PERTRONIC INDUSTRIES LTD

INSTALLATION NOTE

Fireray One Beam Detector

Overview:

The Fireray One is a long range beam detector designed to protect open areas. The system comprises an infra-red transmitter/receiver unit and a reflector. Smoke entering the area between the detector and the reflector causes a reduction in the beam's intensity. When the obscuration reaches the alarm threshold (set in the transmitter/receiver unit), the detector will generate an alarm signal.

If the beam is completely blocked the detector will generate a fault (or defect) signal.

Slow changes in the obscuration due to a build-up of dust or dirt on the detector lens and/or reflector are automatically compensated by electronics in the detector. When the compensation limit is reached, the detector will indicate a fault (defect) indicating that the lens and reflector need to be cleaned.

Fireray One Beam Detector and Reflector

The Fireray One incorporates an auto-alignment system to simplify installation as well as a manual alignment system. The Fireray also compensates for natural shifts in alignment caused by movements in the building.

For interfacing to Analogue Addressable Fire Panels, the Pertronic Fireray Loop Interface (FRLI) board and M210EA-CZR module are required (Order separately).

For interfacing to Conventional Panels, the Pertronic Fireray Conventional Zone Interface (FCZI) board is required. (Order separately).

Features:

- Detection range up to 50m (or 50-120m with Reflective Long Range kit)
- Can be installed by one person
- Automatic (laser assisted) or manual alignment of detector and reflector
- Two voltage-free contact output relays - Alarm and Fault. Relay ratings: 0.5A @ 30 VDC
- Four alarm response thresholds – 25%, 35% (default), 55% and 85%
- Automatically compensates for the build-up of contamination on the optical surfaces, high levels of sunlight and artificial lighting, and misalignment of the beam through building movement
- System status LEDS – Normal (Green flashing LED), Alarm (Red flashing LED), and Fault (Yellow flashing LED)
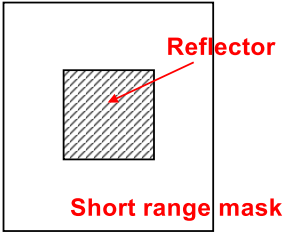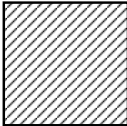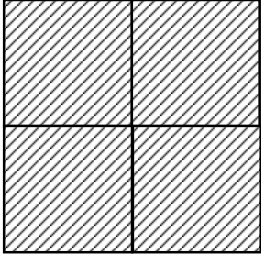- Individually addressable by the fire panel

Specifications:

	Product Code	Description
Electrical	Operating Voltage Range	14 V dc to 36 V dc
	Operating Current	5 mA (max)
	Current - Fast Alignment mode	33 mA
Optical	Beam wavelength	850nm, near infra-red
	Alignment laser	650nm visible (Class 3R <5mW)
	Separation Distance (Detector/Reflector)	5 to 50 m 50 to 120 m with reflective long range kit
	Beam Alignment	Laser assisted auto-alignment, manual alignment
	Beam path clearance	1 m in diameter from the centre line between Detector and Reflector
	Max angular alignment range	± 4.5 Degrees
	Compensation	Building movement, contamination, light cancelling
Mechanical	Dimensions (H x W x D)	Detector 130 x 181 x 134 mm (W x H x D) Reflector (single) 100 x 100 x 10 mm (W x H X D)
	Weight	Detector 700 g Reflector 100 g
Field Wiring	Maximum Wire Size	2 core, 0.5 to 1.6 mm (22 to 14 AWG)
	Cable entry	3 knock-out locations (M20,1/2 in or 3/4 in glands) 4 drill-out locations (<21 mm glands)
Environmental	IP Rating	IP 55
	Operating Temperature	-20°C to 55°C
	Humidity	0% to 93% Relative Humidity, non-condensing or icing
User Interface	Alignment status	2 Green LEDs, 1 Yellow LED
	System status	Normal - Green LED, flashing every 10 secs Alarm - Red LED, flashing every 5 seconds Fault - Yellow LED, obscuration, flashing every 10 seconds contamination, flashing every 5 seconds
	Alarm response thresholds	25% - fast response to smoke 35% - default 55% - High immunity to false alarms, slow response to smoke 85% - Highest immunity to false alarms, slowest response to smoke
	Delay	To alarm – 10 seconds, for momentary partial obstruction of beam path To fault - 10 Seconds, for momentary obstruction of beam path

