EDWARDS

LaserSense Nano Aspirating Smoke Detector Installers Handbook

Copyright	© 2013 UTC Fire & Security. All rights reserved.
Manufacturer	Kidde Products Limited Unit 2, Blair Way, Dawdon Seaham, County Durham SR7 7PP United Kingdom
Certification	$C\epsilon$ 0832
	0832-CPD-1312
	EN 54-20: 2006
	Aspirating smoke detectors for fire detection and fire alarm systems for buildings.
	Class A, B, and C
	Technical data: See INF48022 and INF48023 held by the manufacturer.
Contact information	For contact information, see www.airsensetechnology.com.

Content

Important information

Regulatory information

This equipment is Class III as defined in EN 60950 (i.e., this equipment is designed to operate from Safety Extra Low Voltages and does not generate any hazardous voltages).

As this equipment is part of a fire detection system, input power should be supplied from an approved power supply conforming to EN 54-4 or UL/ULC and FM standards.

This product has been designed to meet the following requirements:

- NFPA 72 *National Fire Alarm and Signaling Code*
- UL 268 *Smoke Detectors for Fire Alarm Signaling Systems*
- UL 268A *Smoke Detectors for Duct Applications*
- UL 864 *Control Units for Fire Protective Signaling Systems*
- CAN/ULC-S524 *Installation of Fire Alarm Systems*
- ULC-S527 *Control Units for Fire Alarm Systems*
- CAN/ULC-S529 *Smoke Detectors for Fire Alarm Systems*

System reacceptance test after reprogramming (UL/ULC and FM): To ensure proper system operation, this system must be retested in accordance with NFPA 72 after any programming change. Reacceptance testing is also required after any addition or deletion of system components, and after any modification, repair, or adjustment to system hardware or wiring.

Limitation of liability

To the maximum extent permitted by applicable law, in no event will UTCFS be liable for any lost profits or business opportunities, loss of use, business interruption, loss of data, or any other indirect, special, incidental, or consequential damages under any theory of liability, whether based in contract, tort, negligence, product liability, or otherwise. Because some jurisdictions do not allow the exclusion or limitation of liability for consequential or incidental damages the preceding limitation may not apply to you. In any event the total liability of UTCFS shall not exceed the purchase price of the product. The foregoing limitation will apply to the maximum extent permitted by applicable law, regardless of whether UTCFS has been advised of the possibility of such damages and regardless of whether any remedy fails of its essential purpose.

Installation in accordance with this manual, applicable codes, and the instructions of the authority having jurisdiction is mandatory.

While every precaution has been taken during the preparation of this manual to ensure the accuracy of its contents, UTCFS assumes no responsibility for errors or omissions.

Advisory messages

Advisory messages alert you to conditions or practices that can cause unwanted results. The advisory messages used in this document are shown and described below.

WARNING: Warning messages advise you of hazards that could result in injury or loss of life. They tell you which actions to take or to avoid in order to prevent the injury or loss of life.

Caution: Caution messages advise you of possible equipment damage. They tell you which actions to take or to avoid in order to prevent the damage.

Note: Note messages advise you of the possible loss of time or effort. They describe how to avoid the loss. Notes are also used to point out important information that you should read.

Product Symbols

	This symbol appears on the main board of the unit and indicates that the board contains static sensitive components.
LASER CLASS 1 PRODUCT	This label is located on the laser chamber at the bottom right of the open detector and signifies that the unit is a Class 1 Laser product as specified in IEC 60825-1. The unit incorporates a Class 3B embedded laser which must not be removed from the detector, as retinal damage may result if the laser beam enters the eye.
	This symbol indicates the Safety ground studs. These are for grounding cable screens, etc., and should not be connected to 0V or signal earth.

EN 54-20 compliance

The installation must be designed using PipeCAD software, which is provided free on the CD shipped with each detector. After designing the installation including pipes, endcaps and sampling holes, enter the detector type. To select the detector type, select Options, select Calculation options, and then select the detector from the Type drop-down list.

Select Options > Calculate or click on the calculator icon. The software will prompt you to choose from Use set hole sizes, Best flow balance, or Max. permissible transit time. Select the appropriate option, and then click OK. The results for each pipe (View > Results) show calculations for each sampling hole on the pipe with the nearest to the detector at the top of the screen, and the endcap hole at the bottom.

The classification of each sampling device configuration and associated sensitivity settings are determined by the column headed Hole sensitivity % obs/m, which shows the predicted sensitivity for each hole. For the installation to comply with EN 54-20 depending on the class of installation, each sampling hole must be no less sensitive than the following:

Class A: 0.80% obs/m

Class B: 1.66% obs/m

Class C: 7.54% obs/m

The calculation can be further refined by leaving a working detector in the protected area for at least 24 hours at the intended alarm factor for the installation (this could be done before or after installation). The detector sensitivity can be read from the Sensitivity figure on the histogram screen of the Remote software supplied with each detector. Click Options > Calculation options to open the Hole calculation options dialog box. Enter the sensitivity value obtained from the practical test, and then click OK. The new calculated value will use the real sensitivity from the practical test.

The PipeCAD software will determine the classification of any used configuration. Commissioning and periodic system tests must involve smoke tests to verify that the system performs as expected and enters Fire 1 alarm within the time determined by PipeCAD from the farthest hole. The detector sensitivity must also be inspected to ensure it has not radically fallen from the installed figure. If it has changed for any reason, the new figure must be re-entered into PipeCAD and the recalculated hole sensitivities must be confirmed to be within the class limits shown above.

