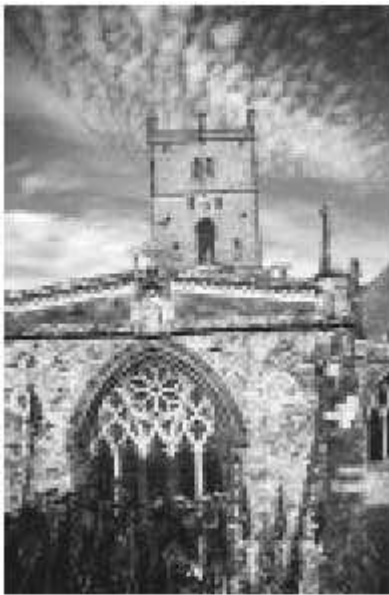


# Firearay 2000

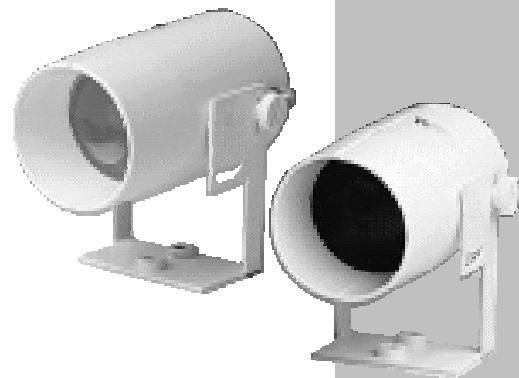
## Application and



## Installation Guide

### FEATURES

- Range 10-100 metres
- 12V to 24V dc operation
- Selectable alarm thresholds
- Low current consumption
- Ground level electronics
- Manual or automatic reset



## SYSTEM DESCRIPTION

Fireray 2000 comprises of a transmitter which projects a modulated infra-red light beam onto a receiver unit. The received signal is analysed in the ground level controller. Should smoke be present in the beam for a period of approximately 8 to 10 seconds, a Fire relay is activated. The system is designed to be mounted so that the beam will project between 0.3 to 0.6 metres below and parallel to the roof or ceiling level at ranges up to 100 metres. The maximum lateral detection range is 7.5 metres either side of the actual beam.

## SMOKE DETECTION

When smoke is present in the beam path the received signal is reduced by a level determined by the density of the smoke. In the event of the smoke reducing the signal strength by between the sensitivity level and 93% for a period between 8 to 10 seconds, the fire alarm relay is activated. This sensitivity level can be selected to suit different environments. The sensitivity levels available are: 25%, 35% and 50%.

## AUTO RESET

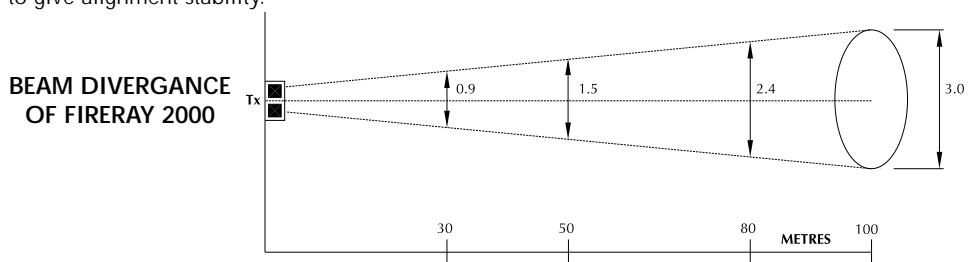
After a fault condition is indicated, the control unit automatically resets if the fault is no longer present. The fire alarm relay may be latching or non-latching (close 'ALARM' switch for latching).

## AUTOMATIC GAIN CONTROL (AGC)

Long term degradation of signal strength by component ageing or build up of dirt on optical surfaces will not generate an alarm because of compensation provided by an AGC circuit. This operates by comparing the received signal against a standard at predetermined time intervals. Differences of more than 7% are corrected by the automatic selection of gain stages. The AGC time interval is factory set to nominally 1.5 hours.