Installation:

- The detector must be installed in accordance with the relevant standards (For example AS1670.1, AS1670.12, AS1603-7, AS7240-12, NZS4512, ISO7240). These standards define where beam detectors can be located, their distance from walls, height from the ceiling/roof, maximum distance between beams and so on
- Do not position the detector where personnel can enter or physical obstructions are in the beam path
- Do not install the detector or reflector in environments where condensation or icing are likely to occur
- Beam detectors are usually mounted with the beam parallel to the ceiling. Position the detector and reflector as high as possible. Ensure that the distance from the detector/reflector to the ceiling is greater than 0.3m (see diagram below)
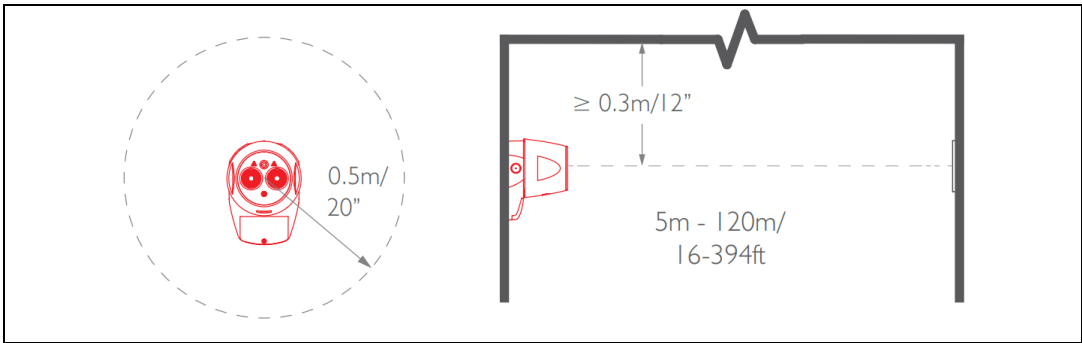

- Do not mount the reflector onto reflective surfaces
- Ensure the detector is mounted on a solid surface such as a structural wall or girder that is not expected to experience vibration or movement over time.
- Ensure the correct reflector configuration is selected for the appropriate distance (see table below)

Distance	5m to 20m	20m to 50m	50m to 120m
Number of reflectors	1	1	4
Number of short range masks	1	0	0
Reflector mounting			

Mounting the Detector:

- Mark and drill holes for mounting the base

- Mount the base using 2 screws
   Hole spacing: 86mm
   Hole size: 6mm (1/4in) diameter

Detector Base
Mounting Screw
Mounting Screw

- Plug the cable from the detector head into the PCB connector

Detector base
Connector
Note plug orientation
Detector head
Detector head cable

- Locate the detector head on the base

- Grip the sides of the detector head and rotate clockwise until the 'Dip' (green circle) and 'Pip' (red circle) align as shown in the blue circle

