

This training course discusses the FIRERAY5000 Optical Beam Smoke Detector.

It covers what is the FIRERAY5000, how to install, commission, use and maintain it and its specification.



OPTICAL BEAM SMOKE DETECTORS

This training material provides information to assist the Fire System Designer and Installer in achieving a successful Optical Beam Smoke Detector installation.

The appropriate local installation standards and legislation in effect at the time of installation must be adhered to and take precedence over any statements made or implied by this training material.

Fire Fighting Enterprises cannot take responsibility for the installation (beam positioning and mounting), commissioning or maintenance of products.



AGENDA

- WHAT IS **FIRERAY5000**?
- INSTALLING **FIRERAY5000**
- COMMISSIONING **FIRERAY5000**
- USING **FIRERAY5000**
- MAINTAINING **FIRERAY5000**
- TECHNICAL SPECIFICATIONS OF **FIRERAY5000**



OVERVIEW



Motorised Optical Beam Smoke Detector (Reflective)

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH

The FIRERAY5000 is a Reflective, Motorised, Optical Beam Smoke Detector comprising System Controller, Detector Head(s) and Reflector(s).



COMPARISON WITH FIRE RAY 50/100R

- Fireray50/100RV range is the market leading Reflective beam
- Analogue addressable and zone powered versions available
- Comprises transceiver with integrated control unit and reflector(s)
- Transceiver and controller are at high level
- User and Installer familiarity
- Manual adjustment



WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH

FR50/100RV has:

Range 5-50m with one reflector and 50-100m with four reflectors

Fire sensitivity 25, 35 and 50%

Delay to fire 10s

Delay to fault 10s

AGC

Fireray50/100RV utilises mechanical thumbwheels to align at high level

FR5000 has:

Range 8-18m with one reflector and mask, 18-50m with one reflector and 50-100m with four reflectors

Fire sensitivity 10-60% in 1% steps

Delay to fire 2-30s in 1s steps

Delay to fault 2-30s in 1s steps

AGC and AutoOptimise to compensate for building movement

Automatic alignment

A simple, first-fix system

A low-level System Controller

In summary Fireray5000 provides in comparison quick and easy Automatic, motorised alignment from low level and maintenance of alignment with building movement.



COMPARISON WITH **FIRERAY2000**

- Fireray2000 range is the current Projected beam
- Analogue addressable versions available
- Comprises separate transmitter, receiver and low level control unit
- Manual adjustment
- Small heads



WHAT INSTALL COMMISSION USE MAINTAIN TECH

FR2000 has:

Range	10-100m
Fire sensitivity	25, 35 and 50%
Delay to fire	2 – 12s
Delay to fault	2 – 12s

Automatic Gain Compensation for dust and dirt accumulation (AGC)

Test meter point for use during alignment and mechanical clamps to align at high level.

A multiway control unit is available.

In summary Fireray5000 provides in comparison, reflected technology with quick and easy Automatic, motorised alignment and maintenance of alignment with building movement.



WHY USE FIRERAY5000?

- Multi-head capability
- Laser Alignment
- Fast Auto-Alignment
- Auto-Optimise
- 'One-Wire Comms' (Communication-over-power)
- 'First Fix' System
- 'Easy-Fit' 'Second Fix' System
- System Controller Mounted at Low Level



WHAT

INSTALL

COMMISSION

USE

MAINTAIN

TECH

Next-generation technology and new features (motorised beam head allowing Auto-Alignment and compensation for building movement) and uses new technology (modern components, specialist optics & Digital Signal Processing)

One system controller can be fitted with 1, 2, 3 or 4 detector heads

After mounting the Detector head and Reflective prism, the integrated visible laser allows an initial coarse alignment to be easily achieved. This reduces setup time and increases probability of a successful alignment.

Automatic, quick and effective alignment after initial Laser Alignment using motorised head.

Compensation for gradual building movement using motorised head.

The cable between the System Controller and Detector only needs to be a 2-core screened cable as the FIRERAY5000 communicates on the power line. This allows for a large cost saving by using 2-core rather than 4-core cable

'First Fix' enables the bases of both the Detector head and System Controller to be fitted and wired first by the electrician. This means that the actual Detector head and System Controller can be fitted last after any dirt and dusty work in the area has been completed.

After 'First Fix' the Detector head and System Controller can be easily fitted, without tools.

Easy set-up and checking of system at user height, avoiding costly high-access equipment.



WHY USE **FIRERAY5000**?

- Reduced Installation & Commissioning Time & Service Costs
- 5 year warranty
- Designed and fully assembled and tested at FFE Headquarters
- Minimal reflective prisms versus range
- Extensive accessory range
- Multi-language Installation Guide



WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH

All of the previous give a saving in the installation, alignment, commissioning and maintenance time.

Any FIRERAY5000 returned under warranty is replaced with new product without question, provided the fault is due to a manufacturing fault. We conduct full tests to establish and resolve causes of failures, improving product quality.

FFE have full control over product quality and minimising customer lead times.

Needs only 1 reflective prism for 8 to 50m and only 4 prisms for 50 to 100m.

Adjustable brackets, ceiling mount brackets, brackets to hold reflective prisms (surface mount or adjustable), back boxes and trim plates for easy installation in challenging positions.



Fully approved by all the internationally recognised authorities including UL, ULC, VdS, NF (France), CCCF (China) and KFI (Korean).



'OUT OF THE BOX' BREAKDOWN OF PARTS



WHAT INSTALL COMMISSION USE MAINTAIN TECH

The FIRERAY5000 can be broken down into 3 key elements.

The Detector Head.

Transmits and receives the infrared light beam and then communicates the status to the System Controller

The System Controller

Interfaces to the fire panel via the loop/zone wiring of the fire system and indicates the status of the protected area.

The Reflector

Reflects the infrared from the transmitter lens along the same path back onto the receiver lens.

The number of Reflectors required depends on the operating distance.

8 to 18m = 1 Reflectors and supplied Short Range Mask

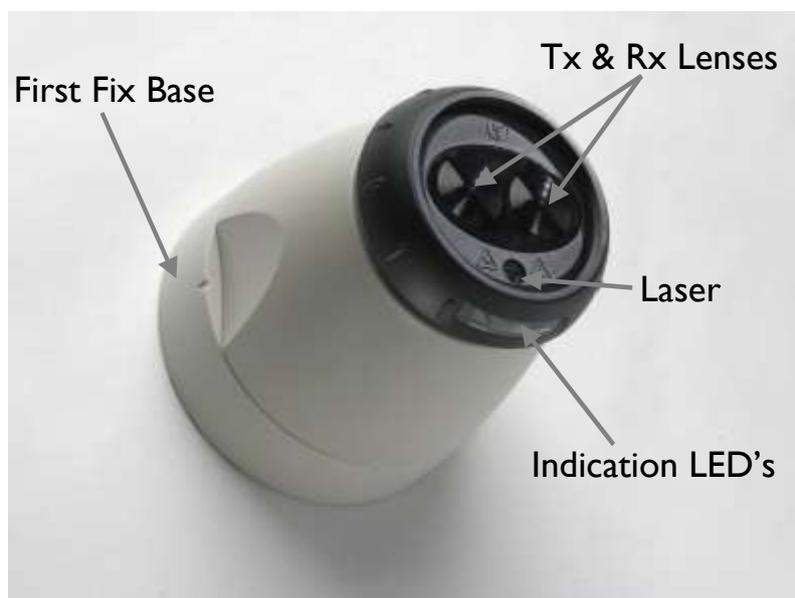
18 to 50m = 1 Reflector

50 to 100m = 4 Reflectors.

Note the additional 3 reflectors required for 50 to 100m operation can be purchased separately as a Long Range Kit.



DETECTOR HEAD



WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH

The Detector head contains the Transmitter and Receiver lenses and circuitry. The transmitter lens collimates the light from the Infrared LED, (IRED), so that it is projected across the protected area in a defined 'conical' shape.

Some of the light that is reflected back from the reflector will reach the receiver lens. This light is focussed down onto the photodiode inside the Detector.

The light energy is then converted into an electrical signal from which the level of obscuration can be determined.

The Detector head makes the decision on fire and fault conditions which it then communicates to the System Controller.

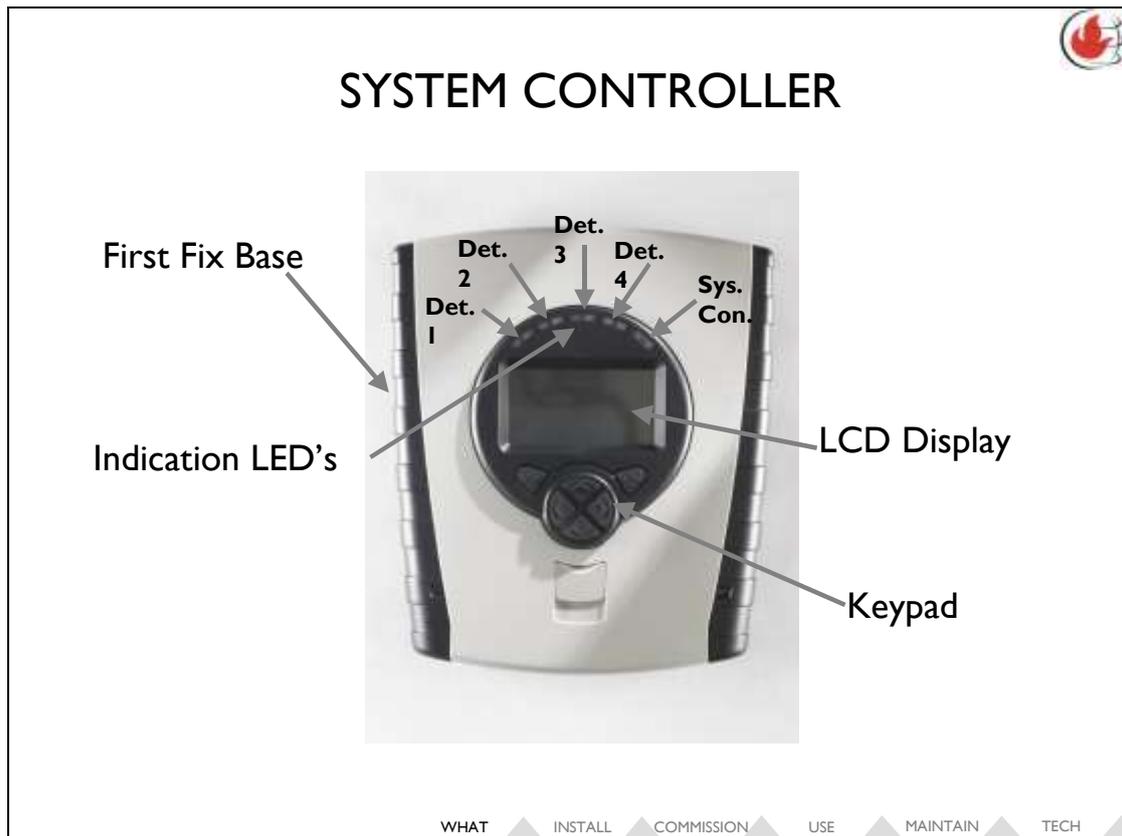
The current state of the Detector is indicated by the indication LED's. Green = OK, amber = Fault, Red = Fire.

Depending on the state of the Detector, the corresponding LED will flash once every 10 seconds.

Only 1 LED will flash at any one given time.

The Detector has an integral laser that allows the user to roughly align the infrared onto the reflector.

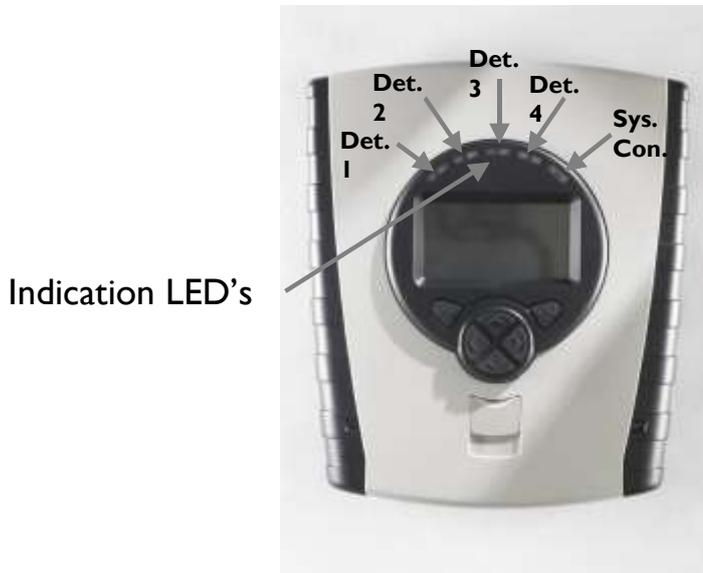
The Detector also consists of the first-fix base that allow the Detector to be easily inserted and removed.



The System Controller is the interface to the fire panel via the zone / loop wiring of the fire system. It allows the user to control all functions of the Detector from low level. This removes the need to access the Detector to change for example the sensitivity level or delay to fire. It also allows the Detector to be aligned from low level. Ideal if Detector access is difficult.

There are 5 indication LED positions on the System Controller. From left to right, the first 4 positions are for the status indication of the four Detectors. The 5th position is for the status of the System Controller.

SYSTEM CONTROLLER LED INDICATIONS



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DETECTOR LED's

The first position is for Detector 1, the second for Detector 2, the third for Detector 3 and the fourth for Detector 4.

The indication LED's for the detector/s are:

Off = OK, amber = Fault, Red = Fire.

SYSTEM CONTROLLER LED

The purpose of the System Controller status LED is to signal the System Controller condition and not the Detectors and therefore not the environment. OK = Green, Fault or Fire = No LED Indication

LED EXAMPLE 1

If Detector 1 has been aligned and is ok and there is nothing wrong with the System Controller then the only LED that will flash is the Green System Controller LED once every 10 seconds.

LED EXAMPLE 2

If Detector 1 has been aligned but is seeing a Fire condition and there is nothing wrong with the System Controller then the Red LED in Detector 1 position will flash once every 10 seconds and the Green System Controller LED will not indicate.

All status LED's will flash once every 10 seconds.



FIRERAY5000 ACCESSORIES



Universal Bracket



4 Prism Plate



1 Prism Plate



Prism Mount Plate



Universal Bracket
in use



Detector cage



System Controller
cage



Reflective
Prism



Universal Ceiling
Mount



Controller Back
Box



Trim Plate for
Controller Back Box



Detector Back
Box



Cover Plate for
Detector Back Box

WHAT INSTALL COMMISSION USE MAINTAIN TECH

Key accessories are:

Universal Bracket

4 Prism Plate

1 Prism Plate

Prism Mount Plate

Detector and System Controller cages

Reflective Prism

In addition there are:

Universal Ceiling Mount

Controller Back Box

Trim Plate for Controller Back Box

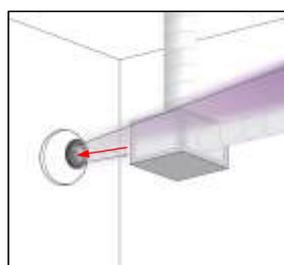
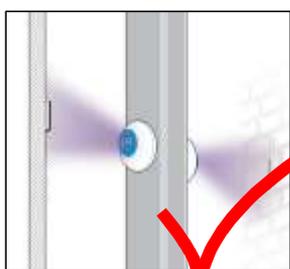
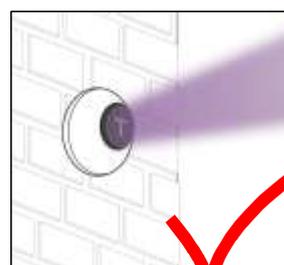
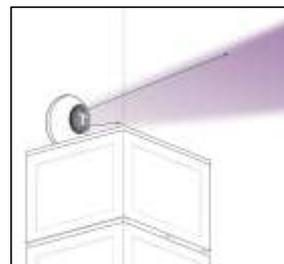
Detector Back Box

Cover Plate for Detector Back Box



INSTALLATION FUNDAMENTALS

- Clear line of sight
- Rigid mounting
- Reflections and obstructions
- Crosstalk
- Light sources and other challenges



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In order to avoid unwanted Fire or Fault signals, keep a diameter of 1m along the infrared beam axis clear of obstructions at all times.

Optical Beams must be mounted on stable surfaces to limit misalignment due to movement of the building. If there is only one stable mounting surface available, the Reflector of a Reflective system should be mounted on the less stable surface as it tolerates misalignment better. Secure and rigid metal-frame assemblies should be used when it is not possible to mount directly onto a suitable surface.

For a Reflective Optical Beam, objects close to the line of sight can reflect the Infrared beam possibly leaving some of the area unprotected.

An obstruction during alignment would make a Reflective or Projected Optical Beam difficult or impossible to align. Movement of obstructions in the line of sight of an installed Optical Beam can cause false alarms. The positioning of Optical Beams should be assessed for any activity that may cause a blockage during operation.

Confirming correct alignment with cover up tests of the reflector (of Reflective beams) is a sound way of ensuring the whole area is protected.

Optical Beams should be positioned to avoid Infrared emissions from other Optical Beams falling on the Receiver. This can cause false Fire or Trouble (Fault) conditions.

Avoid mounting Receivers or Reflectors back to back, instead mount transmitters back to back. Saturation by strong Infrared light sources, such as the sun, is a problem for all Optical Beam Smoke Detectors. An Optical Beam, just like the human eye, cannot tolerate strong, direct sunlight down the Receiver path. Standard incandescent lamps, sodium lamps and camera photoflash sources may contain IR, however normal fluorescent lamps emit very little infrared light.