## PRINCIPLE OF DETECTION

The infra-red signal is transmitted from the Transmitter via an optical system. At 100m the diameter of this infra-red signal is 3m. This wide angle beam arrangement helps to simplify alignment and to give alignment stability.



It is important that the Fireray is positioned correctly to minimise the detection time. Experiments have shown that smoke from a fire does not rise only directly upwards, but fans out as in a 'mushroom' due to air currents and heat layering effects. A fire alarm condition occurs when the smoke obscures the infra-red beam. The time to signal a fire condition depends on the location of the Fireray within the premises, the volume of smoke produced, the construction of the roof and ventilation arrangements.

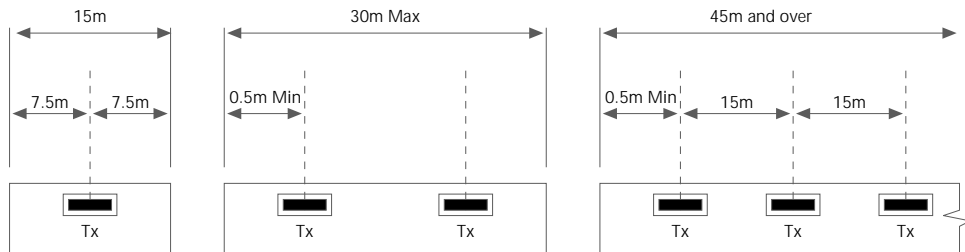
For Firerays positioned beneath flat ceilings the smoke has to curl its way into the detection zone from the point on the ceiling directly above the fire. The time taken depends upon the distance of the fire from the beam axis, the height of the beam and source of the fire and the slope of the ceiling.

The maximum distance either side of the beam axis is found to be typically 7.5m for satisfactory detection under flat ceilings, providing a maximum total area coverage of (100 x 15) square metres. Smoke layering, where the smoke does not reach the ceiling level due to layers of static hot air above, is overcome by mounting the Fireray at the recommended height bringing the infra-red beam below the heat layer and into the smoke layer.

The recommended installation height is between 30 - 60cms below the ceiling. 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.

**SINGLE BEAM**  
See Note

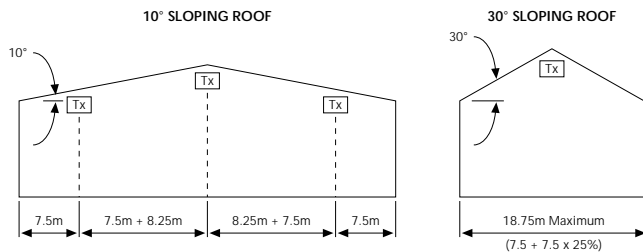
**MULTIPLE BEAMS**



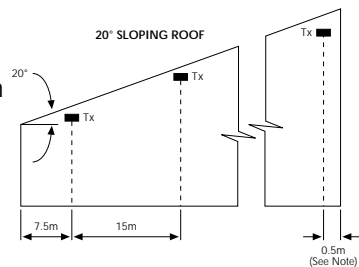
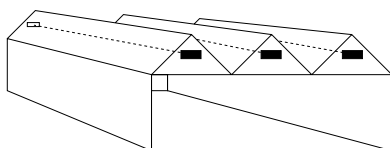
A ceiling or roof with a slope in excess of 3.5 degrees should be regarded as an apex roof.

**Note1:** No more than 3m of the beam path should be within 500mm of any wall or partitions.

When Firerays are mounted in the apex the horizontal distance may be increased by 1% for each degree of ceiling slope, up to 25% maximum. (for Fireray in apex only).



