GREEN and the fault relay opening will indicate this. The fault condition will automatically reset after a period not greater than 2 seconds when the obstruction is removed.

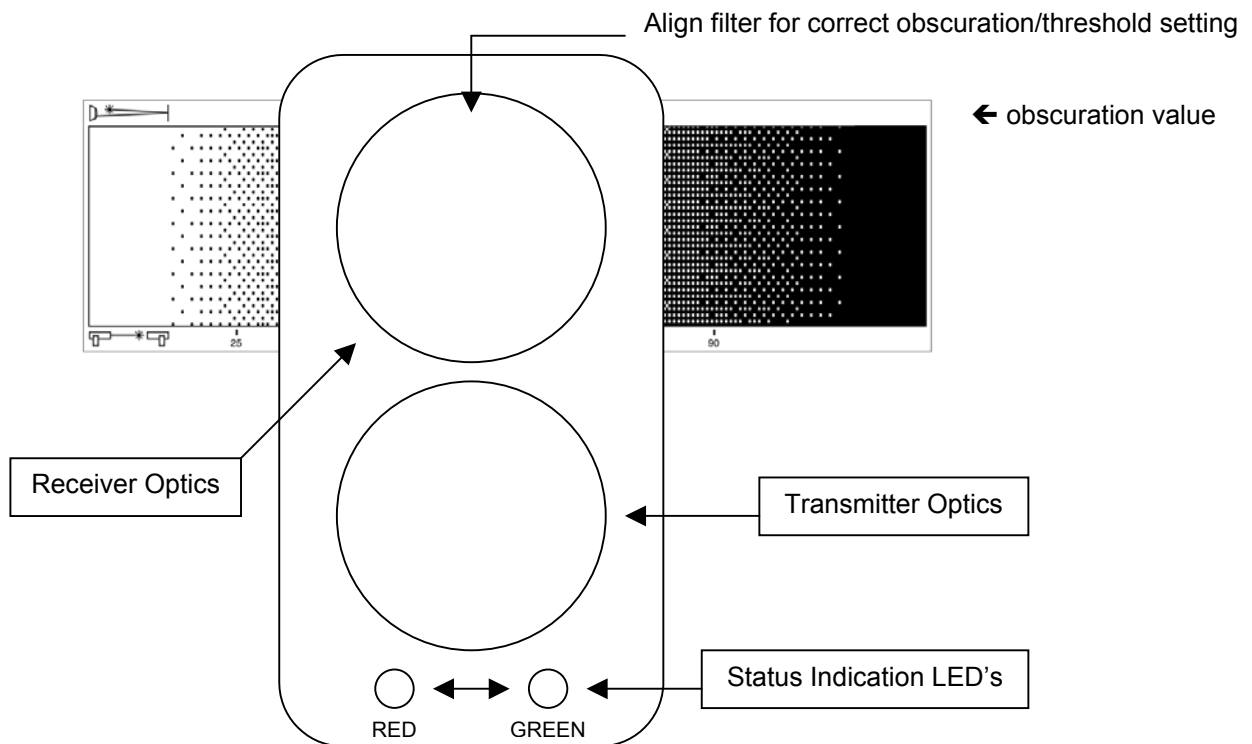


Fig. 3.

## 8. Connection and Configuration Settings.

### 8.1. Field Wiring.

The field wiring interface is accessed through the back plate of the Detector Head (See Fig 4). The small 2 pin connector on the left is not used. The 8 pin connector is the interface to the field and is numbered left to right. See table below:

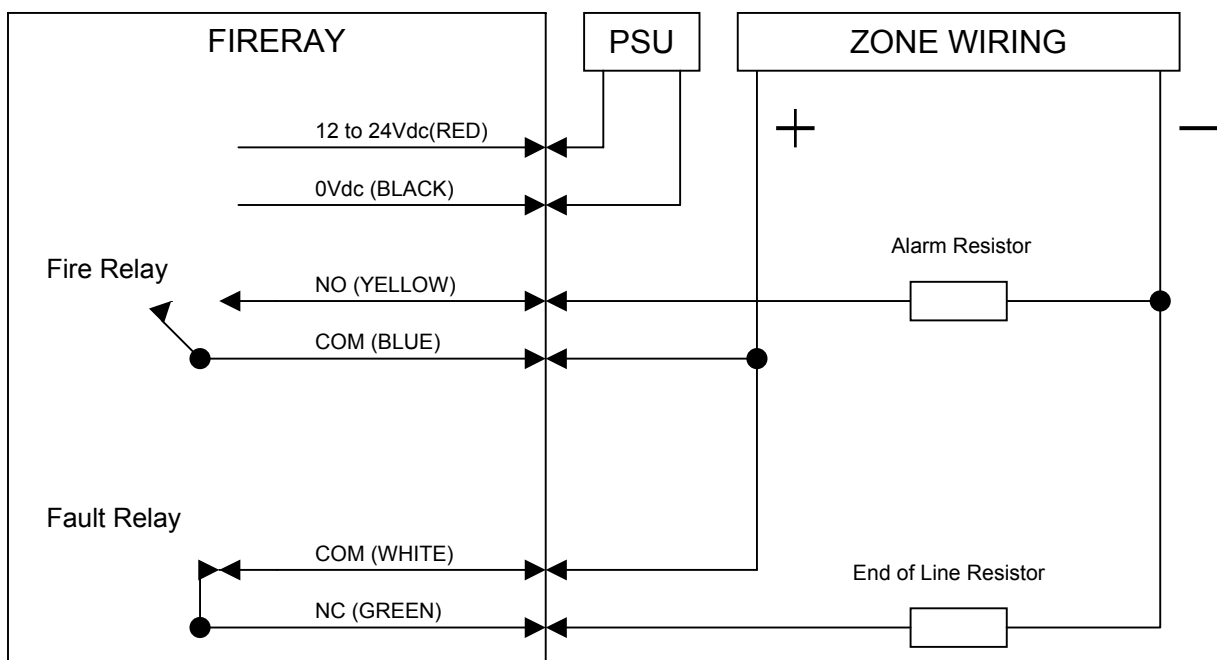
Pin Number	Wire Colour	Signal Description
1		n/a
2	BLUE	Fire relay common (COM) connection
3	YELLOW	Fire relay normally open (NO) connection
4	RED	Positive Supply +10.2 to +30 Vdc
5	BLACK	Negative Supply
6	GREEN	Fault relay normally closed (NC) connection
7	WHITE	Fault relay common connection (COM) connection
8		n/a

### 8.2. DIP Switch Settings.

Access to the configuration settings is through the back plate of the Detector Head (See Fig 4). Default configuration settings are marked ←.

Function	1	2	3	4	
50% Threshold	X	X	OFF	OFF	
35% Threshold	X	X	OFF	ON	←
25% Threshold	X	X	ON	OFF	
12% Threshold (Do Not Use – Future Requirement)	X	X	ON	ON	
Latching Fire Relay	OFF	X	X	X	
Auto Reset Fire Relay (5 seconds)	ON	X	X	X	←
Fire Relay Enable On Compensation Limit	X	OFF	X	X	←
Fire Relay Disable On Compensation Limit	X	ON	X	X	

## 9. Typical single zone wiring diagram.



This diagram is an example for a single Fireray being the only device on a zone. The correct operation for Fire and Fault should always be checked connected to a typical panel. Relays are shown in quiescent condition. Contact fire panel manufacturer for values of 'Alarm Resistor' and 'End of Line Resistor'.