Rotate

- Remove the User Interface door to expose the interface PCB

- Note the door should remain attached to the base by a tether

Laser window
Detector Status indicator
Door mounting screw
User interface door
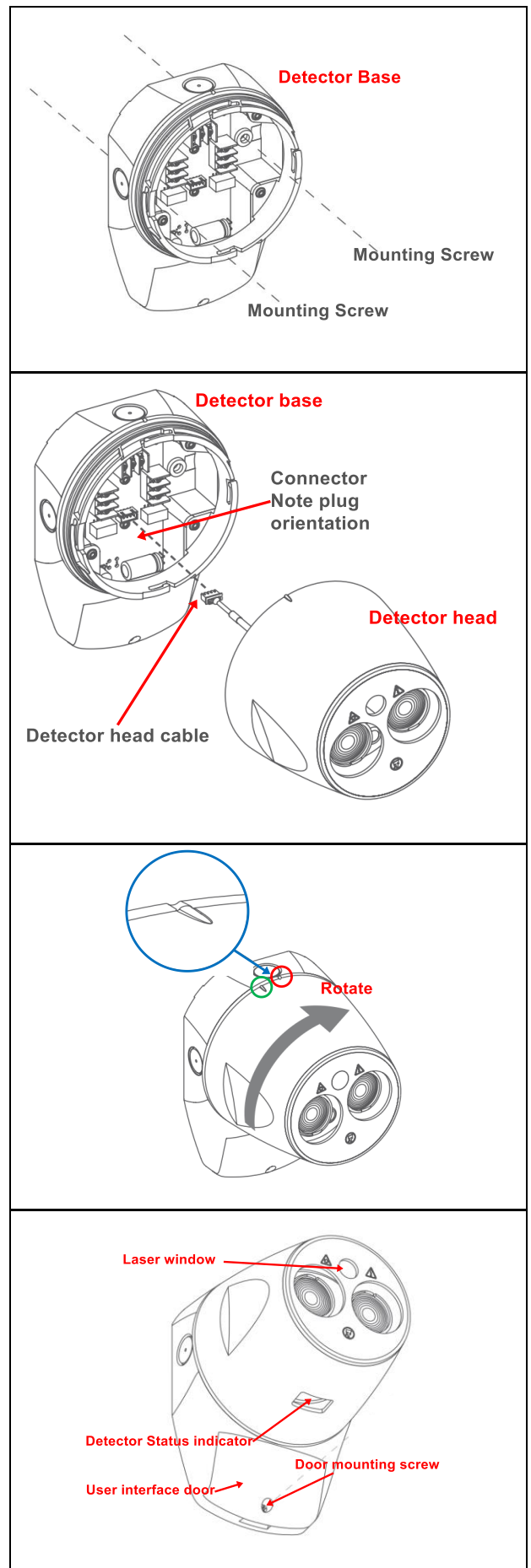
Connections:

1. Interfacing to Analogue Addressable System

The Pertronic Loop Interface (FRLI) allows a FRONE to be powered from the analogue addressable loop (Figure 1) using an M210EA-CZR single input conventional zone module.

Note: the M210EA-CZR is NOT a NZS4512 compliant conventional circuit but is suitable as an analogue addressable interface.

Fault and Alarm relays from the FRONE are signalled to the M210EA-CZR via the two resistors.

470R resistor across the circuit puts the M210EA-CZR into Alarm.

Loss of the EOL 3K9 resistor across the circuit creates a defect.

Loss of power to the FRONE will also create a defect, as the Fault relay is held on.