INSTALL AN OPTICAL BEAM SMOKE DETECTOR



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Mounting onto surfaces such as purlins or cladding may result in the alignment of the beam being compromised. This is because these surfaces can move with heat or vibration.

The mounting method must also be rigid.

The photo on this slide shows a Fireray2000 mounted onto the purlins (non rigid) also with a poor mounting method.



EXCERPT FROM STANDARDS

BS5839:

“Transmitters, Receivers and any Reflectors should be mounted on solid construction that will not be subject to movement, likely to affect the alignment of the optical beam, as a result of changes in temperature or imposed load”

UL:

“Projected beam-type detectors and mirrors shall be mounted on stable surfaces to prevent false or erratic operation due to movement.”



INSTALL AN OPTICAL BEAM SMOKE DETECTOR



WHAT INSTALL COMMISSION USE MAINTAIN TECH

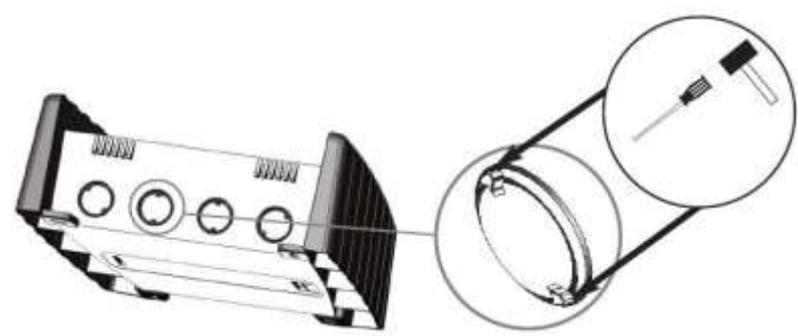
The correct method is to mount onto a rigid, structural surface of the building such as the I-beam (RSJ), etc).

A rigid mounting method must also be used such as metal framing.

This slide shows a good mounting surface and fixing method.



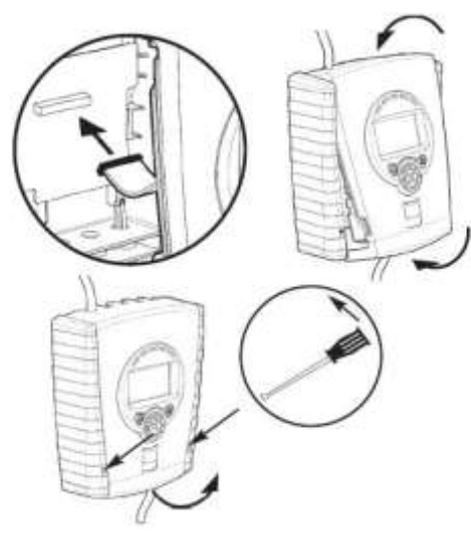
KNOCKOUTS



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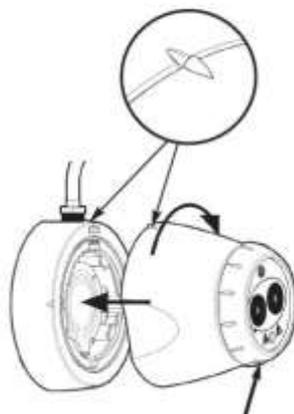
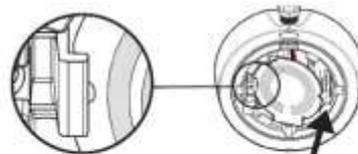


FITTING AND REMOVING SYSTEM CONTROLLER FRONT





INSTALLING DETECTOR



LED indicator must face downward

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With the Detector first fix plastics securely mounted to a suitable, structural surface:

Wire into the first fix PCB

Locate PCB into the square edge locating connector of the first fix plastics

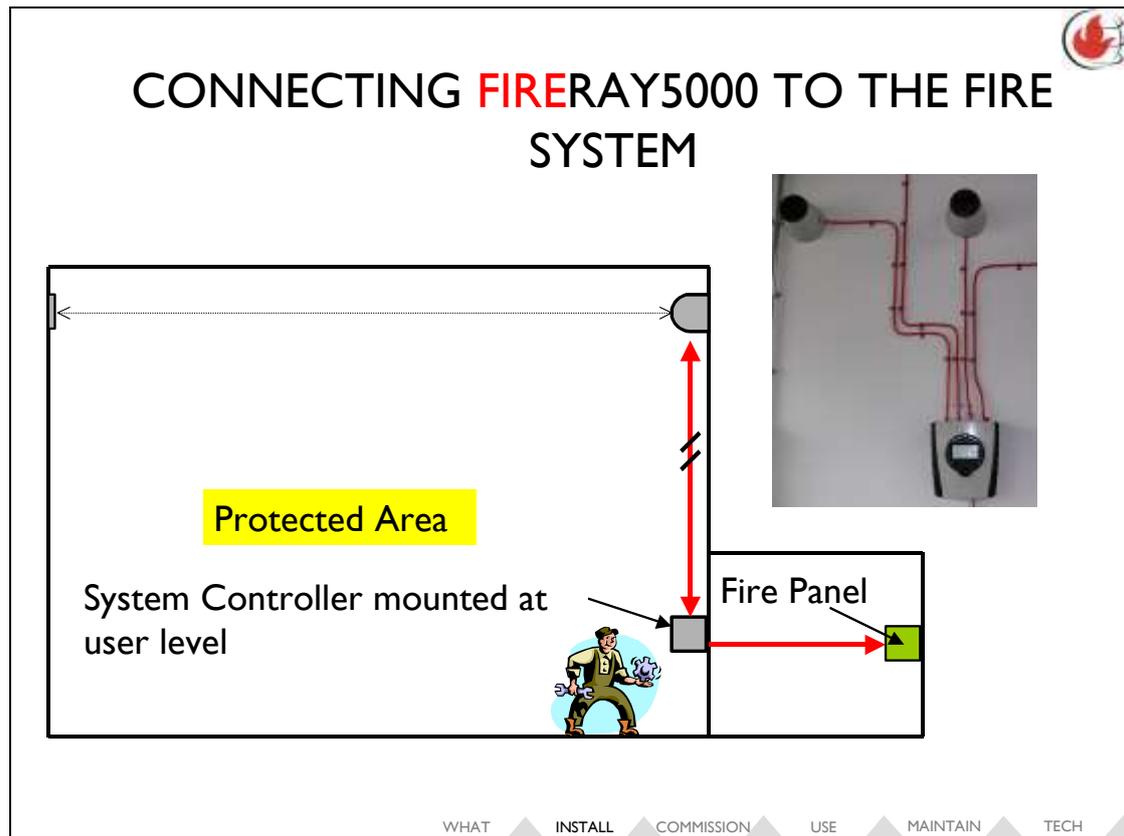
Push and click the other side of the PCB into the first fix plastics.

Offer Detector head to the first fix plastics

Rotate clockwise until click

Ensure that the indication LED's are facing downwards

CONNECTING FIRERAY5000 TO THE FIRE SYSTEM



Shows detector mounted at high level.

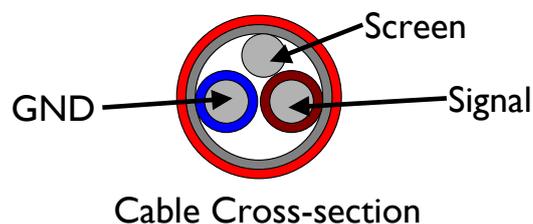
Shows 2-core dedicated, fireproof, screened cable (1 to 100m) between detector and system controller.

Cable to fire panel dependent upon fire panel manufacturer's/system designer's recommendations



CABLE TYPE

- Cable gauge: 0.5 to 1.5mm diameter
24 to 14 AWG
- Dedicated, screened (shielded), fireproof, 2-core cable between the System Controller and Detector
- Cable distance between System Controller and Detector: 1m to 100m



WHAT INSTALL COMMISSION USE MAINTAIN TECH

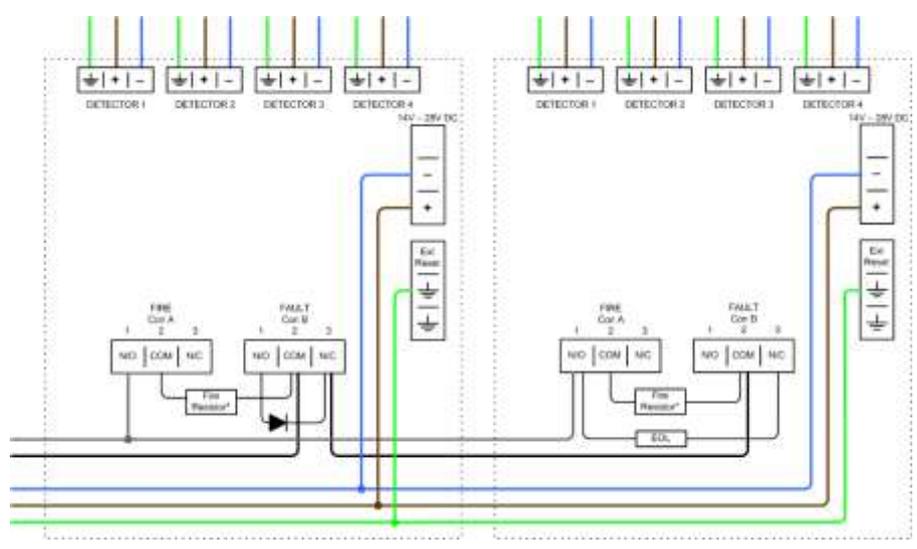
The FIRERAY5000 can accept cable sizes between 0.5 to 1.5mm diameter (24 to 14 AWG). Correct termination into the System Controller and Detector first fix PCB's cannot be guaranteed outside of these sizes.

A dedicated 'screened' fireproof cable must be used between the System Controller and Detector. Performance cannot be guaranteed if this cable is not screened or if there are other signal or power lines within the cable.

The cable distance between the System Controller and Detector can be between 1 to 100m so long as the previous two points have been adhered to.



ZONE WIRING



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Zone wiring – sometimes called a ‘Conventional’ system. Refer to user guide for full details.

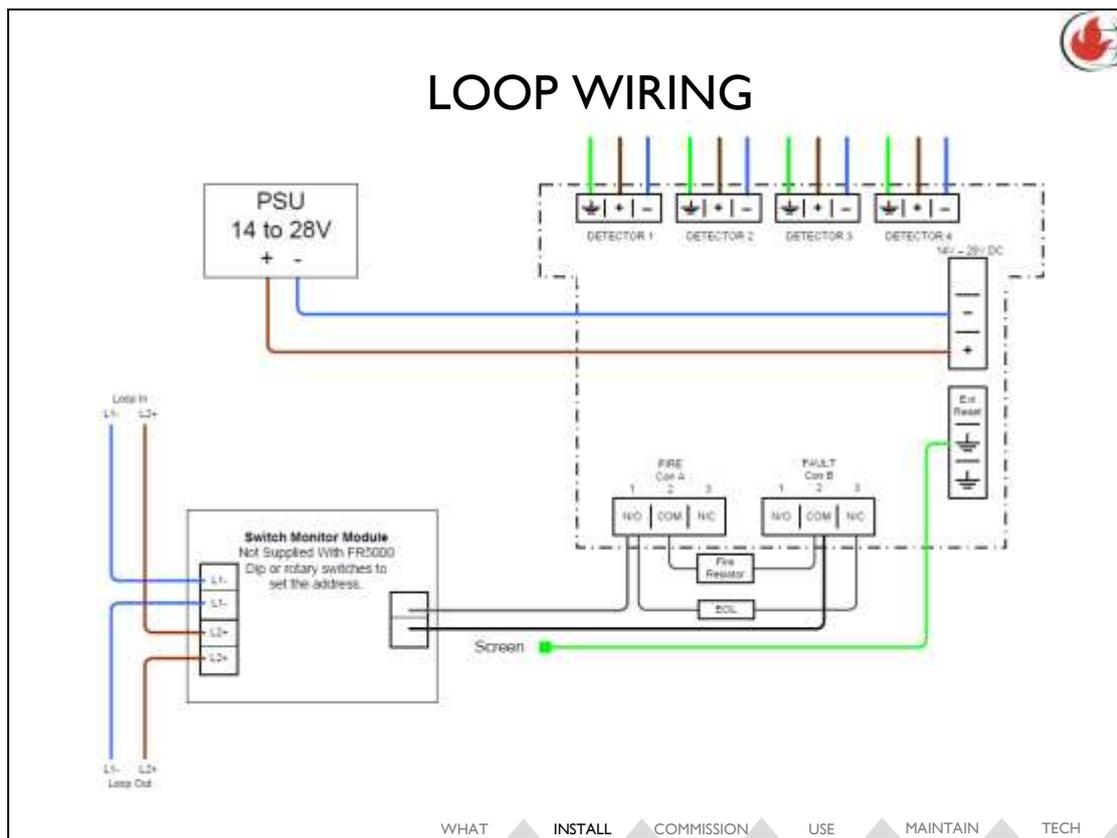
Note: External PSU, end-of-line device (EOL device), and fire resistor are not supplied by Fire Fighting Enterprises. The EOL and fire resistor are specified by the fire panel manufacturer.

The power supply should be able to supply a minimal current of 10mA to power a FIRERAY5000 system with one detector head (between 14 to 28v DC), although 50mA will allow for a quicker setup. An additional 2mA per head is required e.g. 16mA for a four-head system.

Power should not be applied until all wiring to, and fixing of, System Controller has been completed.

A complete fire and fault test of the FIRERAY5000 should be conducted to ensure correct wiring to the fire panel.

Note: Relays are closed when system is in normal operation without fault or fire condition.



Loop wiring – sometimes referred to as ‘analogue addressable’ system. The detector address is set by adjusting dip or rotary switches within the protocol interface card. Note: External PSU, protocol interface card, end-of-line device (EOL device), and fire resistor are not supplied by Fire Fighting Enterprises. The EOL and fire resistor are specified by the fire panel manufacturer.

The power supply should be able to supply a minimal current of 10mA (between 14 to 28v DC) to power 1 FIRERAY5000, although 50mA will allow for a quicker setup. Power should not be applied until all wiring to, and fixing of, the System Controller has been completed.

The protocol interface card should be chosen for the desired loop protocol.

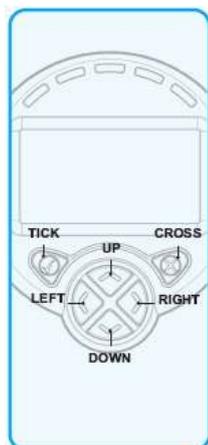
A complete fire and fault test of the FIRERAY5000 should be conducted to ensure correct wiring to the protocol interface card.

Note: Isolators may be required either side of the protocol interface card to comply with local codes of practice.

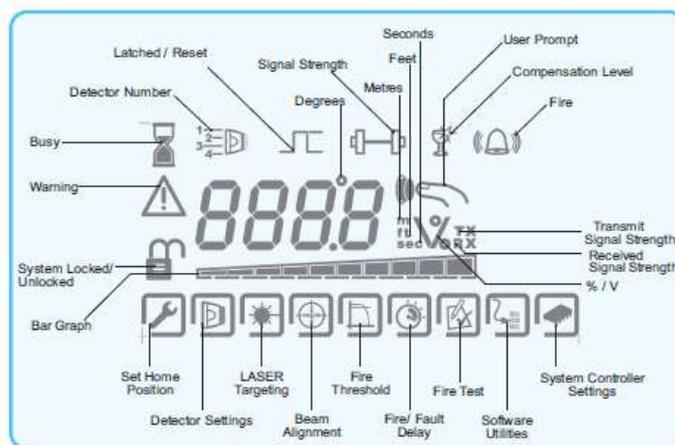


INTERFACE & DISPLAY

Keypad



LCD Display



WHAT INSTALL COMMISSION USE MAINTAIN TECH

The FIRERAY5000 uses a custom LCD display and keypad to interface and control the functions and settings of the system. The display provides a quick, clear indication of the system settings and status without being language specific. The keypad is used to scroll through the menu structure and change system settings. The 'tick' button will accept a settings change, enter the next level of the menu or select a function. The 'cross' button will cancel a settings change, return to the previous menu or exit a function.