RECEIVER AND TRANSMITTER SHOULD BE POSITIONED 0.3m to 0.6m BELOW THE CEILING



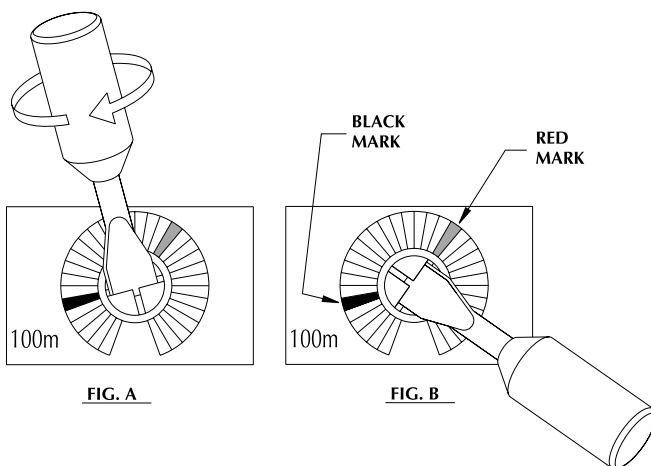
## INSTALLATION

### Pre-installation at Ground Level

1. The Controller should be positioned so that it is accessible. The cable run connecting the Controller to the Receiver should not exceed 100m. Care should be taken that this cable is routed away from building electrical cables and any switchgear.
2. **Controller:** There are knock-out holes in the upper, lower and side faces for cable entries. Four 7mm fixing holes are located on the rear face, for installing the box to the building structure. Wiring connections are described on a label inside the controller door. See figure 1.
3. Select the required options, (sensitivity level, alarm relay latching/non latching, AGC last stage operation (see figure 3).

### Transmitter

1. A range adjuster (potentiometer) is accessed through a removable grommet.



The transmitter is set at 100 metres and should not be adjusted unless distances below 30 metres are required. In the event that a distance below 30 metres is required, adjust as follows:

Ref. FIG. A. Place the screwdriver blade in the position shown. The blade should align with the 100 metre mark. (BLACK)  
Turn the screwdriver clockwise so that the blade points to the RED mark as shown in FIG. B.

### Receiver

1. The receiver should be installed such that lighting, artificial or natural sunlight, does not at any time fall directly onto the receiver lens. The Fireray is immune to most normal ambient lighting conditions.
2. Receiver to Control unit cable run must not exceed 100m (or be less than 5).

### Installation

#### Transmitters and Receivers

1. The Transmitter must be in line of sight of Receiver and mounted rigidly on a secure section of the building.
2. Locate the right angle fixing brackets for the Transmitter and Receiver so that they are in the line of sight and are both installed equally 30 -60 cms below the ceiling.
3. Install the Optical heads on the brackets and position in the line of sight. Align Rx as accurately as possible to the Tx (by eye).
4. Install all cables and connect as figure 1. (Heads are supplied with 1m of cable. This should be correctly terminated with the System wiring).
5. Check that the RESET/TEST switch located in the Controller is in the ON position.
6. Position the Gain potentiometer in the Controller to the mid-way position.
7. Apply the power to the system (check first that it is within limits 11.5 - 28 volts).
8. At this stage signal High or Low LED's may be illuminated.

**Alignment: Method 'A' Voltmeter**

1. Connect the required length of two core cable to the test meter outputs and run to the Transmitter, connect a DC voltmeter (0 to 10V range) to this cable.
2. Adjust the Transmitter horizontally and vertically until the maximum reading is obtained, (no signal reading is approx 2.6V).
3. To avoid any possibility of working loose under vibration, tighten both the Transmitter thumbwheel screws securely, using a suitable coin or wide bladed screwdriver (Ensure it fills the thumbwheel slot completely to avoid slippage and damage).
4. At the Controller adjust the gain control potentiometer until the high LED just goes off.
5. Move the RESET/TEST switch to the off position.
6. Wait at least 45 seconds before performing any smoke tests.
7. Disconnect alignment cable.

**Alignment: Method 'B' FFE Alignment Aid**

(Optional extra - Refer to factory)

1. Connect a temporary 3 core cable between the control Unit terminals and the Alignment Aid:-
  - Connect +VE SUPPLY from Control Board to red connector on Alignment Aid.
  - Connect -VE SUPPLY from Control Board to black connector on Alignment Aid.
  - Connect TEST METER+ from Control Board to yellow connector on Alignment Aid.
2. Place the alignment aid in any convenient position, which is visible when viewed from the Tx, with it's lamp pointing at the Tx.
3. Align the Tx and observe the Alignment Aid (Up to 100m away). Adjust for highest flash rate. Lamp will glow steadily when alignment is OK. Continue with Method A, step 4.
4. Disconnect Alignment Aid temporary cable.