Resetting a Latched Alarm on the M210EA-CZR will pull the EXT RST line on the FRONE momentarily to 0V to reset the FRONE Fire Relay back to Normal.
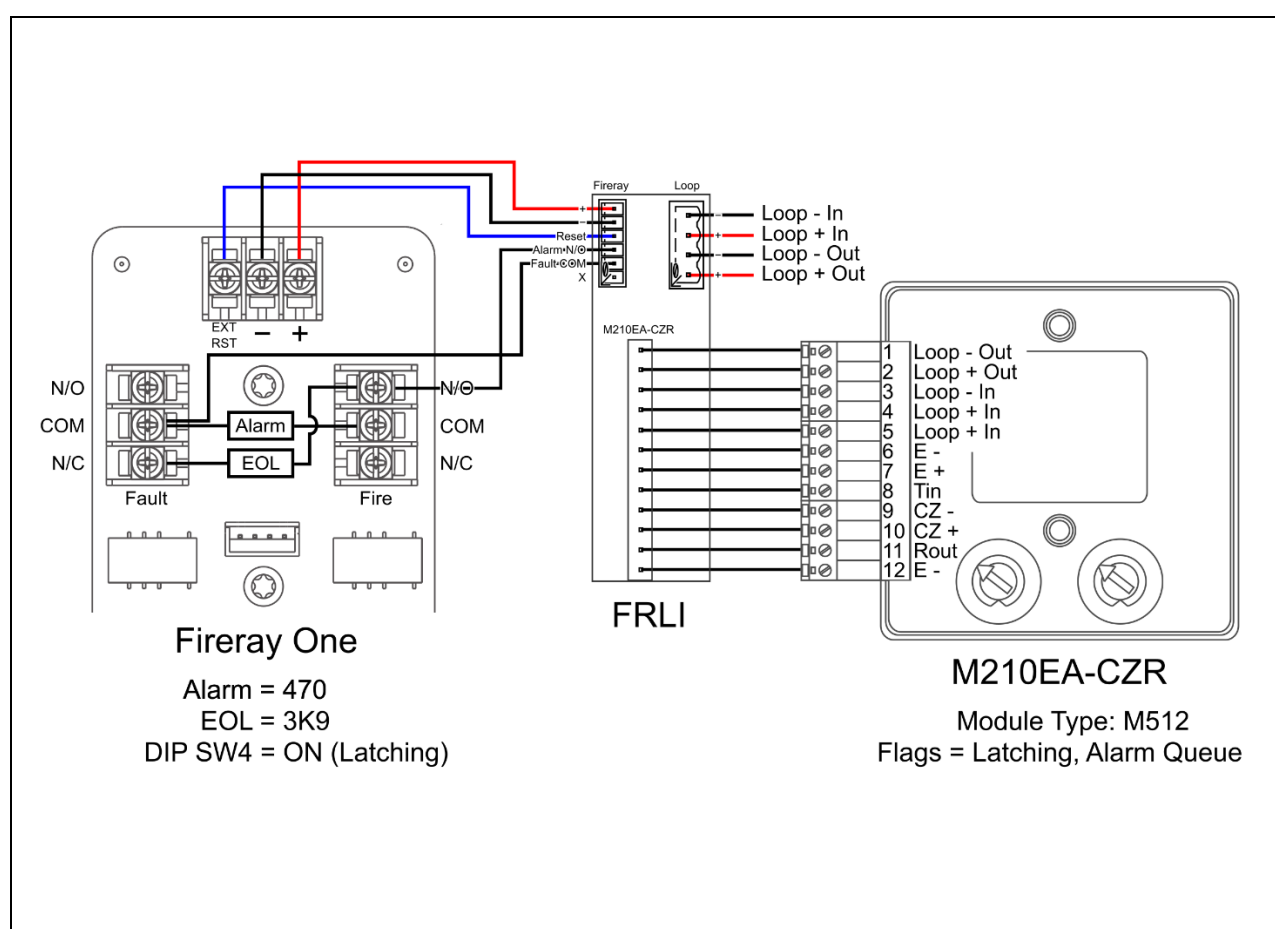

Figure 1: Interfacing a Loop Powered Fireray to an Analogue Addressable Circuit using a Pertronic FRLI Board

2. Interfacing to a Conventional Circuit using the FRCZI board

The Fireray Conventional Zone Interface (FRCZI) is a supplementary board that connects directly to the connectors inside the Fireray's detector base as shown in Figure 2. The FRCZI operates from 24Vdc, sourced from either the panel's supply or from an independent isolated external power supply.