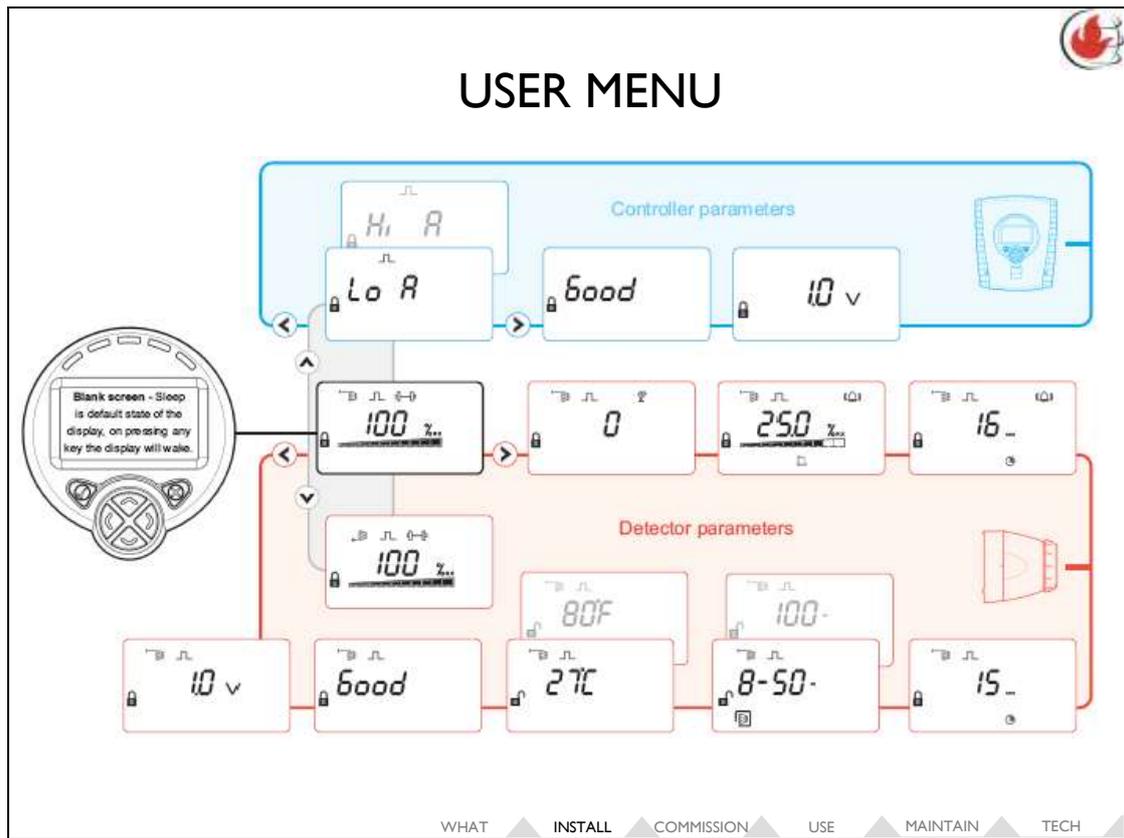
MENU STRUCTURE

- User Menu
 - Indicated by locked padlock on LCD
 - Accessible by anyone
 - Displays system status and settings
 - System settings cannot be changed
- Engineering Menu
 - Indicated by un-locked padlock on LCD
 - Pass code protected
 - Displays system status and settings
 - System settings can be changed

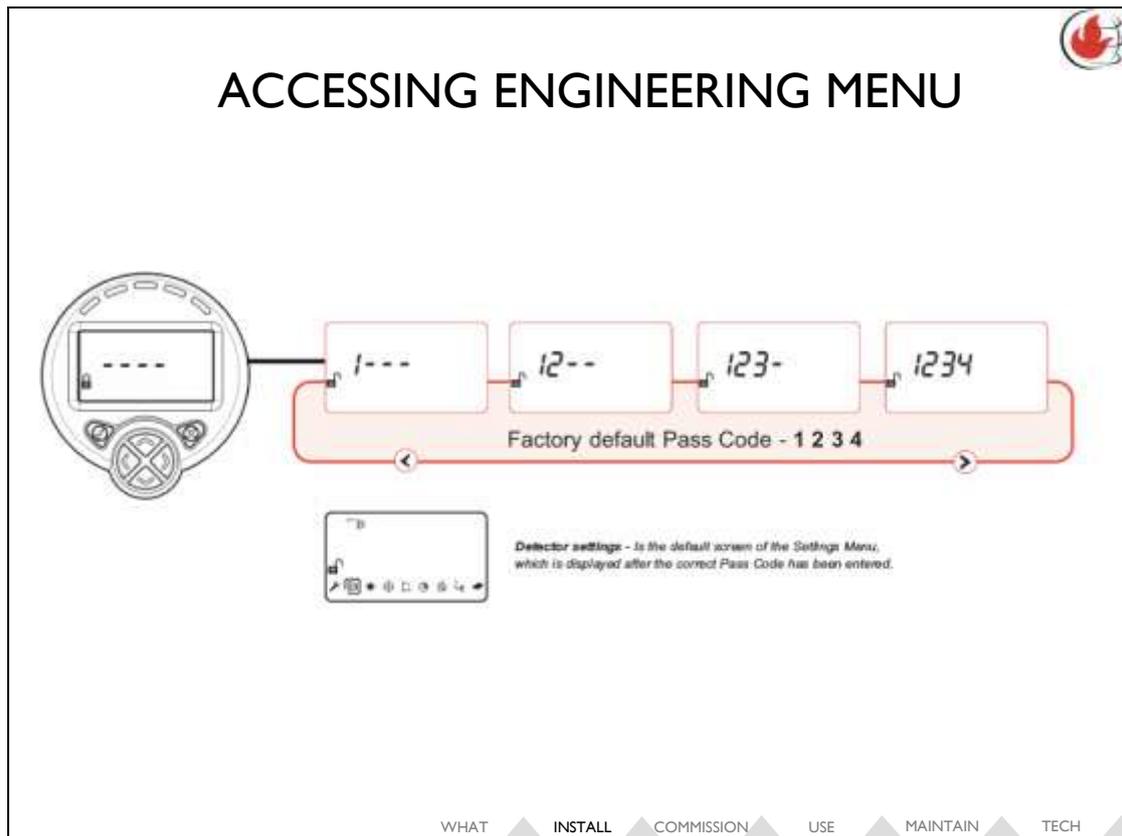
WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH ▲

The FIRERAY5000 has two levels of access: User Menu and Engineering Menu. The User Menu can be viewed by anyone as a means of viewing the settings and status of the system.

The Engineering Menu needs to be accessed with a pass code, thus restricting who can align the beam and change the system settings.



The User Menu can be viewed by anyone. Settings cannot be altered in this Menu. Pressing the Up/Down keys will cycle through the Detector(s) and System Controller. Pressing the Left/Right keys will cycle through the System Controller or selected Detectors parameters.



The Engineering Menu must be accessed to align the FIRERAY5000 or change any of the system settings. As a result this menu is restricted to authorised personnel by a pass code. The default pass code is 1234, but this can be changed by the user to any 4 number code by a function within the Engineering Menu.

The Up/Down keys scroll through 0-9.

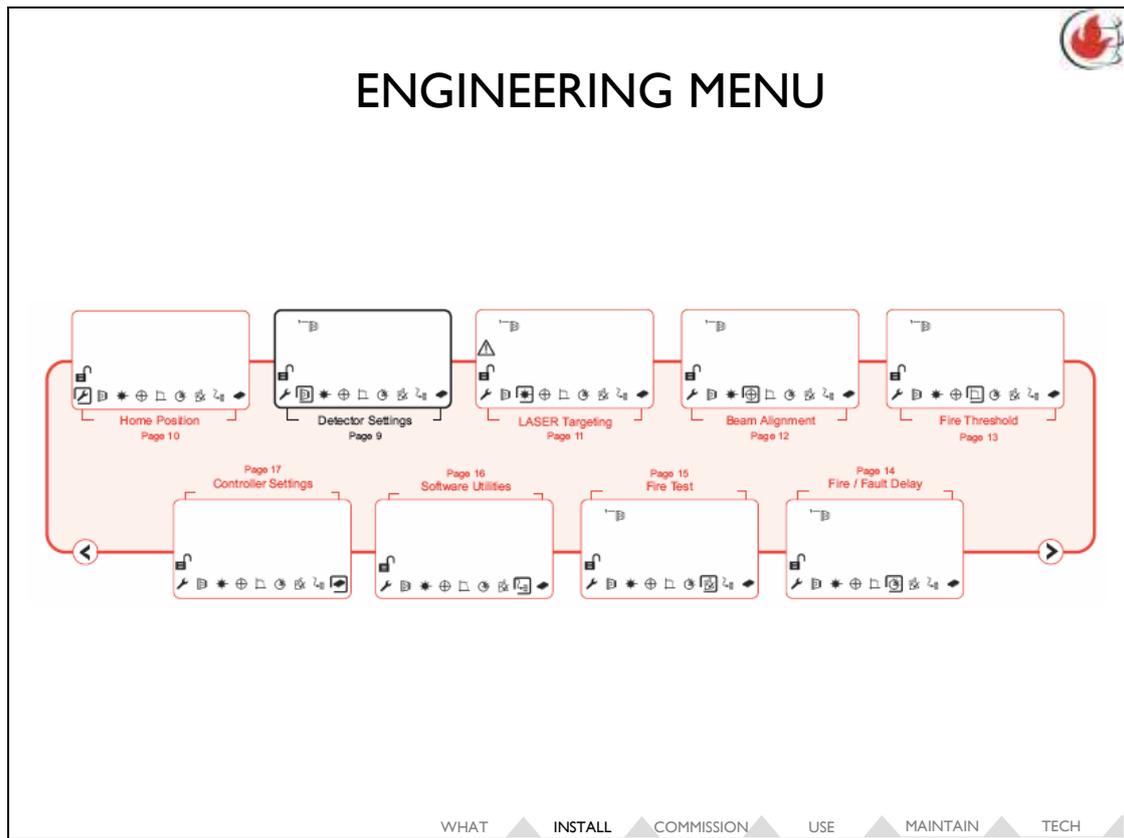
The Right/Left keys scroll through the next/previous number of the code.

'Tick' will accept the code.

'Cross' will return back to the User Menu.

3 wrong entries of the code will deny any further attempts of accessing the Engineering Menu for 3 minutes (the padlock will flash)

Users should be aware that if the pass code is changed and 'lost' or forgotten, then the user will need to contact FFE Technical Support for the remedy (which depends upon device software version).



The Engineering Menu allows for beam alignment and changing of system parameters of the FIRERAY5000.

When a correct pass code has been entered the Detector Settings icon will by default be outlined by the cursor.

Pressing Left/Right will move the cursor over different function/parameters of the selected Detector.

Pressing up/down will move between the detectors of a multi-head system.



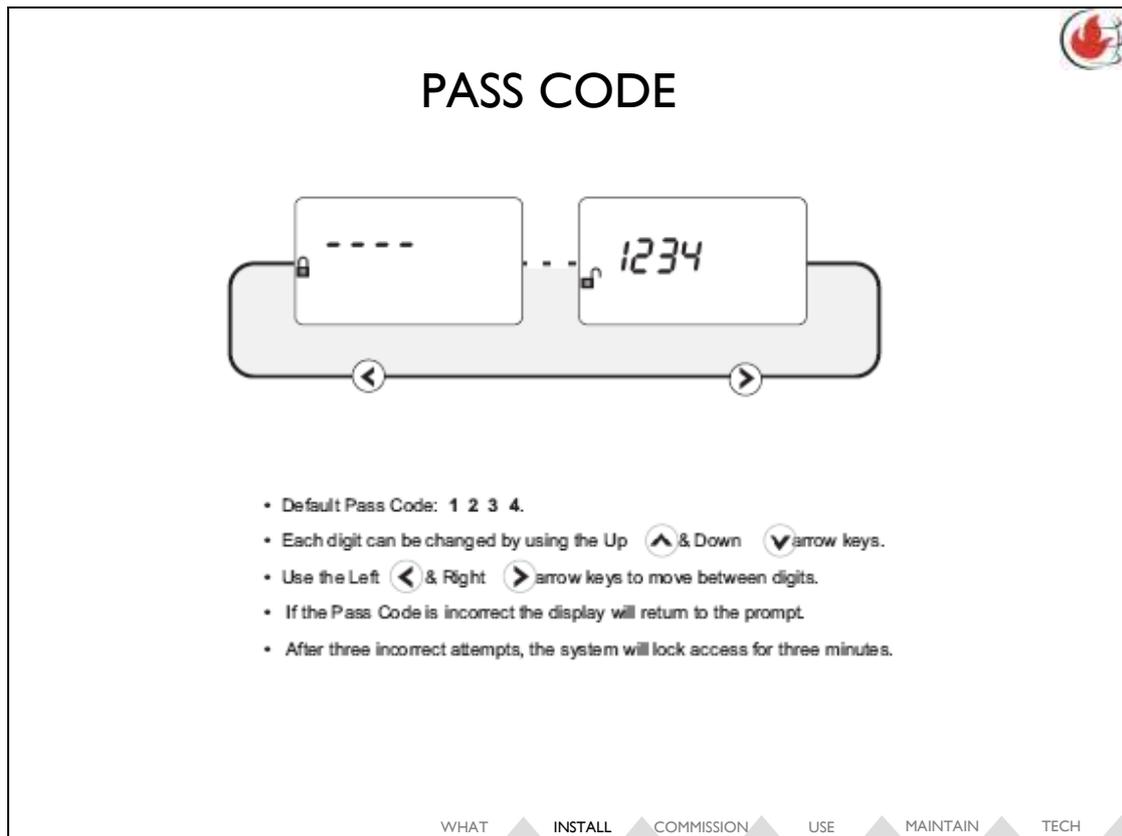
SYSTEM POWER UP

One System Controller can be used to control and monitor up to four Detector heads. The '#' symbol in this guide is used to represent the number of the Detector currently selected (1, 2, 3 or 4).



Ensure that the beam is wired correctly and that the voltage to the System Controller is within specification before the power is turned on.

When the power is turned on, the Detector and System Controller will power-up after 5 and 45 seconds respectively. Initially, the LCD will flash on for 1 second and then display error E-01 whilst the Detector powers up. After the initial power up, the amber LED's on the Detector and System Controller will flash indicating a fault, since the system has not been aligned (refer to Error Codes if one is indicated). Press the 'tick' button twice to access the pass code screen (pressing once will access the User Menu).



Enter pass code. The default pass code is 1234, but this can be changed by the user to any 4 number code by a function within the Engineering Menu.

The Up/Down keys scroll through 0-9.

The Right/Left keys scroll through the next/previous number of the code.

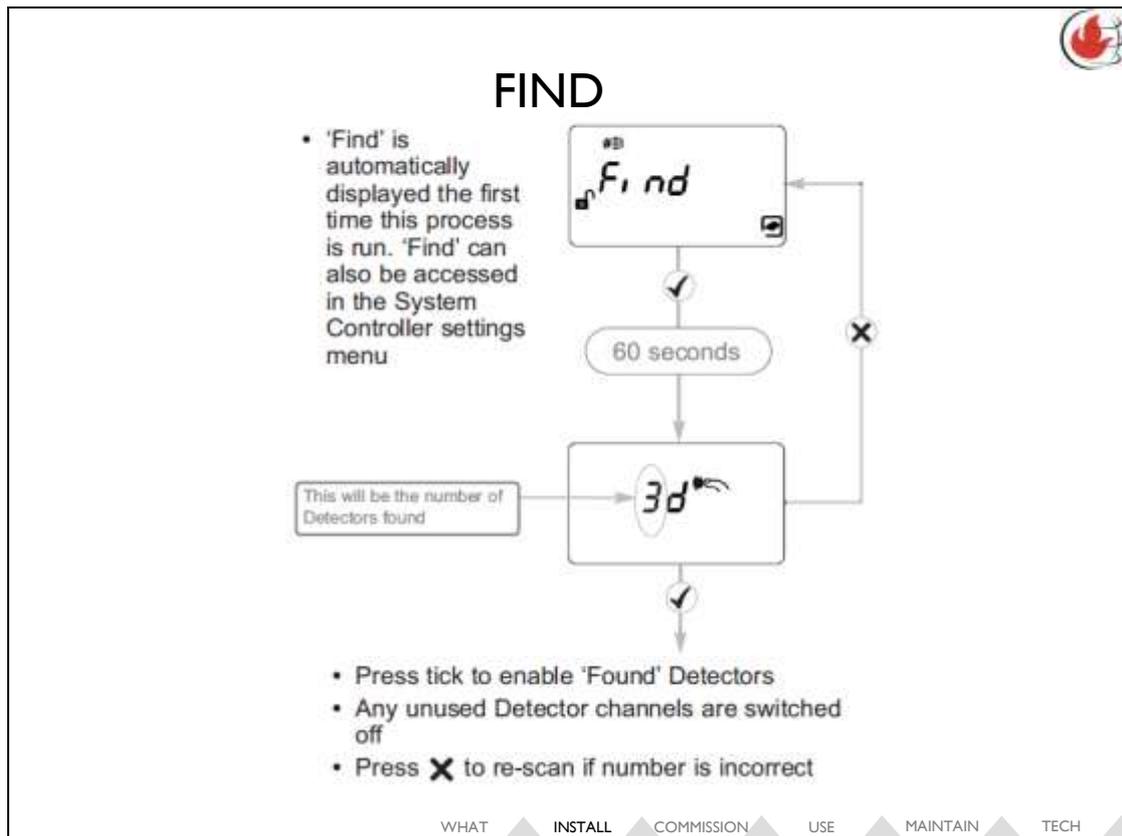
'Tick' will accept the code.

'Cross' will return back to the User Menu.

3 wrong entries of the code will deny any further attempts of accessing the Engineering Menu for 3 minutes and the padlock flashes.

Users should be aware that if the pass code is changed and 'lost' or forgotten, then the user will need to contact FFE Technical Support for the remedy (which depends upon device software version).

To change the passcode to the user's preference, see System Controller Settings Menu.



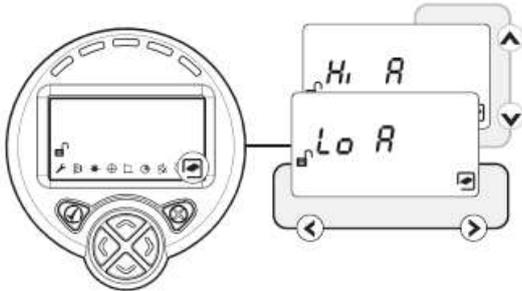
'Find' is automatically displayed the first time the passcode is entered, if a Find has not already been completed

The number/position of each detector head is also displayed next to the detector icon in top left of the display.