**Smoke Alarm test:** Hold the test filter over the RX head. After approximately 9 seconds the alarm relay will switch over, and the red alarm lamp will light. Remove the test filter, and the alarm will reset after approx. 4 seconds (unless in latching mode).

To reset after a Fire alarm:-

1. Maybe automatically ('ALARM' switch open).
2. By the RESET/TEST switch.
3. By disconnecting the Controller supply for one second.
4. By taking to 0V the external reset terminal for one second.

**Fault Alarm test:** The fault relay and the fault LED operate if the beam is totally blocked for approx 10 seconds. Clearing the beam clears the fault in approx. 4 seconds.

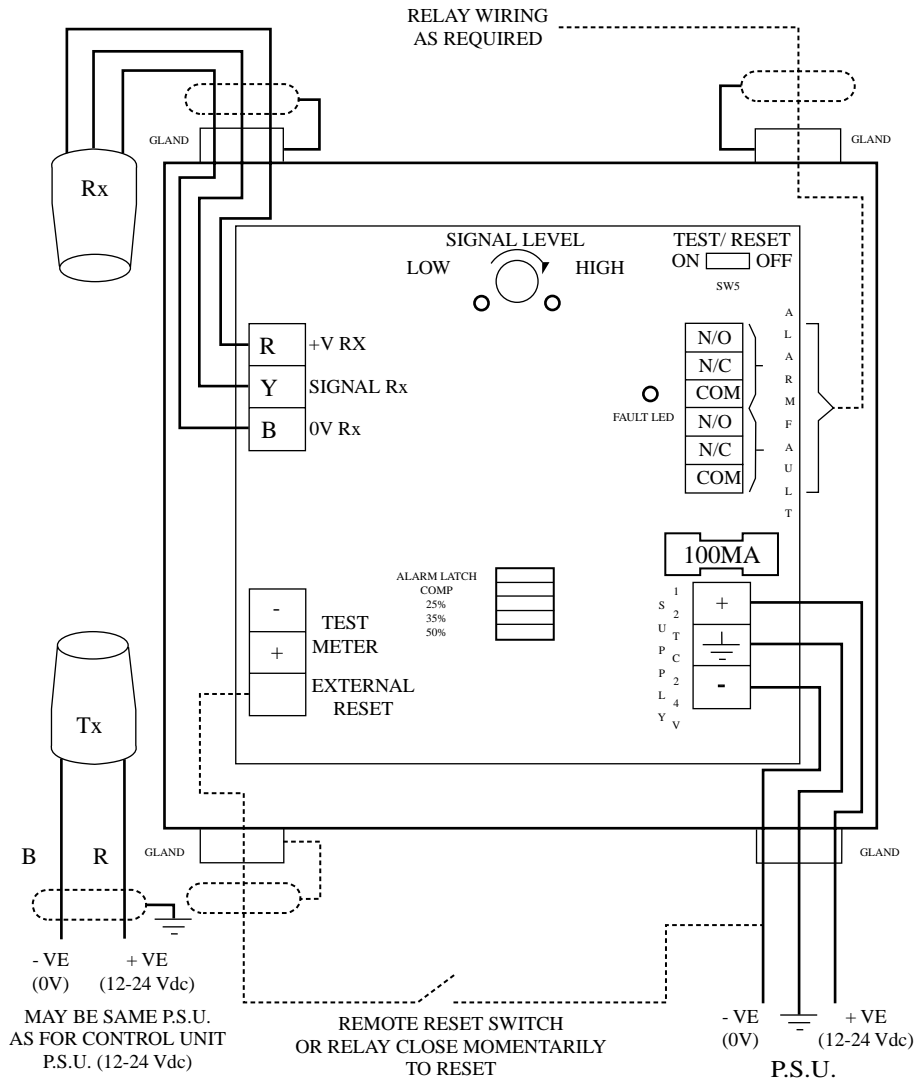
**Fault Indication**

Causes of FAULT alarms

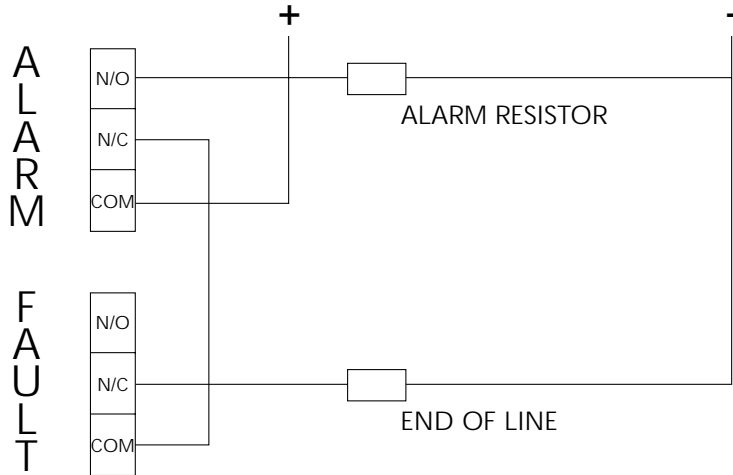
- The Ground level controller being in the RESET mode
- Infra-red beam being reduced in signal strength by more than 93% for more than 10 seconds.
- The AGC reaching the last stage of compensation (see figure 3).
- Loss of power at Ground level Controller or at Transmitter.
- Misalignment resulting in a received low signal.

# Connection and wiring diagram Figure 1

Good quality screened cable or MICC recommended for all wiring except control unit to P.S.U. earth must not be omitted screen of cable should terminate at glands. Do not use pigtails (All junction box's should be metal)



**Figure 2**  
**Typical single zone wiring**



This diagram is 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' (EOL).

**Figure 3**  
**Fireray Selectable Options**

SWITCH	SWITCH OPEN	SWITCH CLOSED
<b>ALARM LATCH</b>	Fire relay will auto - reset *	Fire relay will latch into Fire