FRCZI board

Fireray base without the FRCZI board inserted

Fireray base with the FRCZI board mounted. Use the 9 M2.5 screws to secure the FRCZI board to the Fireray base PCB.
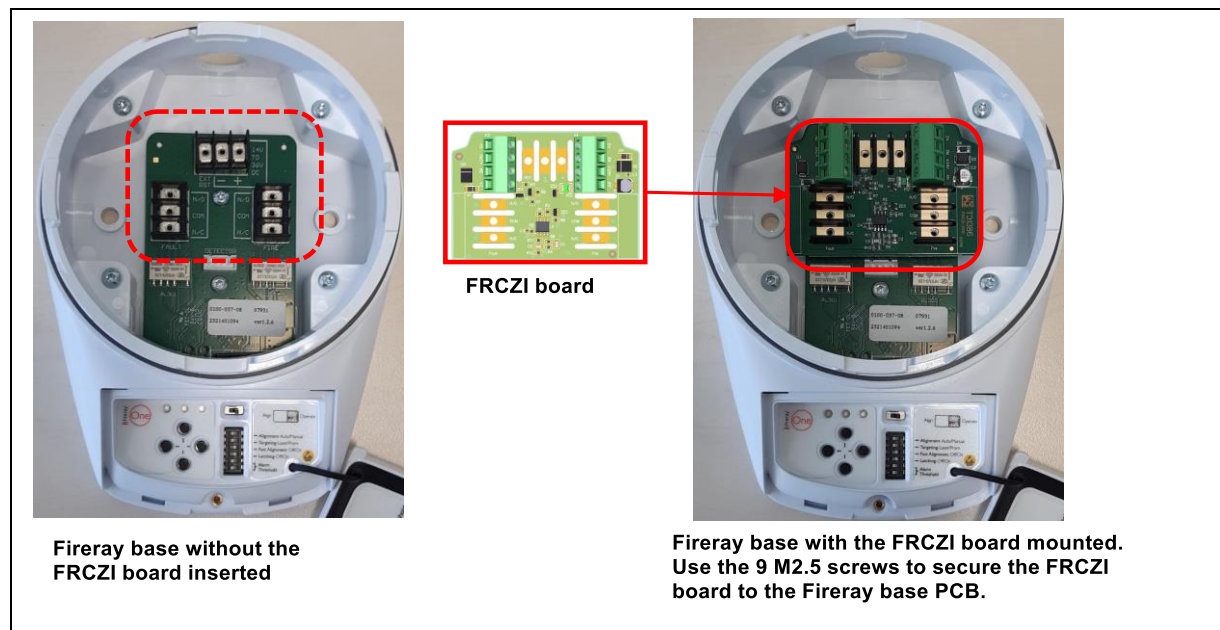
Figure 2: The FRCZI is mounted inside the Fireray's base, connecting directly with the Fault, Fire and Power connectors.
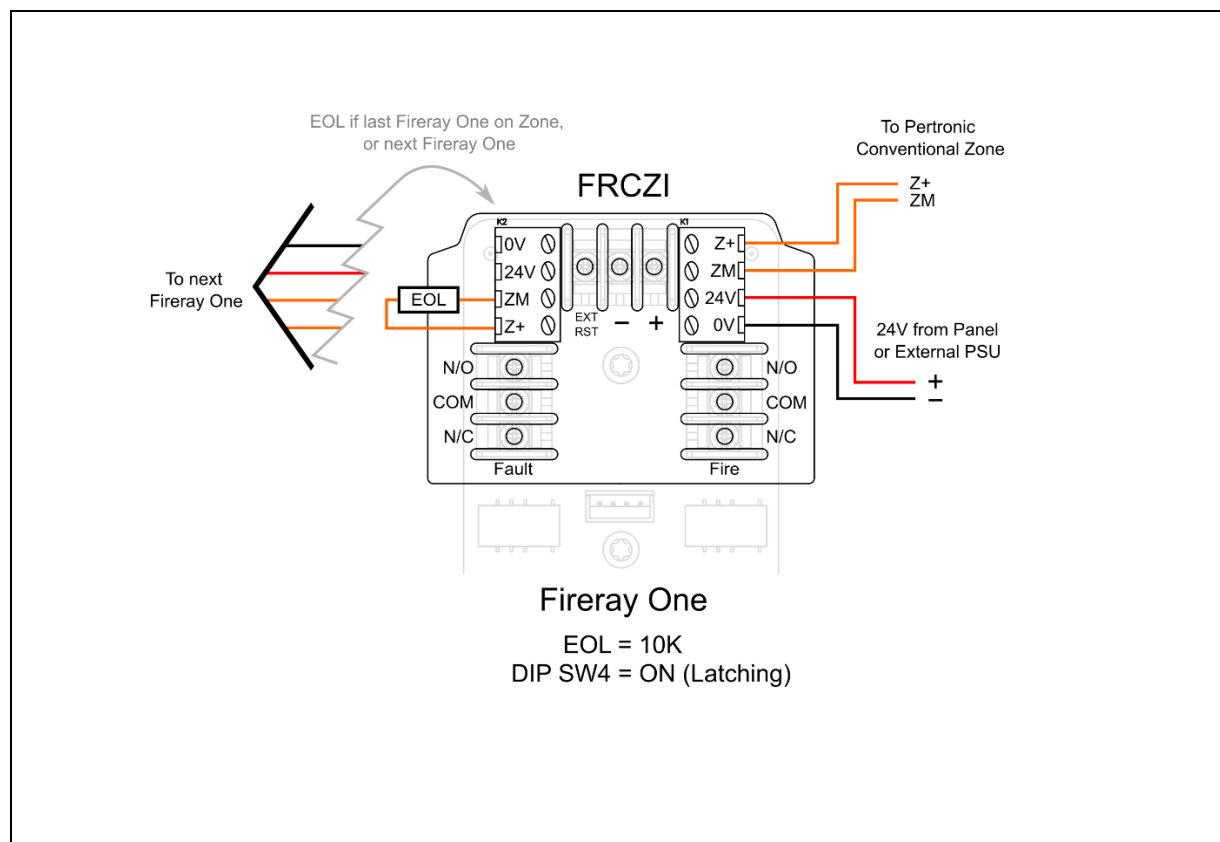