Pressing X during a scan will abort and return the system to be in 'E-02'.

If the system finds all four detectors it will finish the Find command early, otherwise it takes 60s.

SET POWER MODE



Make Selection: Hi A = 50mA or Lo A = 10mA (default)

- ✓ To accept
- ✗ To cancel

WHAT INSTALL COMMISSION USE MAINTAIN TECH

Power mode is set for the system.

Scroll right/left by pressing the Right/Left keys until the cursor is over the 'Controller Settings' icon.

Press 'Tick' to enter into Controller Setting structure.

Press 'Right', if required, until indicated screen is shown.

Pressing Up/Down will cycle through the two power modes – Hi and Lo.

Hi current will draw 50mA, constant current, and will allow the beam to align quicker.

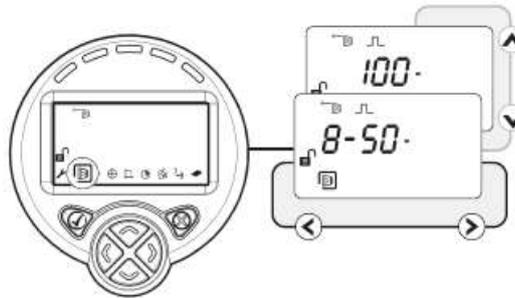
Lo current will draw 10, 12, 14 or 16mA for 1, 2, 3 or 4 detectors found, constant current. Beam will align slower than if in High current.

Note: AutoOptimise (AGC and building movement compensation) will take the same amount of time in both power modes.

'Tick' will accept selection and return to the Engineering Menu.

'Cross' will cancel selection and return to the Engineering Menu.

SELECT DETECTOR & SET RANGE



Make Selection: 8–50m (default) or 100m

- ✓ To accept
- ✗ To cancel

WHAT INSTALL COMMISSION USE MAINTAIN TECH

First select the Detector to be accessed, then set range for each before moving onto to alignment. Scroll right/left by pressing the Right/Left keys until the cursor is over the 'Detector Settings' icon.

Press 'Tick' to enter into Detector Settings structure.

Press 'Right', if required, until indicated screen is shown.

Pressing Up/Down will cycle through the two distance modes – 8-50m and 100m.

8-50m should be selected if the operating distance is between 8 to 50m. This distance requires 1 reflector to be fitted.

100m should be selected if the operating distance is between 50 to 100m. This distance requires 4 reflectors to be fitted.

'Tick' will accept selection and return to the Engineering Menu.

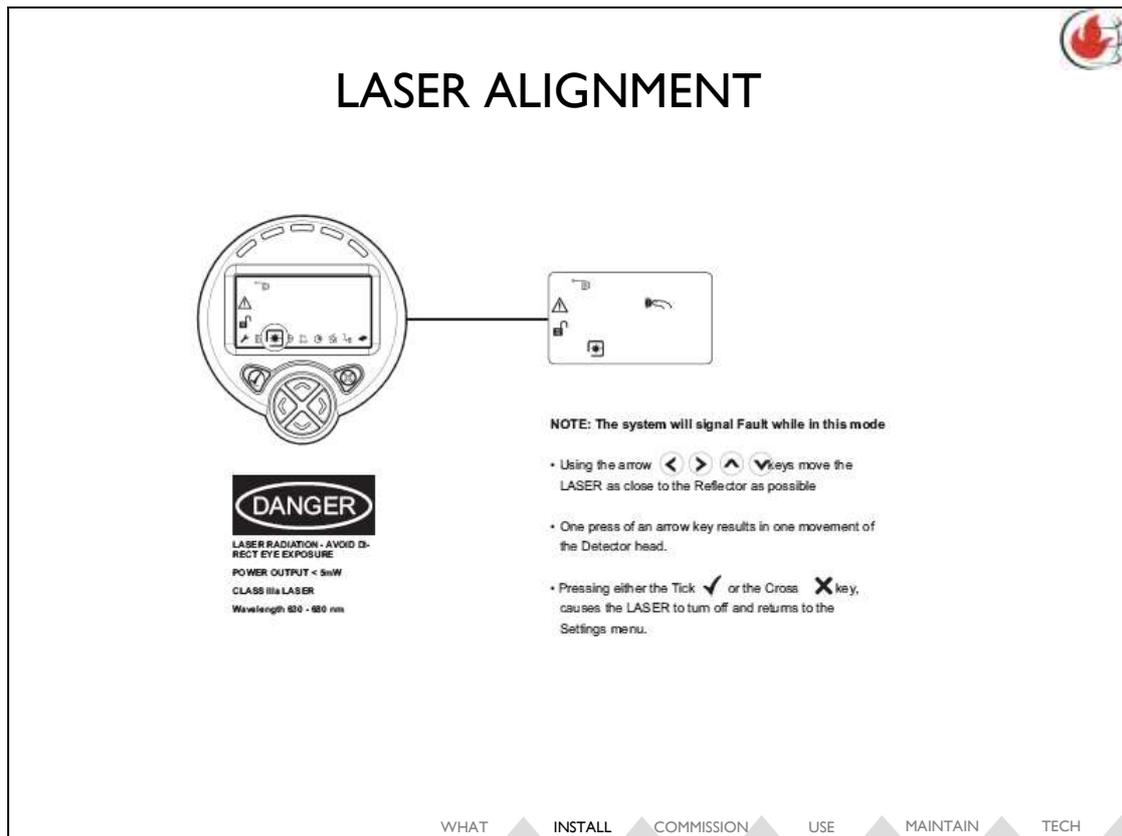
'Cross' will cancel selection and return to the Engineering Menu.

If the user has selected 100m range, when the installation is under 50m, the following applies: at start of AUTO the system sets the highest Tx power, hence AUTO can take longer to bring down the power to an appropriate level

It is possible that if the detector is initially poorly aligned, the high power could result in finding another reflective surface

It is possible that if the detector is initially poorly aligned, AUTO may finish its set number of steps without reaching the reflector, in which case it would return error code E-11 or E-14

If the user has selected 50m range, when the installation is over 50m, the following applies: the system may fail to achieve satisfactory AUTO alignment since it has insufficient transmit power, thus returning error E-10



Note: This function will turn on a laser. Therefore, precautions should be taken so that no personnel look directly into the laser.

The system will signal Fault while in LASER mode.

See Laser Safety Note in course notes.

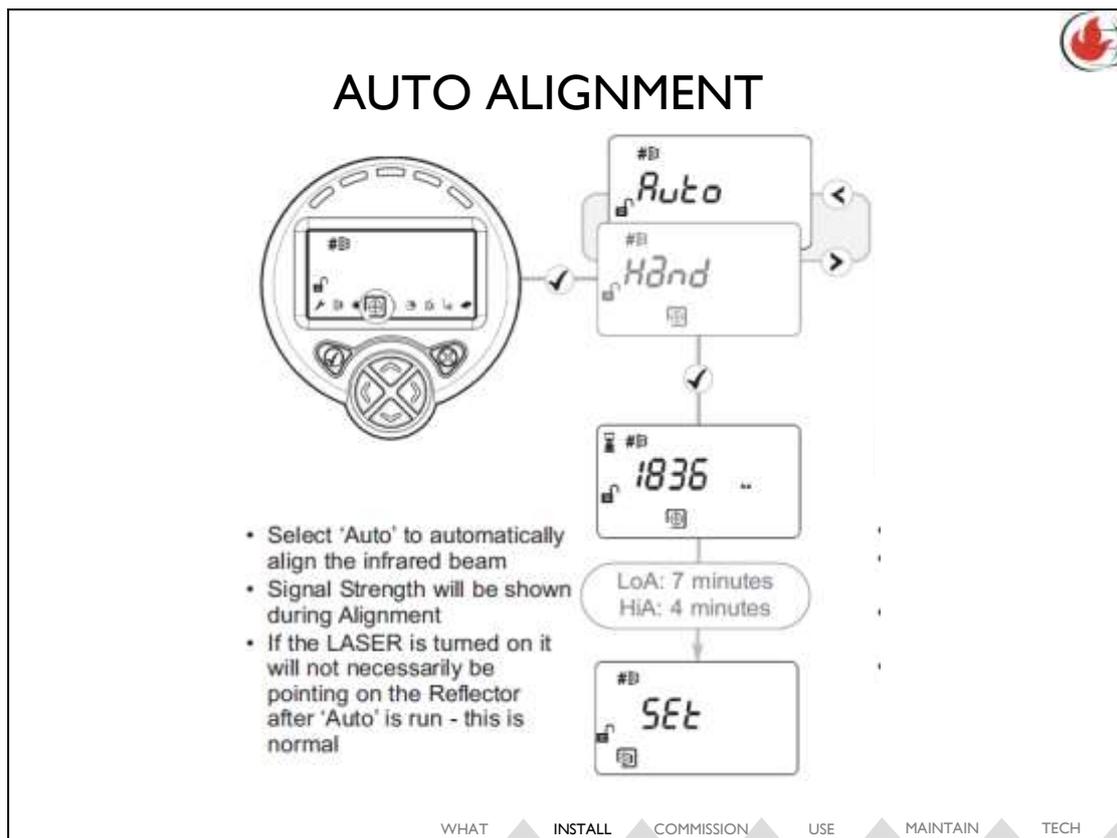
Scroll right/left by pressing the Right/Left keys until the cursor is over the 'Laser Targeting' icon.

Press 'Tick' to turn on the integrated laser in the Detector.

The laser will flash once per second, indicating the rough position of the infrared beam.

Press Up/Down/Left/Right keys to move the laser onto the reflector/s.

When the laser is on the reflector press either 'Tick' or 'Cross' to return to the Engineering Menu.



Scroll right/left by pressing the Right/Left keys until the cursor is over the 'Beam Alignment' icon.

Press 'Tick' to enter into Beam Alignment structure.

Press 'Tick' to start the Auto-Alignment function.

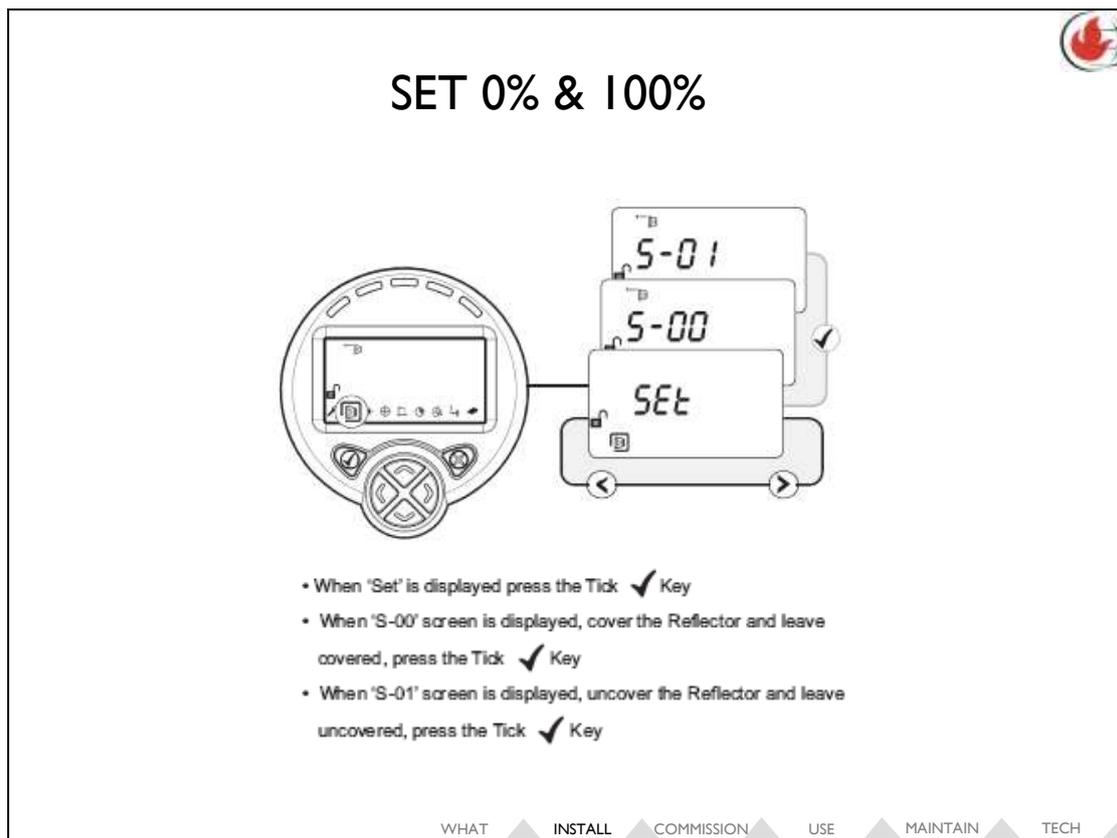
The Detector will now start to align onto the Reflector, taking approximately 2-4 minutes depending on power mode selected.

On successful alignment onto the Reflector, the LCD will go to the SET command.

Otherwise an Error Code will be displayed.

See later slide giving further detail on the Auto-Align function.

Note: The laser is a coarse alignment aid used to find a good starting point for the AUTO ALIGNMENT to succeed. Due to manufacturing tolerances if the laser is turned on after Auto it may not point directly at the centre of the reflector. Do not adjust away from this optimal Auto alignment.



After a successful Auto-Align, you will be taken to the SET menu option.

With the Reflector uncovered, press 'Tick' to start the SET procedure. The S-00 screen should be shown. Fully cover the Reflector/s and press 'Tick'. The S-01 screen should be shown. Fully uncover the Reflector and press 'Tick'. A successful setup will return to the Engineering Menu (i.e. no error codes indicated).

An unsuccessful setup will result in an Error Code.

Set performs the following functions:

- Ensures that the beam is located on the reflector, by looking for a large signal drop when the reflector is covered

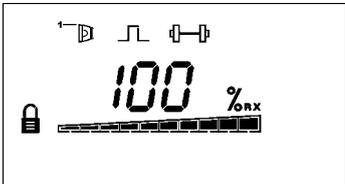
- Stores the noise floor in order to eliminate background noise and minor reflections

- Calculates what signal strength is 100% and thus how to scale other values as percentages

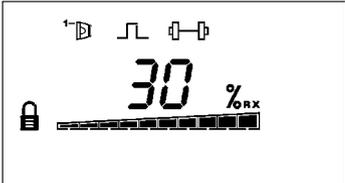
After SET, repeat alignment for other detectors.

When completed, set system back into Lo A mode. Green LED on Detector flashes every 10 second and signal strength will be between 99 and 101%.

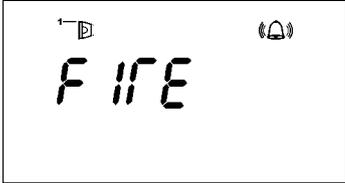
MANUAL FIRE TEST



Beam Aligned



Slowly start to cover the Reflector past the Response Threshold/Sensitivity level



After the Delay to Fire has passed, Fire will be signalled

WHAT INSTALL COMMISSION USE MAINTAIN TECH

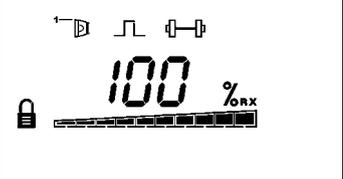
After installation or cleaning it is recommended that manual FIRE and FAULT tests are carried out.

The Fire and Fault test of the FIRERAY5000 must be done at the Reflector to ensure that the beam is aligned and is operating correctly.

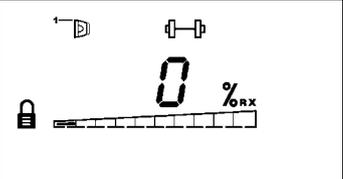
FIRE TEST

With a non-reflective object, (i.e. the brown cardboard of the FIRERAY5000), start to slowly cover the Reflector past the Response Threshold/Sensitivity and keep it covered. The FIRERAY5000 should then signal a fire condition by flashing the red LED's on both the Detector and System Controller and also by flashing the text FIRE (only when in 'standby' i.e. display is off) on the LCD after the Delay to Fire time has elapsed.