<b>COMP</b>	For BS 5839PT 5 leave open * At the last AGC stage the Fireray will signal a Fault, but in the event of any further signal loss reducing the signal to the selected sensitivity level, a Fire alarm will be signalled.	The Fireray will at the last AGC gain stage signal a Fault. This will inhibit the Fire relay.
<b>25%</b>		<b>25%</b> Alarm sensitivity selected
<b>35% *</b>		<b>35%</b> Alarm sensitivity selected
<b>50%</b>		<b>50%</b> Alarm sensitivity selected

NOTE: Select ONE alarm sensitivity level only.

\* Factory Default Settings.

**Technical Data**

- DC Supply (at the Detector) 11.5 to 28 volts
- Quiescent current <13mA
- Alarm current <20mA
- Operating temperature -20° to 55°C
- Tolerance to Beam misalignment at 35%: Tx +/-1°; Rx +/-4°
- Fire alarm thresholds 1.25dB (25%) 1.87dB (35%) 3.0dB (50%)
- Optical wavelength 880nm
- Max. Sizes: Control Unit 215x265x88mm; Heads with Brackets 83x115x135mm
- Weight: Control Unit 1060gms; Heads with Brackets 650gms

**Service/Application Notes**

- For full compliance with BS5839 Pt.5, use 25% and 35% thresholds. 50% threshold is recommended for hostile environments.  
Contains ESD sensitive devices
- Operating range 10 to 100 metres
- Alarm and Fault indication by voltage free change over relay contacts
- Receiver up to 100 metres cable run from Ground level Controller
- Transmitter and Controller may be powered from separate/common supply
- Alarm relay may be latching or non latching
- Finish White IP50

**Parts List**

- Transmitter with a clear lens
- Receiver with a dark lens
- Ground level controller
- 2 Angle brackets with 4 bolts and washers
- Test Card

6/00

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