Figure 3: Connecting the Fireray to a Conventional Circuit using the FRCZI board
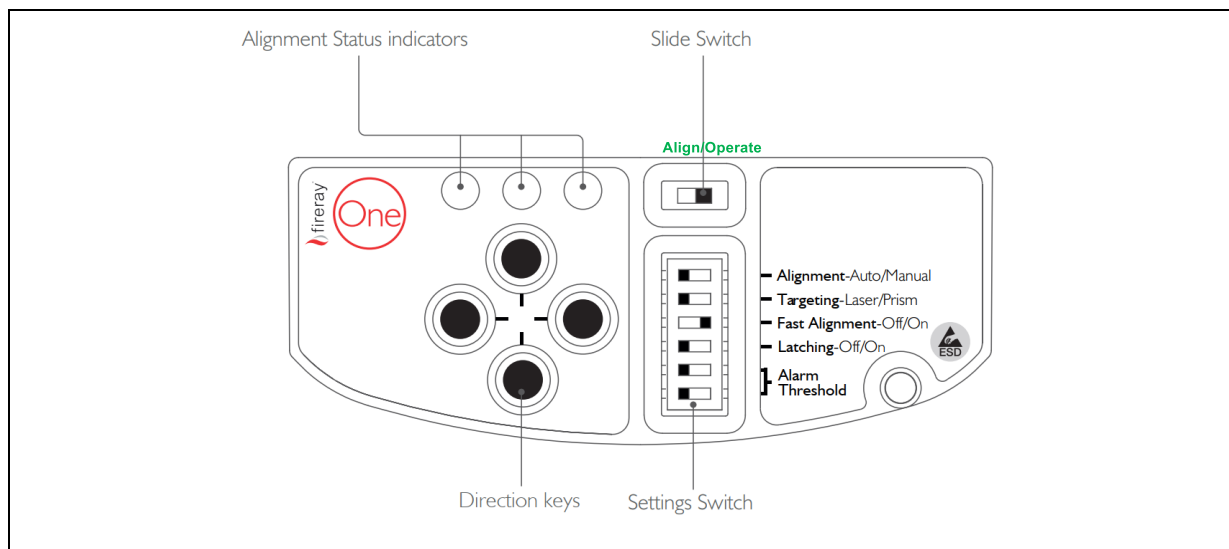
User Interface

Figure 4: User Interface

Fast Alignment

1. Targeting

Setting Switch

- Set Alignment switch (SW1) to Auto (Left)
- Set Targeting switch (SW2) to Laser (Left)
- Set Fast Alignment switch (SW3) to ON (Right)

Align/Operate Switch

- Set Align/Operate switch to Align (Left).
    This turns the laser on.

    WARNING:

    Direct viewing of the laser beam could be hazardous to the eyes.