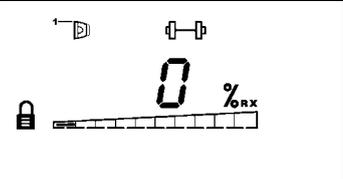
FAULT TEST



Beam Aligned



Cover the Reflector fully within 2 seconds.
Ensure signal drops below 13%



After the Delay to Fault has passed, Fault will be signalled. Fault will not be displayed on the LCD

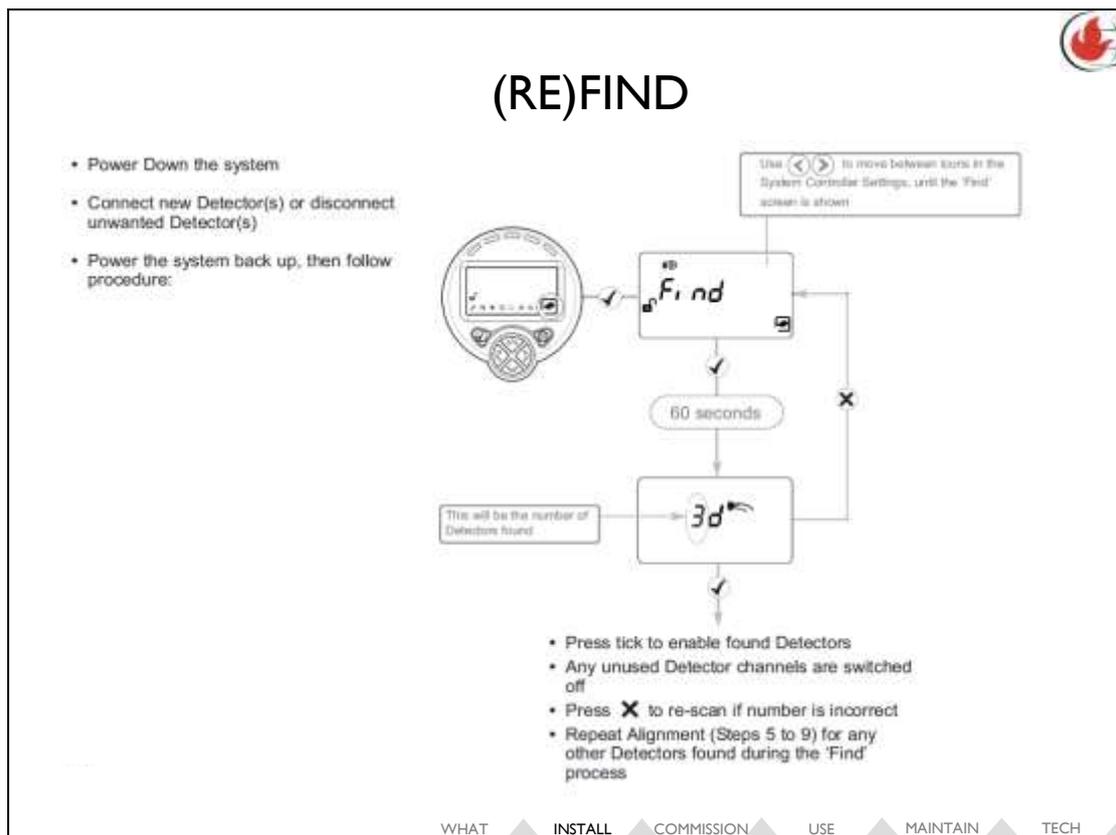
WHAT INSTALL COMMISSION USE MAINTAIN TECH

The Fire and Fault test of the FIRERAY5000 must be done at the Reflector/s to ensure that the beam is has aligned and is operating correctly.

FAULT TEST

With a non-reflective object, (i.e. the brown cardboard packing box of the FIRERAY5000), quickly cover the Reflector/s within 2 seconds, ensuring that the signal drops to 13% or below (a fire will be signalled if the signal does not drop below 13% in less than 2 seconds). The FIRERAY5000 should then signal a Fault condition by flashing the amber LED's on both the Detector and System Controller after the Delay to Fault time has elapsed.

Note: After successful Auto-Alignment, if the LASER is turned on, it will not necessarily be pointing on the centre of the Reflector, since it is a coarse alignment aid. Auto achieves the most effective, centred alignment.



Re-find is only needed if the detector numbers are changed, for example when adding a new detector, or if a detector fitting or wiring fault caused the first 'Find' to return less detectors than are present.

If a previously aligned and SET detector is removed and refitted, re-find using the 'Find' command and check received signal is 100% and beam is aligned by covering up the reflector.

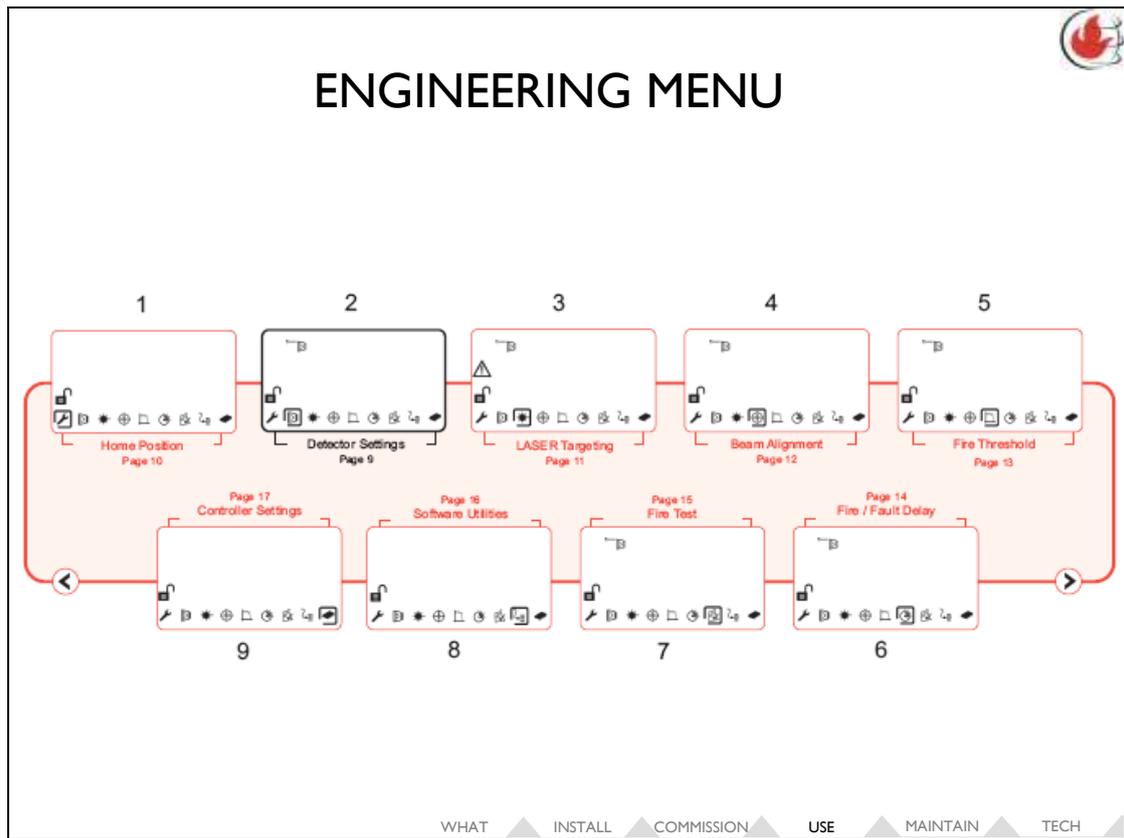
Re-find does not spoil previously correctly aligned and set detectors.



COMMISSIONING FIRERAY5000

To verify the system operates correctly

- Check FIRERAY5000 has been installed suitably, electrically and structurally
- Check for correct alignment with no obstructions or reflections
- Check correct response by manual Fault and Fire tests
- Are Fault and Fire tests reported correctly at the Fire Panel?



- 1 – Home Position**
- 2 – Detector Settings**
- 3 – Laser Targeting**
- 4 – Beam Alignment**
- 5 – Fire Threshold**
- 6 – Fire/Fault Delay**
- 7 – Fire Test**
- 8 – Software Utilities**
- 9 – Controller Settings**

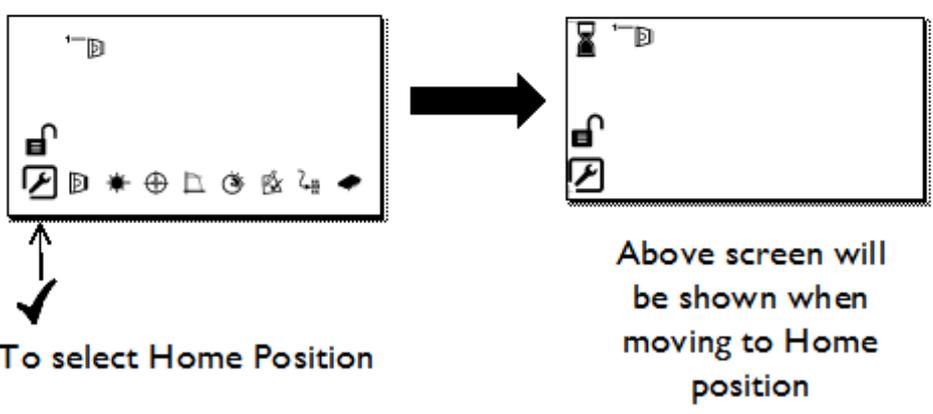
All these features are covered in slides in this presentation



HOME POSITION

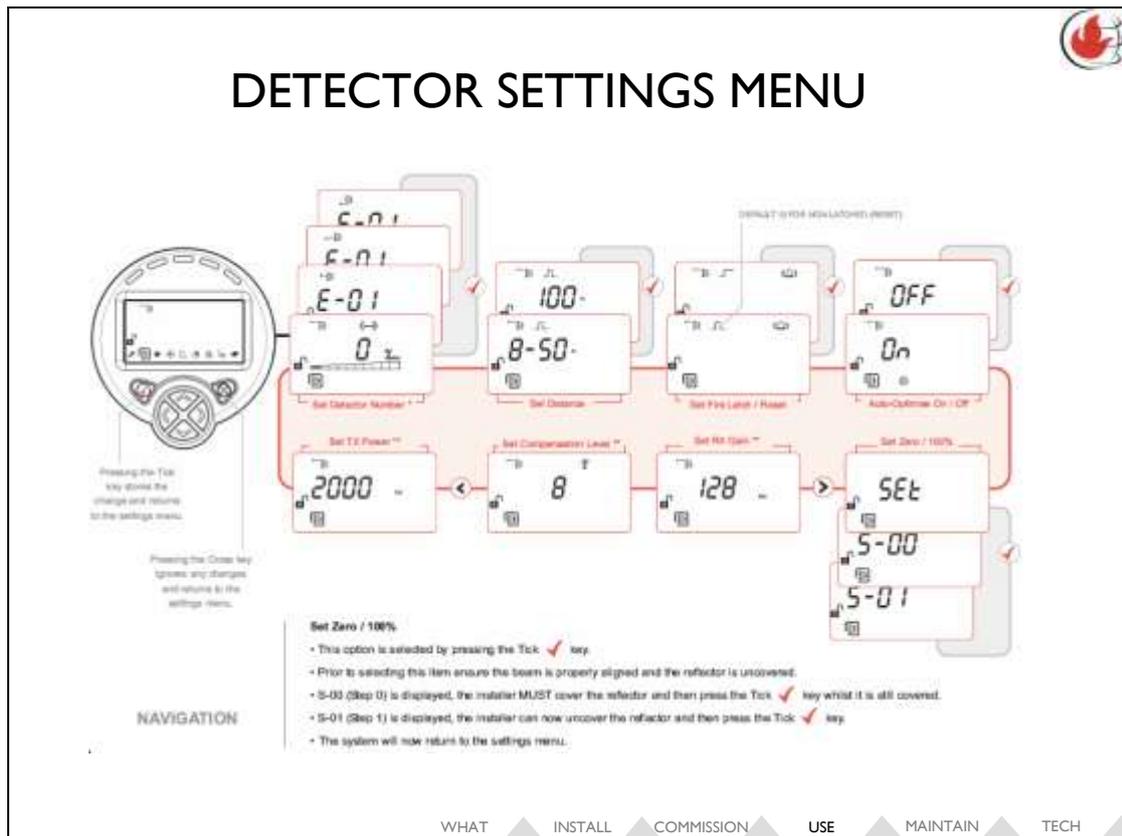
Home is not needed in the standard installation procedure. It is used during problem solving, for example if the laser cannot be seen.

Home position will move the beam until approximately perpendicular to the plastics



The lenses of the FIRERAY5000 are free to move independently of the casing. As a result, when the Detector is fitted, the lenses cannot be guaranteed to be perpendicular to the casing. i.e. the beam will not necessarily point at right angles to the wall it is mounted onto.

By executing the Home command, the motor will automatically move until the lenses are approximately perpendicular to the casing and therefore the wall. The Home command will take approximately 15 minutes. Once selected there is no need for user interaction. When finished the LCD will return to the Engineering Menu.



Set Detector Number

Used to select the Detector to be accessed for setting range, fire threshold and fire or fault delay

Set Distance

To set the selected Detector's range

Set Fire Latch/Reset

To set latching or non-latching mode for the system

AutoOptimise On/Off

To turn on or off the building movement compensation

Set Zero/100%

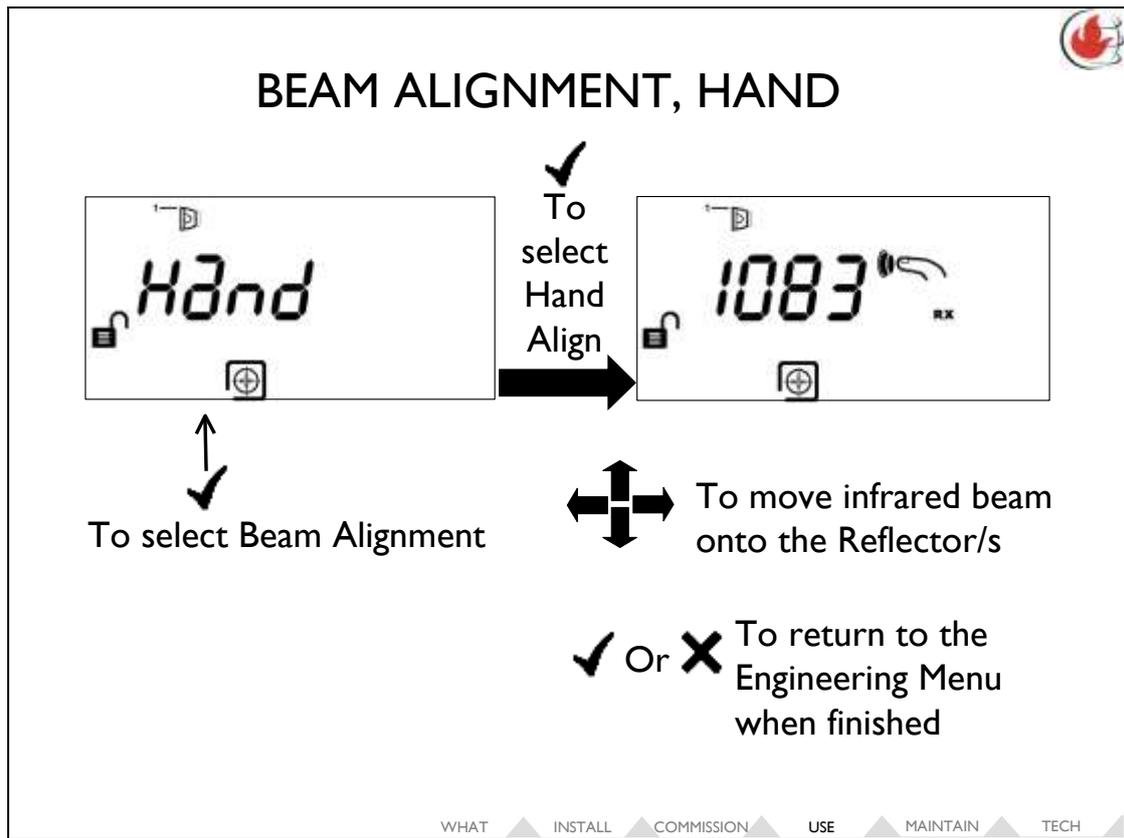
To calibrate the beam as final stage of alignment

Set Rx Gain

Set Compensation Level

Set Tx Power

These three parameters are only changed during trouble shooting by an advanced user



This feature is only used during trouble shooting by an advanced user.



BEAM ALIGNMENT, AUTO

'Auto-Align' aligns the **FIRERAY5000** onto the Reflector/s without the need for user involvement once the Laser has been aligned onto the Reflector.

The 3 automatic stages of the Auto-Align routine are:

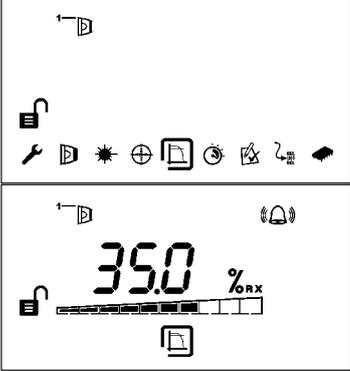
- **Search** – Beam searches for a satisfactory signal
- **Adjust** – moves the beam closer to the reflector whilst adjusting the transmitter power and receiver gain so that the received signal strength is about 1100
- **Centre** – The beam is steered so that it is centred well onto the Reflector/s

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH ▲

The FIRERAY5000 automatic alignment function is called Auto-Align. This function removes the burden of physically aligning the beam onto the Reflector/s by handing over the responsibility to the system once the beam has been coarsely aligned using the Laser Targeting function.

Before Auto-Align the Power and Gain are set automatically according to the range selected. FIRERAY5000 will do this every time, even if the beam has been aligned previously.