# 10. Detector Interface Assembly Configuration Settings.

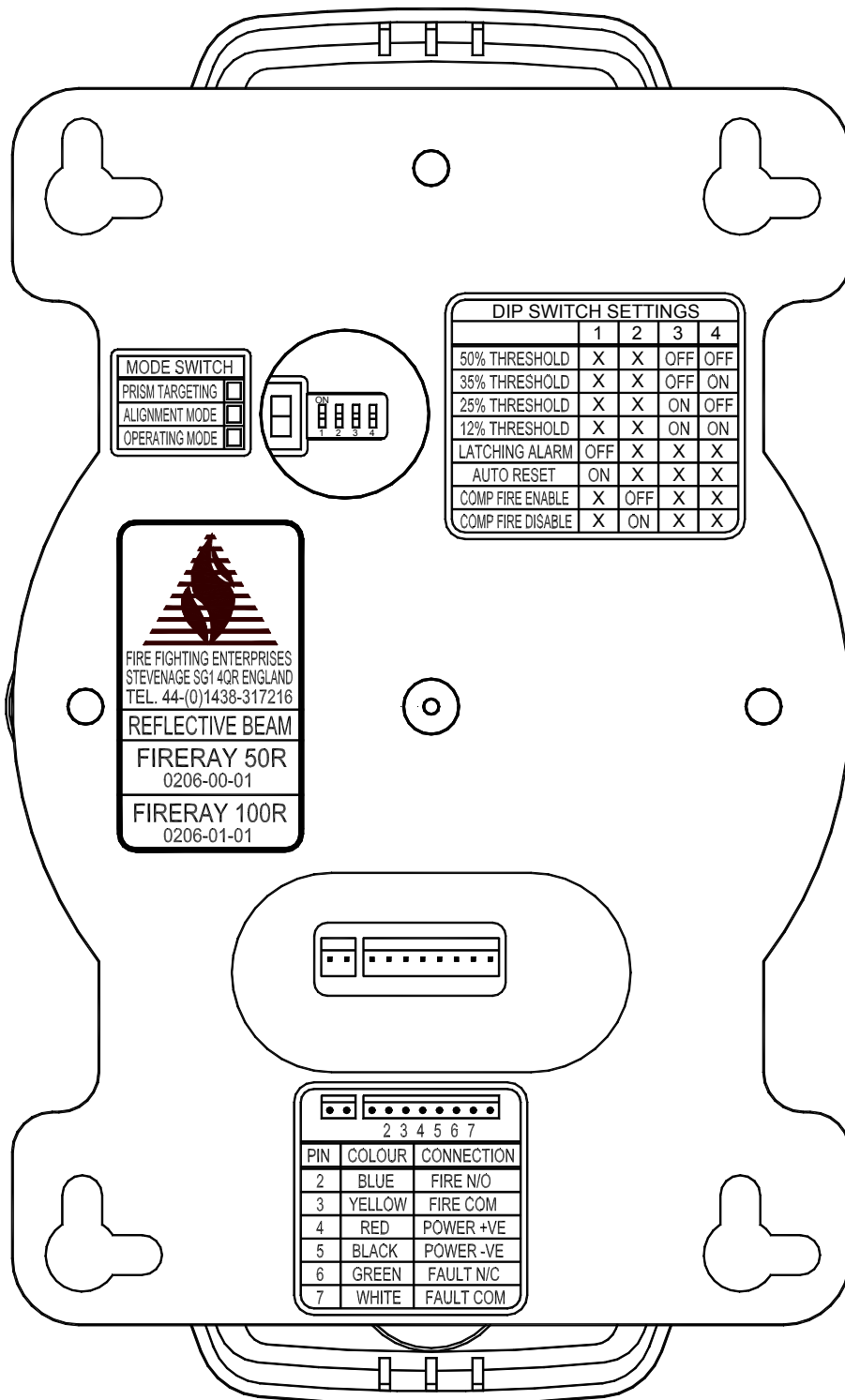


Fig. 4.

## 11. Technical Data.

- Operating Range Fireray 50R 5 to 50 metres
- Operating Range Fireray 100R 50 to 100 metres
- Supply Voltage 10.2Vdc to 30Vdc
- Quiescent Current (no lamp illuminated) <4mA
- Alarm/Fault Current <15 mA
- Power Down Reset Time >5 seconds
- Operating Temperature -30°C to 55°C
- Tolerance to Beam Misalignment at 35% Detector  $\pm 1.0^\circ$ , Prism  $\pm 5.0^\circ$
- Fire Alarm Thresholds 1.63dB (25%), 2.78dB (35%), 6.02dB (50%)
- Optical Wavelength 880nm
- Head Maximum Size Width 130mm, Height 210mm, Depth 120mm
- Weight 670 gms

## 12. Service / Application Notes.

- For full compliance with BS5839 part 5, use 25% and 35%(default) thresholds. The threshold of 50% is recommended for hostile and extreme environments.
- Red LED indicates FIRE.
- Continuous Green LED indicates FAULT.
- Flashing Green LED indicates that the contamination/compensation function has reached it's limit.
- Alarm condition indicated by fire relay closing (relay contacts are normally open).
- Fault condition indicated by fault relay opening (relay contacts are normally closed).
- Alarm may be latching or non-latching (default)

## 13. Parts List.

- 1 off: Detector Head Assembly
- 1 off: Prism for the 50R
- 4 off: Prisms for the 100R
- 1 off: Test Filter
- 1 off. Cable Interface Assembly