- Use the direction keys to move the laser point onto the Reflector
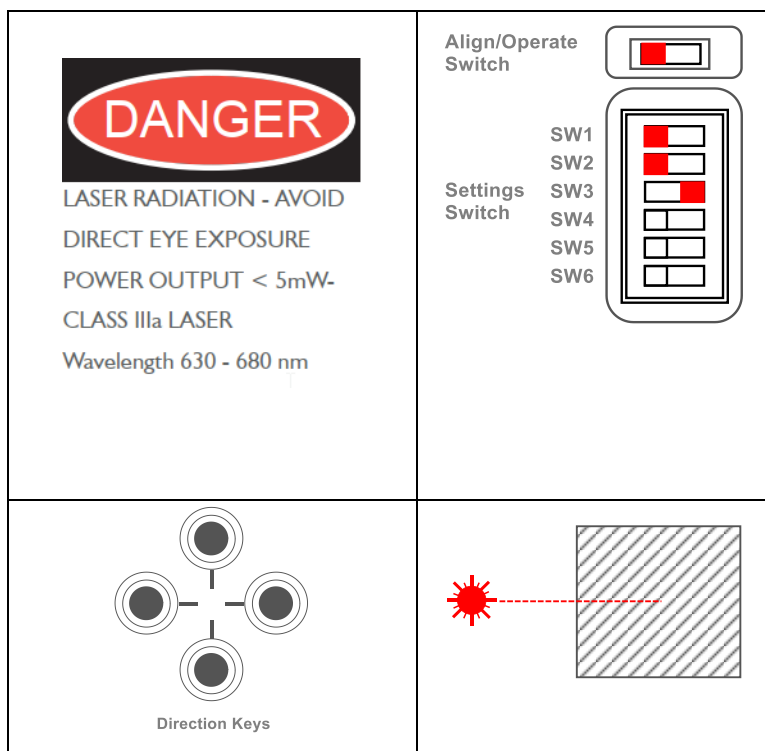
2. Alignment

- Move the Align/Operate switch to Operate (Right)
    The automatic alignment process will begin
- The Alignment Status LEDS show
    - The Alignment process is occurring (flashes green)
    - Indicate which of the 4 stages the Alignment process is in (pulses green)
    - If alignment has failed (flashes yellow)
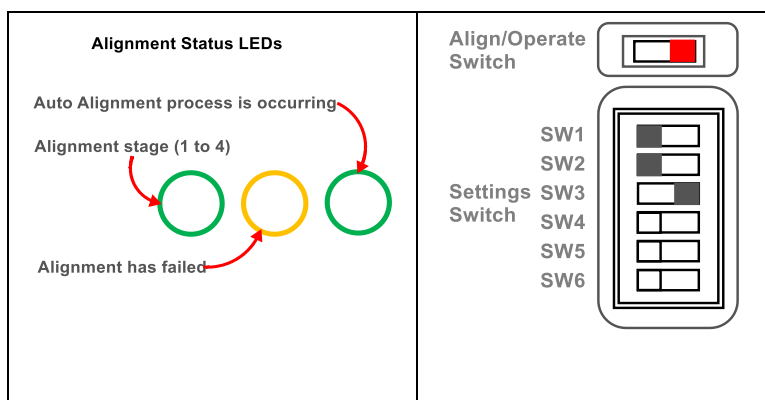
Successful Alignment

If the alignment process was completed successfully:

- The green Alignment LED (right) will flash for 10 seconds
- Fire and Fault relays will open
- Detector's status LED will flash green once every 10 seconds
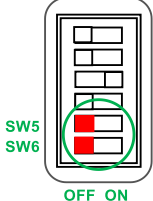
Unsuccessful Alignment

If the alignment process was not successful, check,

- Correct number of reflectors have been installed
- Correct beam clearance
- No reflective surfaces around or close to beam path

Settings:

1. Threshold Selection

Select the threshold for the installed distance

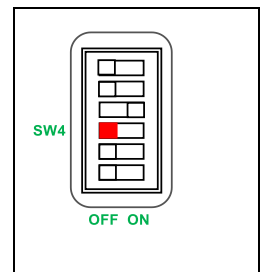| Fire Threshold	SW5	SW6	
25%	ON	ON	
35%	OFF	OFF	
55%	ON	OFF	
85%	OFF	ON	

EN54-12 Threshold Selection

2. Latching Mode

If Latching mode is ON, the Detector will remain in an Alarm condition (i.e latched) after the signal has return to normal.