FIRE THRESHOLD



- ✓ To select Fire Threshold
- ⇕ To change in 1% steps
- ⇐ ⇨ To change between 25%, 35% & 50%
- ✓ To accept changes and return to Engineering Menu
- ✗ To cancel changes and return to Engineering Menu

WHAT INSTALL COMMISSION USE MAINTAIN TECH

Sensitivity set at Low Level via System Controller

User Selectable Sensitivity Level

10% to 60% Sensitivity (product is approved for full range of sensitivities in UL, whereas Europe approval covers sensitivities 25 and 35%)

Selectable in 1% increments

25%, 35% & 50% Quickly Selectable

Default = 35%

System can be tailored to the environment, such as when the environment is particularly contaminated

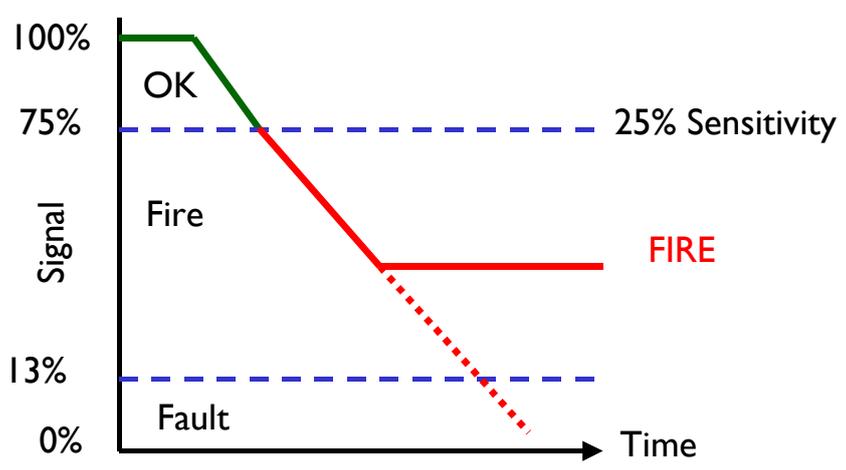
Fire threshold and Fire or Fault Delay can be set for each detector.

Latching or non-latching mode are set for the system. In latching mode, a fire indication has to be deliberately reset by the user, whereas in non-latching mode, a fire indication is reset automatically when the fire conditions are no longer present.



FIRE THRESHOLD

The amount the signal level must drop by to produce a fire condition



WHAT INSTALL COMMISSION USE MAINTAIN TECH

The FIRERAY5000 has user selectable Response threshold/Sensitivity levels. This is the amount the signal level must fall from 100% to signal a fire condition. For example: When the system is aligned and operational the signal level should be 100%. With the Sensitivity set to 25% the signal can vary between 100% & 75% and the system would be OK. If the signal were to drop below 75% a fire condition would be signalled (after the delay to fire). However, if the signal drops from above the fire threshold to 13% or below within 2 seconds a fault will be signalled (this will be covered later).

DELAY TO FIRE

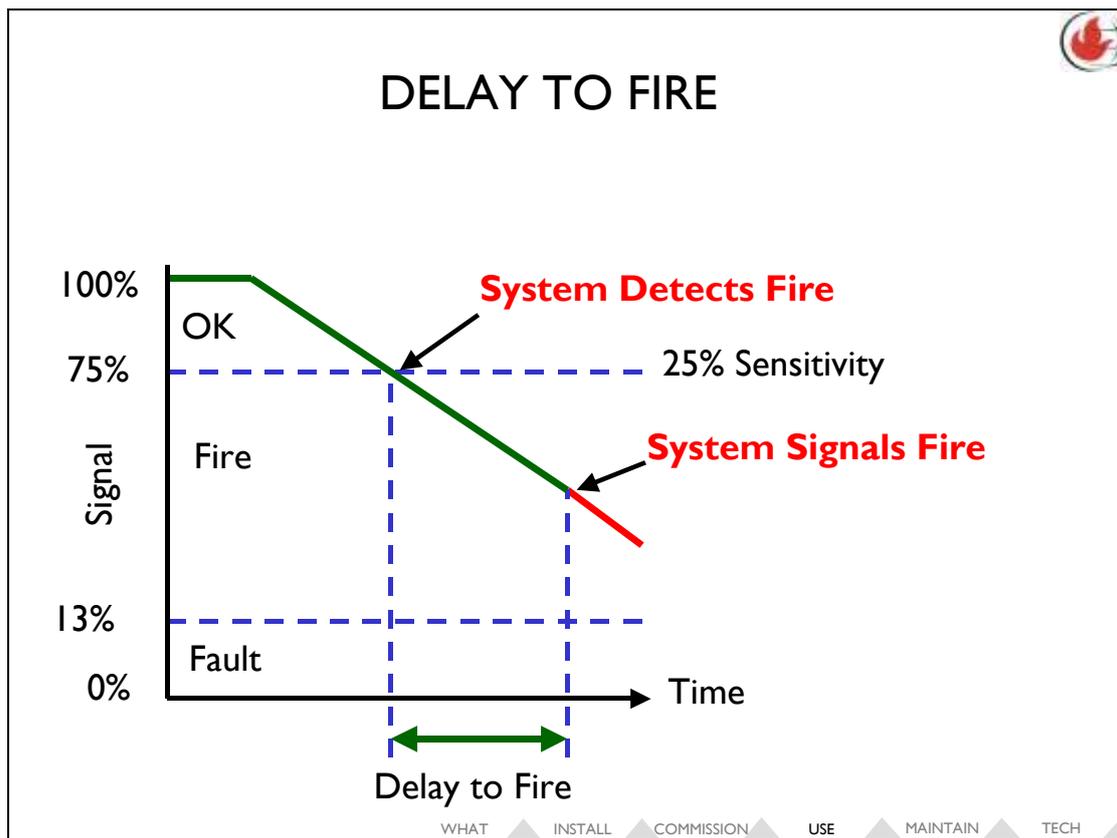
- ✓ To select Delay to Fire/Fault
- ↕ To change in 1 second steps
- ✓ To accept changes and return to Engineering Menu
- ✗ To cancel changes and return to Engineering Menu

WHAT INSTALL COMMISSION USE MAINTAIN TECH

Setting the 'Delay to Fire' is done in the 'Engineering Menu' under Fire/Fault Delay Settings, (6th icon from the left). Pressing the 'Tick' key will take you to a screen similar to the one shown. From here the Up/Down keys scroll in one second changes. Pressing 'Tick' will confirm the changes or Cross will cancel the changes. Either of these two keys will return the system back to the 'Engineering Menu'.
 Note: Software will not allow the Delay to Fire be set to a value less than the Delay to Fault. This is because in a fault condition, if the Delay to Fire was set shorter than Delay to Fault, a fire condition would always be reported, preventing the fault to be reported.

The FIRERAY5000 therefore allows the user to tailor the system to the type of environment it has been installed in and if necessary fine tune whilst operational.

- Selected at Low Level
- User Selectable
- 2 to 30 seconds
- Selectable in 1 second increments
- Default = 10 seconds
- System can be tailored to the environment
- Delay to Fire \geq Delay to Fault



The Delay to Fire is the delay from the system detecting a fire to actually signalling it to the fire panel, (via relays on the conventional AIM inside the System Controller). The reason for a delay is to cater for any known occurrences that could cause a fire condition on the system and therefore reduce the chance for any false alarms by allowing it to clear before the end of the delay. For example a diesel engine starting in a garage may produce a plume of smoke that clears within 10 seconds but could cause a fire condition. In this instance the delay to fire would be set to a value of greater than 10 seconds to give the smoke a chance to clear before a fire can be signalled.

DELAY TO FAULT

✓ To select Delay to Fire/Fault
 → To change to Delay to Fault
 ⇕ To change in 1 second steps
 ✓ To accept changes and return to Engineering Menu
 ✗ To cancel changes and return to Engineering Menu

WHAT INSTALL COMMISSION USE MAINTAIN TECH

Setting the 'Delay to Fault' is done in the 'Engineering Menu' under Fire/Fault Delay Settings, (6th icon from the left). Pressing the 'Tick' key will take you to the Delay to Fire screen. Pressing the Right key will take you to the Delay to Fault screen similar to the one shown. (Delay to Fault screen has the number 2 preceding the delay time and the alarm icon is not on).

From here the Up/Down keys scroll in one second changes. Pressing 'Tick' will confirm the changes or Cross will cancel the changes. Either of these two keys will return the system back to the 'Engineering Menu'.

Note: Software will not allow the Delay to Fault to be set to a value greater than the Delay to Fire. This is to ensure that a fire will always be seen and indicated over a fault condition. i.e. if the Delay to Fire is 15 seconds, the Delay to Fault can be between 2 to 15 seconds.

The FR5000 therefore allows the user to tailor the system to the type of environment it has been installed in and if necessary fine tune whilst operational.

Selected at Low Level

User Selectable

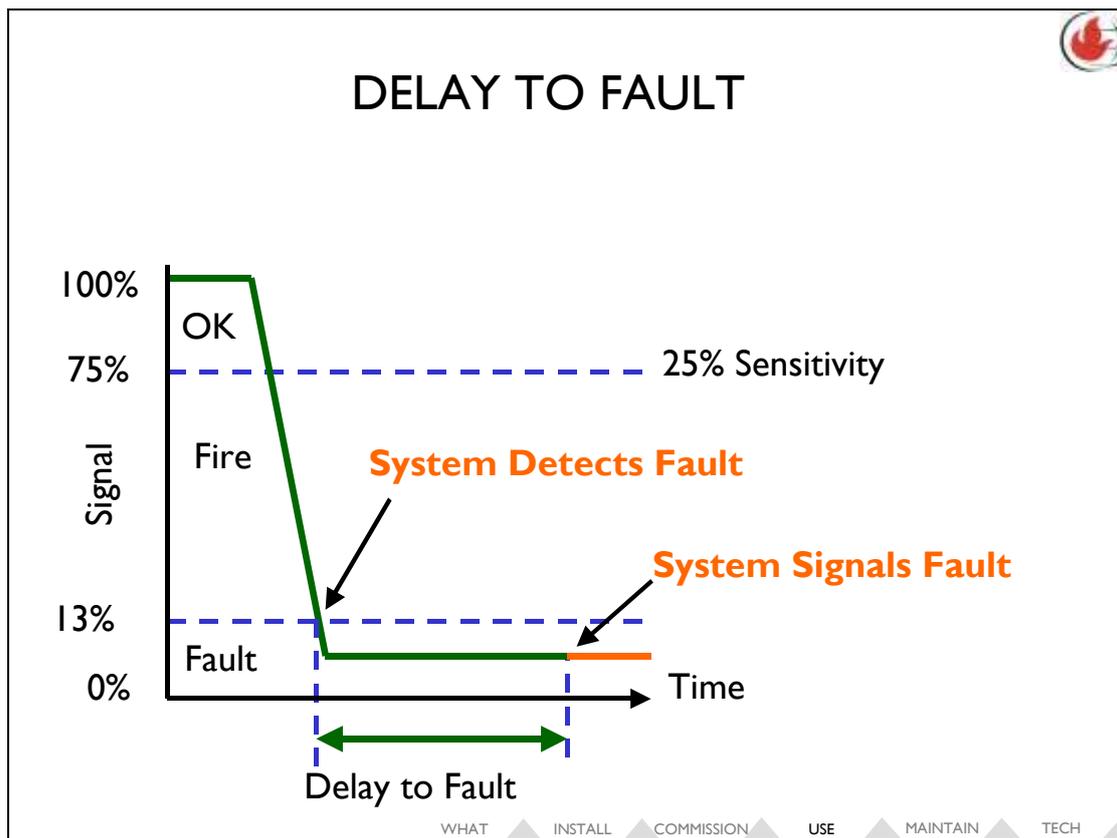
2 to 30 seconds

Selectable in 1 second increments

Default = 10 seconds

System can be tailored to the environment

Delay to Fault \leq Delay to Fire

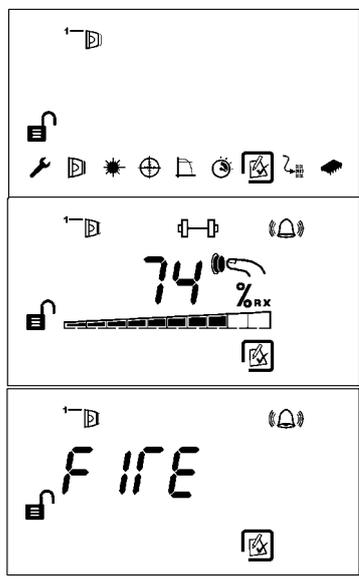


The Delay to Fault is the delay from the system detecting a fault to actually signalling it to the fire panel, (via relays on the conventional AIM inside the System Controller).

The reason for a delay is to cater for any know occurrences that could cause a fault condition on the system and to reduce the chance for any false faults by allowing it to clear before the end of the delay. For example if a beam was regularly blocked by a pallet passing through the beam for a period of 10 seconds. In this instance the delay to fault would be set to a value of greater than 10 seconds.



SOFTWARE FIRE TEST

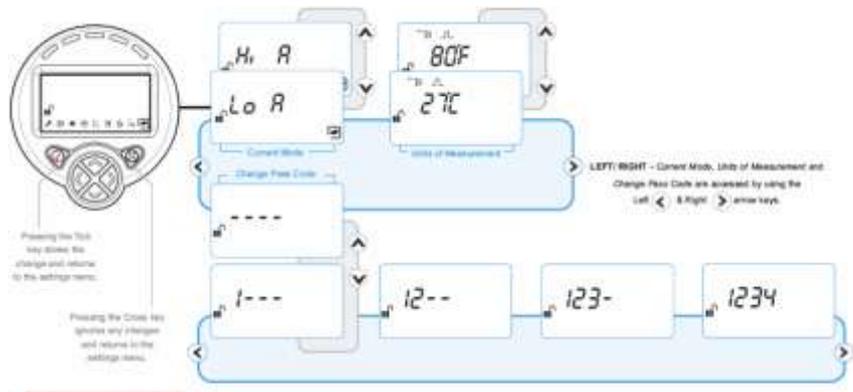


- ✓ To select Fire Test
- Detector now in fire but OK reported to fire panel
- ✓ To acknowledge that the Fire Test will signal a fire via the AIM
- ✗ To cancel Fire Test and return to Engineering Menu
System reports fire to fire panel
- ✗ To stop Fire Test and return to Engineering Menu

Note: This is only a test of the System Electronics and contacts to the outside world via the AIM.
It is not an optical fire test and therefore, it does not negate the need to conduct a manual Fire Test



SYSTEM CONTROLLER SETTINGS MENU



WARNING
Care must be taken when changing the Pass Code. If lost the unit cannot be unlocked and must be returned to the manufacturer. This is not covered by the warranty.

- **Current Mode** - Sets the system into either high or low operating current mode.
- **Units of Measurement** - Changes the units of measurement.
- **Change Pass Code** - Press the Tick key on the Pass Code screen to access the option to change the system Pass Code. Each digit is accessed by the Left & Right arrow keys, the value of each digit being altered by the Up & Down arrow keys.
- Pressing the Tick key accepts the new Pass Code and returns to the settings menu.
- Pressing the Cross key ignores any change and returns to the settings menu.

Current mode: low current mode is 10mA (constant), high current mode is 50mA (constant).

High current mode allows Home Position, Laser Targeting, Hand Align and Auto Align to operate more quickly.

Remember to change back to low current mode after commissioning system.



FIRE RAY 5000 DEMONSTRATION

WHAT ▲ INSTALL ▲ COMMISSION ▲ **USE** ▲ MAINTAIN ▲ TECH ▲



AUTOMATIC GAIN CONTROL (AGC)

- Compensation for slow changes in the signal level
 - Dirt/dust on Lenses or Reflector
 - Building movement
- Will not compensate out a slow burning fire

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH ▲

The FR5000 uses Automatic Gain Control, (AGC), to compensate for slow changes in the signal level of the system to maintain the signal level at 100%. These changes usually come from external influences such as dirt/dust on the lenses/reflector or building movement. This usually happens over days, months or years rather than minutes or seconds. AGC is automatic and does not require user involvement.

If the system did not use AGC a progressive build-up of dust, for example, could cause the system to report a false alarm when the signal drops below the fire threshold. At the same time, AGC must not compensate quicker than a slow burning fire. If it did, a slow burning fire would be compensated out and the signal would remain above the fire threshold and never signal an alarm.

It should be noted that AGC will not compensate for quick, progressive changes in the signal level.

The current level of compensation can be seen in the User Menu and also in the Detector Settings of the Engineering Menu.

AGC can only compensate for a finite amount of signal degradation. When the limit is reached a fault is signalled, and the beams will need to be cleaned. For the FR5000 the limits at which a fault will be signalled are -50 and +205.

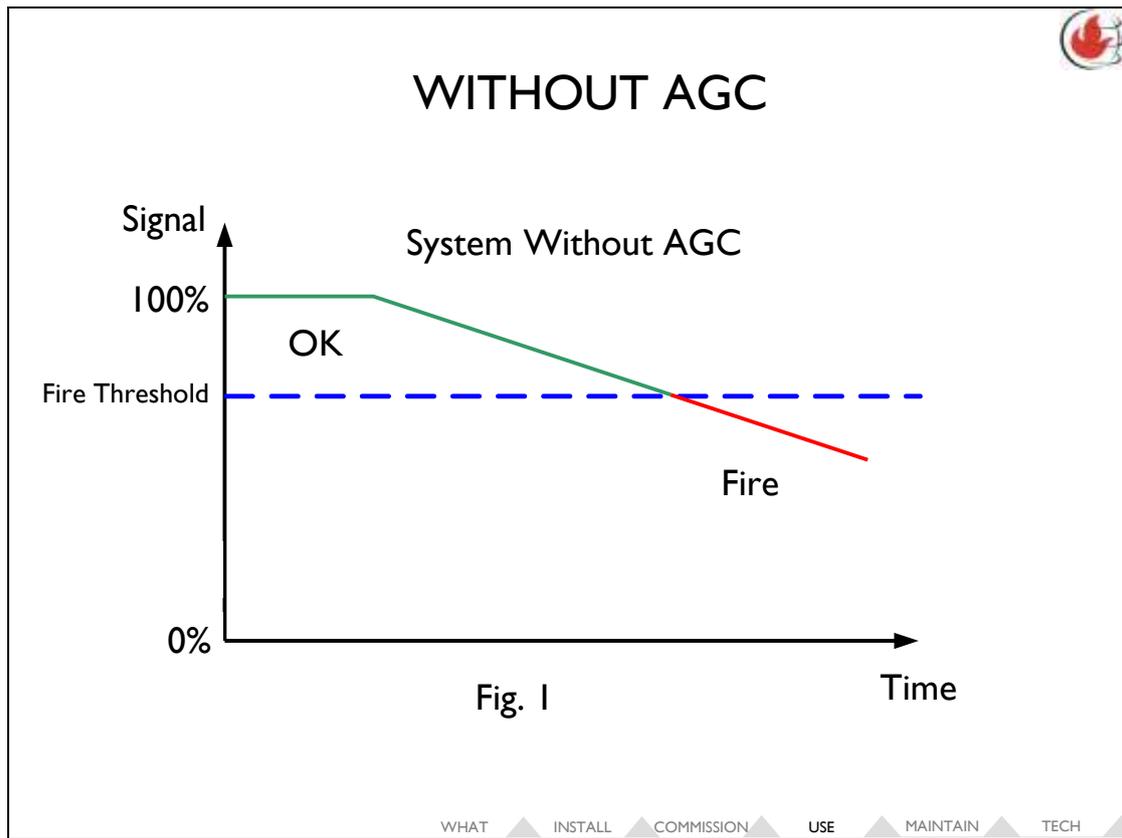


Fig. 1 shows what would happen to the signal level without AGC.

Initially when the beam is setup and commissioned the signal level should be sitting at 100%.

Over time, external influences such as dirt, dust &/or building movement will start to degrade the signal level.

Without AGC, as there is no means of combating this, the signal level will start to drop as the received signal is reducing.

If the external influences persist, the signal level will eventually drop below the fire threshold (sensitivity), thus initiating an alarm.

A system without AGC would therefore require a high level of maintenance as the detector and reflector would need to be accessed regularly to keep the surfaces clean and the system perfectly aligned.

In Fireray5000 multi-head, AGC is unique for each detector head.

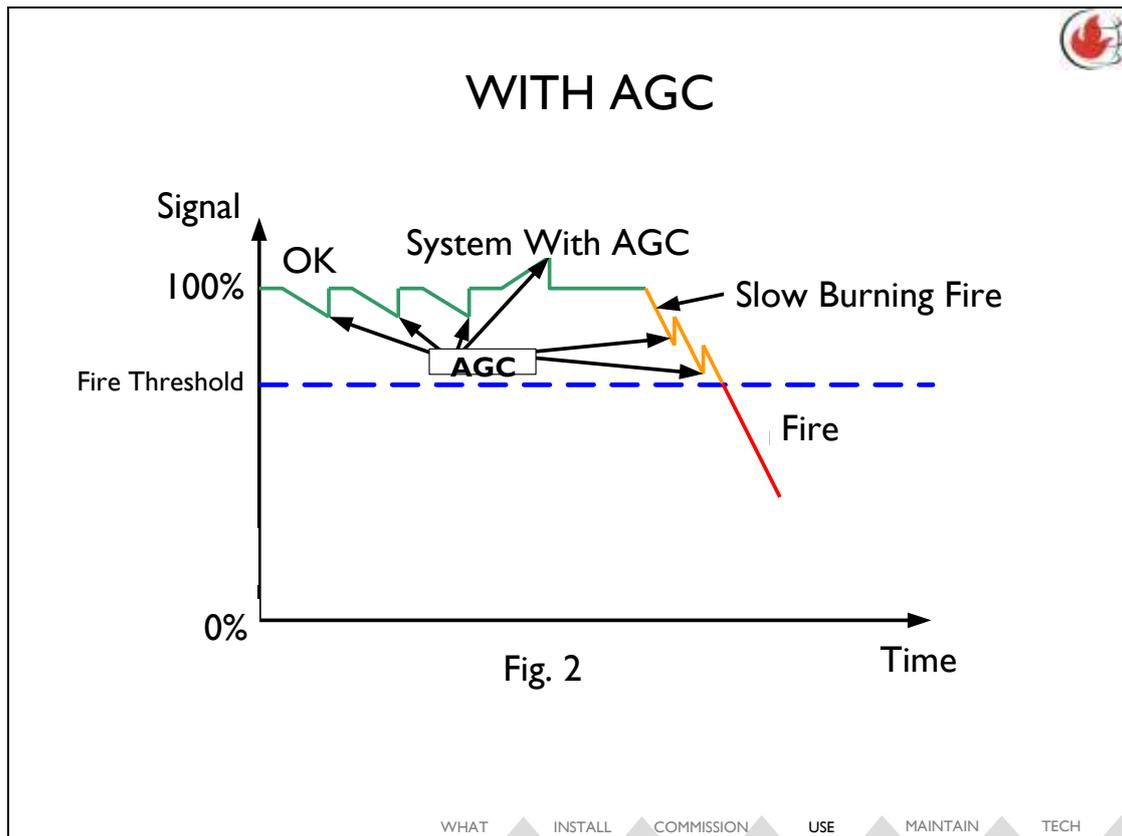


Fig. 2

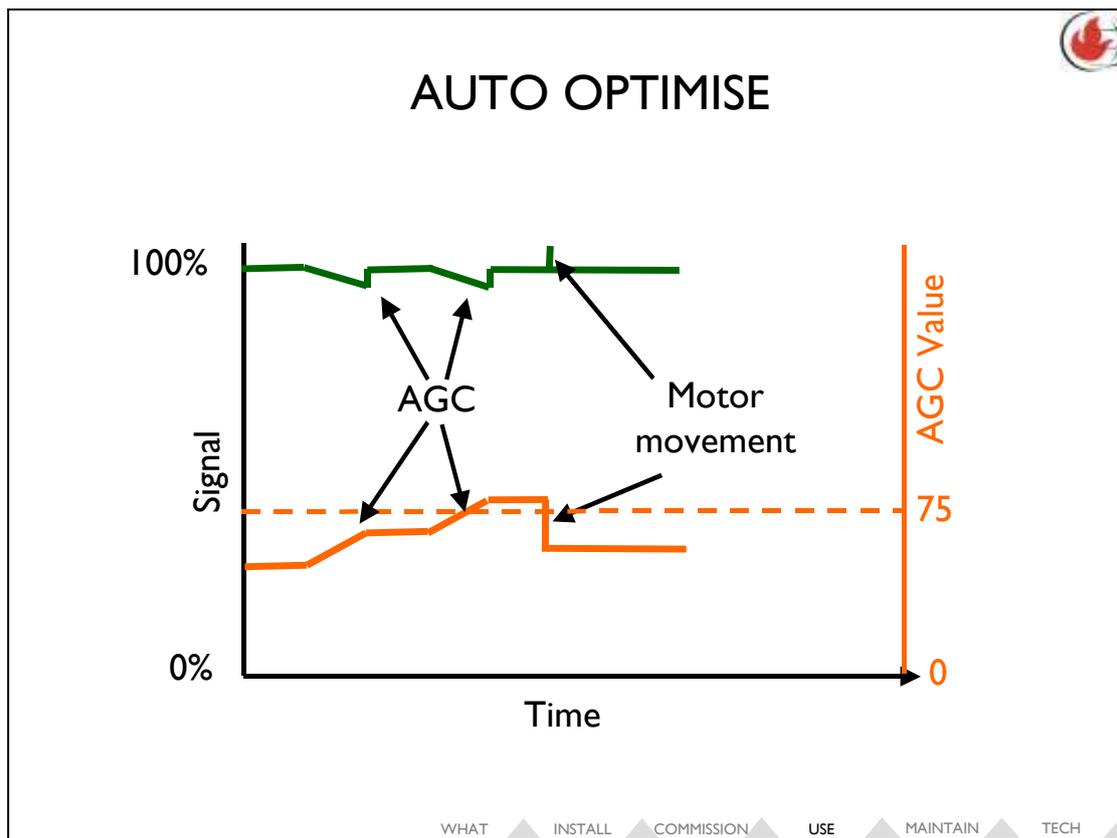
Fig. 2 shows a system with AGC (but not motorised).

As the external influences build-up, the system will compensate for them by increasing the AGC potentiometer.

As mentioned earlier the AGC does not compensate out of a slow burning fire.

It should also be noted that the AGC would stop when the system is in either a fire or fault condition, so as not to compensate out of that condition.

If the AGC limit is reached the beam will need to be cleaned and realigned.



AutoOptimise is a combination of AGC and/or motor movements.

Whilst the value of AGC is under 75, only AGC is used to keep the signal strength at 100%.

When the value of AGC reaches 75, the Fireray5000 will use its motor to steer the beam back onto the reflector at its next AutoOptimise.

A move towards the reflector will increase the signal strength whereas a move in an incorrect direction will decrease the signal strength. In order to keep the system operational the AGC value is very quickly adjusted to keep the signal strength the same as it was before the motor movement.

Only in the case where the signal strength was initially less than 100%, the target signal strength will be set 1% higher than the initial signal strength (i.e. 89% would become 90%)



GOLDEN RULES

- Ensure that the beam path is clear of any obstructions with a clear line of sight of at least 1m diameter
- Rigid mounting
- Always cover the Reflector when setting the system and not the Detector
- Always do a fire and fault test. This checks beams performance as well as system wiring

WHAT

INSTALL

COMMISSION

USE

MAINTAIN

TECH



MAINTAINING AN OPTICAL BEAM SMOKE DETECTOR

To ensure the system continues to operate correctly:

- Routinely check for visual damage
- Check installation remains mechanically and electrically sound
- Check there have been no major changes to the environment such as line of sight, obstructions, reflections, strong light sources etc.
- Clean the system
- Confirm system operation with Trouble (Fault) and Fire tests

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH

Optical Beams are relatively maintenance-free after successful commissioning, however routine checks and cleaning are recommended to ensure satisfactory functioning of the system.

Before maintenance, notify the relevant authorities that Optical Beams will be temporarily out of service and disable the zone or system to ensure fire services are not inadvertently dispatched.

The system should be cleaned during regular maintenance. Refer to the particular product's installation guide for more detailed information. In general, use a lint-free cloth or lint-free feather duster to gently wipe lenses (and reflectors) taking care not to disturb alignment. Confirm alignment remains satisfactory after cleaning with Trouble (Fault) and Fire tests.

Special servicing will be required:

After a fire

If an unacceptable rate of false alarms is experienced

When a new maintenance organisation is contracted

Following long periods of disconnection



CLEANING

- System automatically compensates for dust build-up
- Clean during regular maintenance or if a detector AGC value stays above 130 for several days
- Clean carefully with lint free cloth/feather duster
- After cleaning check signal strength
 - If $\geq 108\%$ reduce AGC value
 - Between 92% and 108%, leave
 - If $\leq 91\%$ perform LASER targetting, Auto-Alignment and SET
- SET command not required if above methods used

WHAT INSTALL COMMISSION USE MAINTAIN TECH

When does the system need cleaning? The system should be cleaned during regular maintenance. The AGC value staying above 130 for a few days in a row is also an indication that the system may need cleaning.

How to clean the system? Ensure that the system has been isolated before cleaning to avoid any false alarms. Using a lint-free cloth or lint-free feather duster, gently wipe the lenses on the detector taking care not to move the lenses.

What needs to be done after cleaning the system? It is possible that the beam may have been knocked out of alignment during cleaning. To determine what needs to be done see below:

Scenario 1: Signal strength is 108% or above. AGC value needs to be reduced to a level that gives a signal strength of 100% +/- 3%. As a rule of thumb, multiply the amount above 100% by 2 and subtract it from the AGC value. e.g. Signal = 110%. Therefore, reduce AGC value by: $(110 - 100) \times 2 = 20$.

If the AGC value remains above 0 after it has been adjusted to give a signal level of 100% then the discrepancy could be due to building movement.

Scenario 2: Signal strength is between 92% & 108%. Leave the system to compensate by itself, this may take a few hours.

Scenario 3: Signal strength is below 91%. Perform LASER targetting, Auto-Align and SET

NOTE: You do **not** need to perform a set command after the first two scenarios. After the above procedure has been completed take the system out of isolation.



FIRERAY5000 TECHNICAL DATA

Parameter	Min.	Typ.	Max	Unit
Operating Voltage (to System Controller)	14	-	28	VDC
Operating Current - low current mode	8	10	12	mA
Operating Current - high current mode	48	50	52	mA
Response Threshold/ Sensitivity (Default 35%)	0.45	-	3.98	dB
	10	-	60	%
Delay to Fire – user settable (Default 10 sec)	2	-	30	sec
Delay to Fault – user settable (Default 10 sec)	2	-	30	sec
Operating distance (separation) *	8	-	100	m
Maximum angular misalignment of Detector from optical axis	-	-	± 0.3	Deg
Maximum angular misalignment of Reflector from optical axis	-	-	± 5	Deg
Maximum angular alignment	-	-	±3.5	Deg
Optical wavelength	850			nm
Fault level/ Rapid obscuration ($\Delta = 2$ sec)	-	-	87	%
Operating temperature (Europe)	-20	-	+55	Deg C
Operating temperature (America)	0	-	+37.8	DegC
Storage temperature (Europe)	-40	-	+85	Deg C
Storage temperature (America)	-40	-	+85	Deg C
Relative humidity (non condensing)	-	-	93	%
IP rating	54			-
Contact Voltage - Fire & Fault relays (DPCO) (Europe)	0.1	-	36	VDC
Contact Voltage - Fire & Fault relays (DPCO) (America)	0.1	-	30	VDC
Contact Current - Fire & Fault relays (DPCO)	0.1	-	500	mA
Cable length – System Controller to Detector	1	-	100	m
	24	-	14	AWG
Cable gauge (2 core screened fire resistant)	0.5	-	1.5	mm
Housing flammability rating	UL94 V0			

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH



OVERVIEW OF ERROR CODES

- Unique code that displays a specific problem, this could be either:
 - A potential installation fault
 - A potential hardware fault
- There are several Error Codes to help the user troubleshoot a particular fault



SOLUTIONS FOR E-01

- **E-01 (Detector communication error)**
 - System still powering up, wait 45 seconds
 - Detector not installed or has been removed, replace
 - Cable break between System Controller and Detector, check wiring
 - Wired incorrectly, check wiring
 - Detector pins not making contact to 1st fix PCB, check detector pins

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH ▲

If the previous issues have been checked, the AIM module may have come loose in the System Controller.

This is not usually a user accessible component, however if care is taken with anti-static precautions, the user can check the fitting of the AIM module.



SOLUTIONS FOR E-02

- **E-02 (Detector not 'found')**
 - 'Find' not successfully completed, re-find
 - 'Find' was aborted, re-find



SOLUTIONS FOR E-03

- **E-03 (AGC limit reached/signal strength too high)**
 - AGC reached –50 or +205, clean, then re-align system
 - Signal strength exceeds 2500, check line of sight for reflective obstructions, resolve and then realign system
 - Signal strength exceeds 2500, realign system as it was not correctly aligned

WHAT ▲ INSTALL ▲ COMMISSION ▲ USE ▲ MAINTAIN ▲ TECH ▲

To confirm signal strength, use HAND alignment mode.



SOLUTIONS FOR E-04

- **E-04 (Too many IR readings missed)**
 - Supply voltage too low, check and resolve supply voltage
 - Detector voltage too low, check cable length and diameter, resolve



SOLUTIONS FOR E-08

- **E-08 (AGC value not Zero)**

Occurs at start of SET:

- If beam has not recently been AUTO aligned, re-align the beam
- AGC value manually changed, set AGC value back to zero

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SOLUTIONS FOR E-09

- **E-09 (Received Signal Strength out of Range)**

Occurs at start of SET, received signal strength not between 800 and 1500:

- Ensure that the correct range has been set, correct and realign
- Ensure that the correct number of reflectors are being used and they are of the correct type, remedy and realign
- Check line of sight for reflective obstructions, resolve and then realign
- If none of the above, realign

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SOLUTIONS FOR E-10

- **E-10 (Reflector not Found)**

Occurs at start of AUTO during Search stage:

- Check coarse alignment with laser, then realign
- Ensure that the correct range has been set, correct and realign
- Ensure that the correct number of reflectors are being used and they are of the correct type, remedy and realign
- Check line of sight for obstructions, resolve and then realign



SOLUTIONS FOR E-11

- **E-11 (Auto-Align Failed)**

Occurs during AUTO at adjust or centre stages:

- Ensure that the correct range has been set, correct and realign
- Ensure that the correct number of reflectors are being used and they are of the correct type, remedy and realign
- Check line of sight for obstructions, resolve and then realign
- Detector head run out of mechanical movement, use universal bracket



SOLUTIONS FOR E-12

- **E-12 (Not correctly aligned to reflector)**

Occurs during SET:

- Ensure that the reflector was covered and uncovered fully and correctly and at the correct time by repeating SET correctly
- Ensure that the reflector is covered with a non-reflective material during SET
- Check line of sight for reflective obstructions, resolve and then realign
- Ensure SET is done by covering reflector, not detector, repeat SET correctly

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SOLUTIONS FOR E-13

- **E-13 (Reflector not uncovered at SET S-01)**

Occurs during SET:

- Ensure that the reflector was uncovered fully and correctly before pressing 'tick' at S-01, repeat SET correctly



SOLUTIONS FOR E-14

- **E-14 ('Centre' failed)**

Occurs during AUTO centre stage:

- Check line of sight for reflective obstructions, resolve and then realign
- Check reflector is not mounted on or close to a partially reflective surface such as a window or girder
- Detector head run out of mechanical movement, use universal bracket

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ENVIRONMENTAL CONDITIONS

- Operating Temperature – EN = -10 to +55°C
- Operating Temperature – UL = 0 to +37.8 °C
- Storage Temperature = -40 to +85°C
- Relative Humidity (Non-Condensing) = 93%
- IP Rating = 54

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It must be remembered that Detectors are usually mounted in the apex of buildings; an area which is usually hotter than the floor level.