The latched state can be cleared using

- An External Reset, or
- By removing the power from the detector for at least 10 seconds

Operation

1. Status Indicators

The tricolour Status indicator is located on the underside of the detector head (see diagram above)

Status	Indicator	Description
Normal	Green, flashing every 10 sec	Both the Fire and Fault relays will be in their normal positions
Fault	Amber, flashing every 10 sec	High/Low Fault. Indicates the signal is either too high (re-align the detector) or too low (no or weak reflection) Fire relay normal. Fault relay will change state.
	Amber, flashing every 5 sec	AGC/Compensation. Indicates that the AGC has reached its limit. Clean the detector lens and reflector with a soft lint-free cloth. Fire Relay normal. Fault relay will change state.
	Amber, flashing every 3 sec	Internal Fault. Indicates there is an internal fault with the detector. Contact Pertronic Support. Fire relay normal. Fault relay will change state.
Fire	Red, flashing every 5 sec	Fire relay will change state. Fault relay normal.

2. Fire Test

After installation or cleaning, ensure that a Fire test is performed. This can be undertaken in one of two ways.

- Slowly (greater than 5 seconds) partially cover the reflector. The Detector will indicate Fire after 10 seconds.
- Use the FRTST gradient test filter, to cover the reflector with appropriate obscuration.

3. Obstruction Fault Detection Test

To test the obstruction fault detection, the reflector should be covered quickly (clear to covered in less than two seconds).

- The detector should go into Fault after a 10 second delay.
  - If the detector goes into Fire then it is likely that there are stray reflections entering the detector and preventing the signal from dropping to the fault threshold.
  - This can be overcome by returning to the detector and pressing the Left and Right buttons simultaneously, this alerts the detector that the previously recorded Fire should have been a Fault, allowing the detector to compensate for stray reflections.
  - The detector will flash the green Alignment status indicator LED three times to show that the Set Compensation feature has been activated.
  - This feature can only be used once after the detector is aligned, to repeat.
- Repeating the Obscuration Test should then result in a Fault being indicated
- A Fire Test should then be repeated.

4. Cleaning

The Detector automatically compensates for the build-up of dust by changing its Automatic Gain Control (AGC) level. Once the AGC limit has been reached the Detector will indicate a Fault. Periodically clean both the Reflector and the Detector's two lens windows with a soft lint-free cloth to prevent the AGC reaching its limit. It is possible that after cleaning, the signal strength may have increased above the Too High threshold triggering a Fault. If this occurs, re-align the Detector

Ordering Information:

Analogue Addressable Kit	
Product Code	**Description**
FRONE	Fireray One – (Includes 1 Reflector). For up to 50m detection range
FRLRK	Reflective Long Range Kit (3 additional Reflectors). For 50m to 120m detection range
FRLI	Fireray Loop Interface board. To connect to M210EA-CZR
M210EA-CZR	Analogue Addressable Interface Module
M200E-SMB	Box to house FRLI and M210EA-CZR. To be mounted beside Fireray one
FRTST	Filter Test Kit. Graduated to test from 0% to 100% obscuration

Conventional Zone Kit	
Product Code	**Description**
FRONE	Fireray One – (Includes 1 Reflector). For up to 50m detection range
FRLRK	Reflective Long Range Kit (3 additional Reflectors). For 50m to 120m detection range
FRCZI	Fireray Conventional Zone Interface board to connect Fireray One to a Pertronic Conventional Zone.
FRTST	Filter Test Kit. Graduated to test from 0% to 100% obscuration

Additional Accessories	
Product Code	**Description**
FRACH	Anti-Condensation Heater
FRDAB	Detector Adjustment Bracket
FRPRC	Protective Cage
FRSBB	Surface Back Box

Document Change History:

Issue Number	Reason for Update	Change Note Number	Author
1.0 April 2024	New Document	CN3449	RJK
1.1 June 2024	Adding Fireray Loop Interface Board	CN3492	RJK
1.2 June 2024	Adding Fireray Conventional Interface board	CN3504	RJK
1.3 July 2024	Additional ordering data, error correction	CN3515	RJK/TC
1.4 March 2025	Add Obstruction Fault Detection Test, error correction	CN3720	JG

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