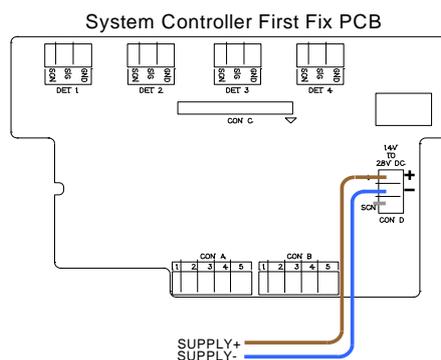
The 'Non-Condensing' statement within the Relative Humidity specification is an important one because if water vapour condenses onto the lenses of the FIRERAY5000 the signal will be attenuated and false fires or faults may occur.

The IP rating means that it has limited ingress against dust – no harmful deposits, and that it will survive water spray from all directions. Note: if operational at the time the beam will signal a fault or fire as the path has been obscured. The system will recover when a clear line of sight returns (lenses are clean and dry).



OPERATING VOLTAGE

- Between 14 to 28 volts DC
- Operating outside of this will cause reduced functionality or damage to the System



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The specified operating voltage to the System Controller is between 14 to 28vdc. This allows for the connection of a standard 24v power supply into the dedicated connector on the System Controller First Fix.

Taking into account tolerances on the power supply, the back-up battery and the cable length between the System Controller & Detector a value of between 14 & 28v must be adhered to in order to maintain system operation and functionality.



OPERATING CURRENT

- Two User Selectable Current Modes
 - High Current – 50mA
 - Low Current – 10mA (Default)
- High Current Mode
 - Faster Laser Targeting and Auto-alignment
- Auto-optimize time same when operational

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The FIRERAY5000 has two selectable current modes accessible from within the Engineering Menu. They are:

High Current Mode of 50mA

Low Current Mode of 10mA (for one head)

By default, the system is in low current mode when shipped. High current mode is purely for faster Laser Targeting, Hand Alignment, Auto Alignment and Home Position.

During operation, there is no difference in the operation of the beam if either High or Low current mode is selected. If the system is powered down, it will return in low current mode.

The output of the power supply must be checked before switching between low to high current mode to ensure that the voltage will not collapse under the extra current draw.



OPERATING RANGE

- The Minimum & Maximum Separation between the Detector & Receiver is 8 to 100m
 - 8 to 18m = 1 Reflector with supplied Short Range Mask
 - 18 to 50m = 1 Reflector
 - 50 to 100m = 4 Reflectors (need Long Range Kit)

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The FIRERAY5000 can operate between 8 to 100 meters. This is the distance between the Detector and Reflector/s, i.e. the beam will make a round trip of between 16 to 200m.

The Reflector size and number must be set according to the operational distance.
8 to 18m = 1 Reflector with supplied Short Range Mask

18 to 50m = 1 Reflector

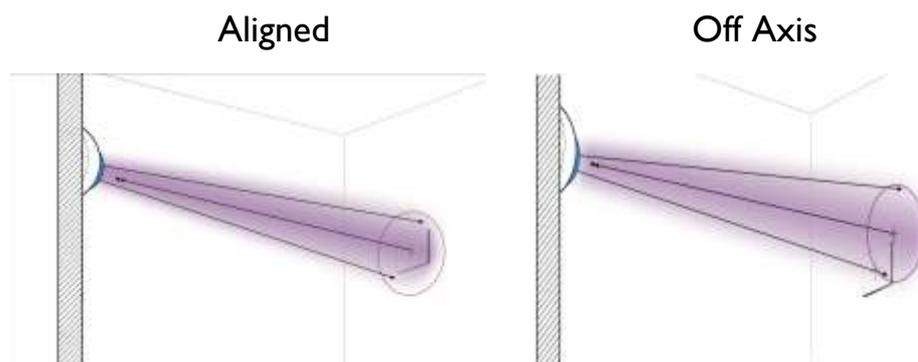
50 to 100m = 4 Reflectors. The additional 3 Reflectors for 50 to 100m operation must be purchased separately as the Long Range Kit.

In addition to the correct configuration of Reflectors, the correct operating range must also be selected from the System Controller for each Detector.



MAXIMUM DETECTOR MISALIGNMENT

The amount by which the Detector can be moved off axis and still be operational (and still be able to detect a fire and fault) = ± 0.3 degrees



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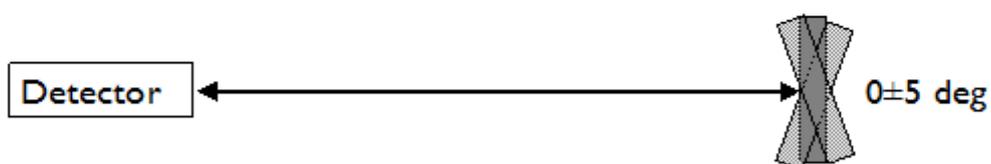
The FIRERAY5000 has been designed so that the beam can move slightly off axis from the Reflector and still operate. This is achieved by the conical form of the projected infrared light. The diameter of the cone will generally be larger than the surface area of the Reflector. Therefore, so long as the reflector remains inside the cone the signal should be ok. This angle is ± 0.3 degrees. Anything greater than this and the signal returned to the Detector will start to drop as the cone is no longer fully illuminating the reflector.

Over time the FR5000 will move to compensate for small building movements, unless this feature has been turned off (in the Detector Settings menu)



MAXIMUM REFLECTOR MISALIGNMENT

The amount by which the Reflector can be moved off axis and for the IR system still to be operational (and still be able to detect a fire and fault) = ± 5 degrees



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Similar to the Detector, the Reflector can be off axis from the Detector and still return enough signal not to create a fire or fault condition. This angle is +/-5 degrees.

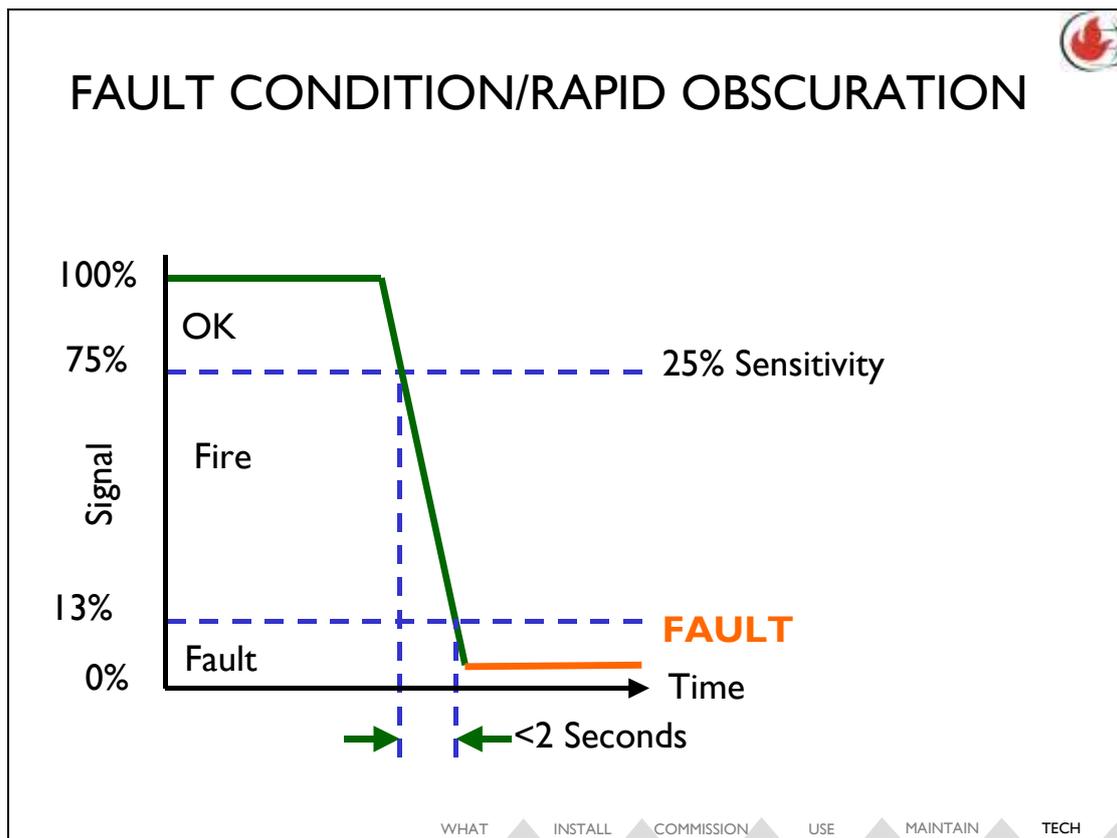


OPTICAL WAVELENGTH

- Wavelength of **FIRERAY5000** Infrared = 850nm (nanometres)
 - Near Infrared
 - Invisible to human eyes
- Visible Wavelength 380 to 750nm

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The typical human eye can see wavelengths between 380 to 750nm, (blue to red). Below 380nm is a region called Ultraviolet. Above 750nm is a region called Infrared. The FIRERAY5000 uses an infrared LED, (IRED), transmitting at 850nm, therefore, making it invisible to human eyes.



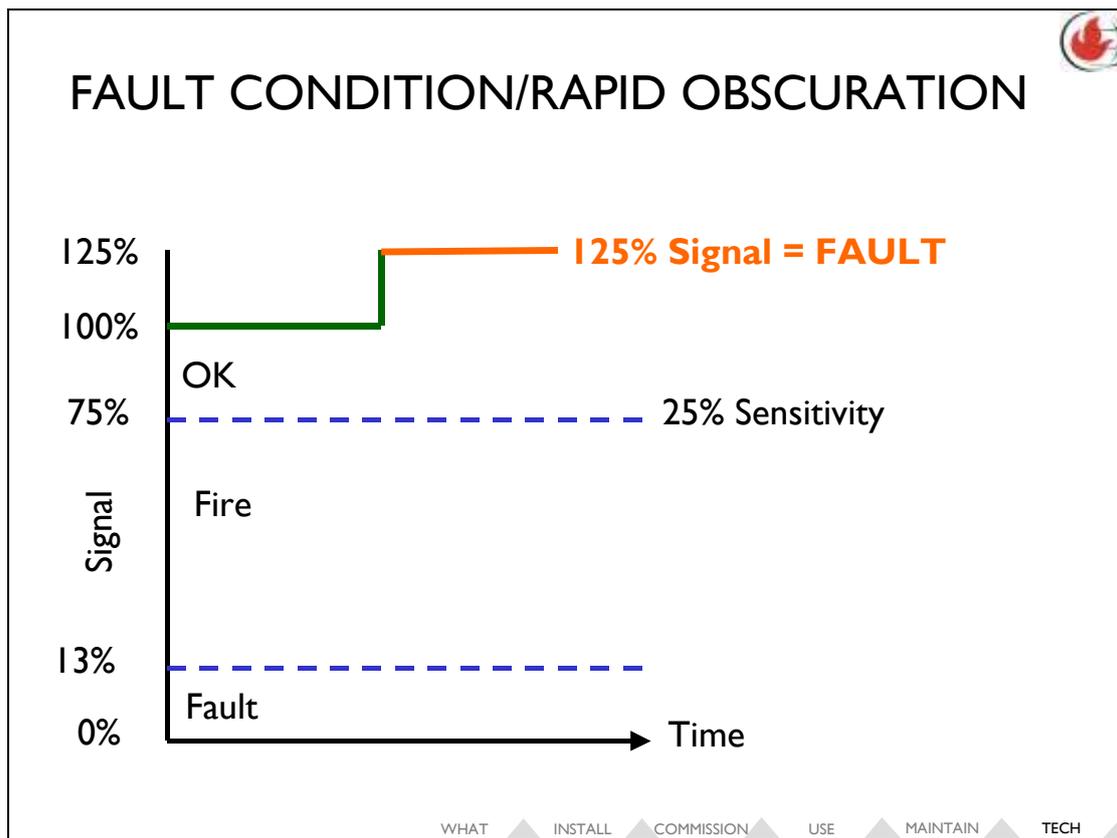
The FIRERAY5000 signals a fault condition when the signal drops from above the fire threshold to below the fault threshold within 2 seconds. The Fault Threshold on the FIRERAY5000 is 13%, i.e. the signal must drop potentially by 87% in 2 seconds or less.

A Fault Condition exists because of the potential for non-reflective objects to be moved quickly into the path of the beam, for example boxes or pallets. This results in the beam being 'blocked' as the Detector can no longer see the Reflector, thus preventing a false fire being signalled but warning that the area cannot be fully protected.

A threshold of 13% is used as a level as potentially the signal may not drop to 0% as the object blocking the beam may be partially reflective.

This is a factory set level and cannot be changed by the user.

The reason for the signal having to drop below this level in 2 seconds or less is because it must not signal a fault for a fast burning fire and also because if an object is moved into the beam-path it usually happens in less than 2 seconds.



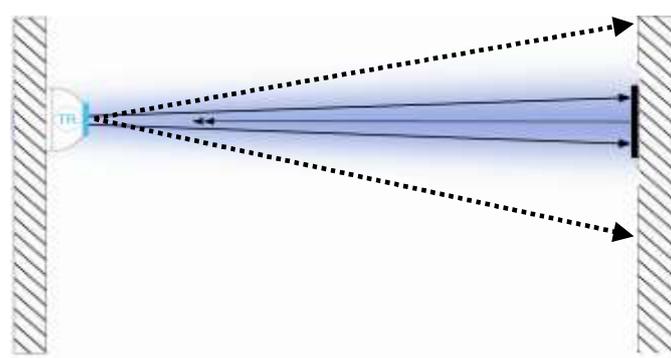
A Fault will also be raised if the signal level increases to 125%. This could be due to a highly reflective object being moved between the Detector and Reflector causing the system not to protect the full area.

If the signal strength jumps from 100% (+/-1) to $\geq 110\%$ within 2 seconds a fault will also be generated, to allow for some reflective objects breaking the beam path.



MAXIMUM ANGULAR MOVEMENT

The Amount of Mechanical Movement in the Detector for Alignment
= ± 3.5 Degrees



FIRERAY5000 Universal Bracket gives additional ± 45 Degrees

The maximum angular movement is the amount by which the beam can be steered from perpendicular, by the motor. This is because there is only a finite amount by which the beam can be steered due to physical and mechanical constraints. For the FIRERAY5000 this figure is ± 3.5 degrees. Normally the Reflector is placed opposite to the Detector and at the same level. Therefore very little mechanical movement is required. However, if the installation is not of this type then this maximum angular movement must be taken into account. I.e. if the beam is going diagonally across a room. Under these conditions a FIRERAY5000 Universal Bracket would need to be purchased which gives an additional adjustment of ± 45 degrees.



AIM RELAY SPECIFICATION

- Contact Voltage EN = 0.1 to 36 VDC
- Contact Voltage UL = 0.1 to 30 VDC
- Contact Current = 0.1 to 500mA

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The Conventional AIM inside the System Controller uses relays to signal the fire and fault conditions. As a result there is a specification as to how much voltage and current these contacts can handle.

The purpose of this specification is to show that the relays cannot be used to switch in any high power devices such as sounders or automatic door closures.



HOUSING FLAMMABILITY RATING

- Housing Flammability Rating = UL94 V0
 - Extinguishes when flame removed
 - Will not drip flaming residue

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The FIREREAY5000 outer plastics are made from UL94 V0 material. This means that if a flame is applied and then removed the product will extinguish itself, (not maintain the fire). It will also not drip any flaming, melted plastic residue (which if it did could cause further fires).



EXTERNAL RESET

- Clears latched fire
- Activation voltage 5V to 40V d.c.
- Duration of at least 2s
- Latched fires can also be cleared by:
 - Correctly entering the pass code
 - Powering down the system controller for 3s



OUR SUPPORT

Website

- www.ffeuk.com

Technical Support (outside US)

- Email: technical@ffeuk.com
- Telephone: 01462 444783

Sales Administration Support

- Email: sales@ffeuk.com
- Telephone: 01462 444740

Technical Support (inside US)

- Email: technical@ffeuk.com
- Telephone: 866-FIRERAY
(= 1-866-347-3729)

FFE Technical Support covers:

helping you select the right type of Optical Beam and advising you of good installation practice

providing telephone support throughout your installation

troubleshooting if any issues arise after installation

We first work with you by phone and email, discussing your data, photos etc. then we can arrange a site visit if necessary

Call or email us to speak with one of our eight Engineers or with our Sales Managers (UK, USA and India)

We offer flexible, modular training courses on Beams in general and our wide range of beam products in particular

Courses can be arranged with the appropriate Sales Managers with an Agenda to suit your requirements

In the UK, courses are usually delivered in our Hitchin office utilising the training room and 27m demonstration area



CONCLUSION

FIRERAY5000 could be the detector of choice for protecting lives, equipment and properties where:

- ✓ Areas are wide
- ✓ Ceilings are high
- ✓ Cost of installation and servicing need to be low
- ✓ Architecture cosmetics / aesthetics are important
- ✓ Ceilings are ornate
- ✓ There is potential for building movement