Chapter 1
Product and component descriptions

Summary

This chapter provides descriptions of the detector features, specifications, and controls and indicators.

Content

Introduction

This aspirating detector is a highly sophisticated next generation high sensitivity aspirating smoke detection product that provides all the benefits of air sampling high sensitivity smoke detection, including very early warning. Designed for easy installation and commissioning, the detector incorporates a patented artificial intelligence known as ClassiFire, which allows the detector to configure itself to optimum sensitivity, alarm thresholds, and minimum nuisance alarms for various environments.

This detector operates by drawing air from a protected space via a supervised piping network in relatively small areas. The sampled air is passed through a dust separator to remove dust and dirt before entering the laser detection chamber. State-of-the-art electronics are used to analyse the sampled air and generate a signal representing the level of smoke present.

ClassiFire intelligence also monitors the detector chamber and dust separator for contamination, continually adjusting the appropriate operating parameters to counteract the negative effects of any contamination. Aspirating smoke detectors are unique in being able to provide a consistent level of protection in a very wide range of environments by continuously making minor adjustments to sensitivity.

The detector can easily be installed without any specialised tools or software.

Available software for the detector

The Remote Control and the SenseNET software packages are available to program the detector.

- **Remote Control software:** Provided free of charge with every detector, this software package enables the user to set up and configure the programmable functions of one or more detectors from a computer connected via an RS-232 serial cable.

- **SenseNET software:** SenseNET software is used to configure and manage a large network of detectors with a simple, streamlined graphical user interface from a computer connected to a detector or command module via an RS-232 serial cable to RS-485 converter interface.

Specifications

Caution: This equipment is only to be used in accordance with these specifications. Failure to operate the equipment as specified may cause damage to the unit, injury, or property damage.

Table 1: Specifications

Specification	Value
SELV rating	EN 60950 Class III
Supply Voltage	21.60 to 26.40 (UL rated 22.25 to 26.40 VDC)
Current consumption	350 mA
Electrical Safety	Complies with EN 610190-1
Size	190 W × 230 H × 110 D mm (7.5 W × 9.0H × 4.3 D in.)
Weight	1.2 kg (2.65 lbs.)
Operating temperature range	−10 to +60ºC (EN 54-20) 32 to 100°F (0 to 38°C) (UL 268, CAN/ULC-S529, FM)
Operating humidity range	0 to 90% relative humidity, noncondensing EN 61010-1 Pollution degree 1 EN 61010-1 Installation category II
IP rating	IP50

Sensitivity range
    (%obs/ft.)
    (%obs/m)
	Min. = 7.62%, Max. = 0.122% FSD
	Min. = 25%, Max. = 0.4% FSD

Maximum sensitivity resolution	0.4% obs/m (0.12% obs/ft.)
Detection principle	Laser light forward scattering mass detection
Maximum number of sampling holes	Class A: 2 Class B: 4 Class C: 10
Maximum sampling pipe length	50 m (164 ft.)
Pipe inlets	2 (sampling and exhaust pipes)
Alarm / fault relays	Pre-Alarm / Alarm / Fault
Relay contact rating (changeover)	1 A at 24 VDC (resistive load)
Programming	Internal DIP switches
PC interrogation	Via optional communications card
APIC compatible	Yes

Indicators

Figure 1 below shows the indicators on the detector.

Figure 1: External components
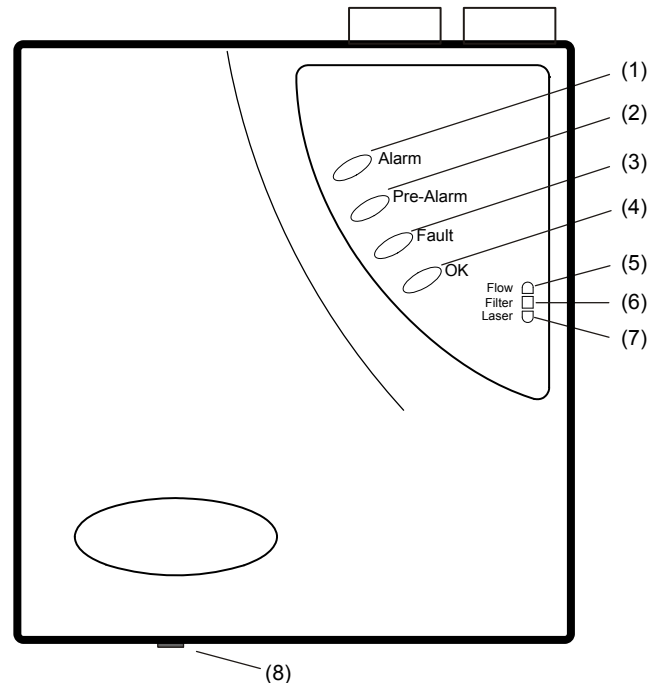
(1) **Alarm:** Illuminates to indicate that the smoke level has passed the detector's Fire 1 threshold, and the normally open ALARM relay contacts have closed.

(2) **Pre-Alarm:** Illuminates to indicate that the smoke level has passed the detector's Pre-Alarm threshold, and the normally open PRE-ALARM relay contacts have closed.

(3) **Fault:** Illuminates to indicate a fault condition and that the normally closed FAULT relay contacts have opened. Three additional LEDs indicate the type of fault.

If the Fault LED is illuminated but none of the additional LEDs are lit, it indicates a problem with the power supply if its fault output is connected to the detector's INPUT terminals and DIP switch 7 is set to OFF (its default position). Alternatively, this can happen if the INPUT terminals are left open circuit and DIP switch 7 is OFF.

(4) **OK:** Illuminates to confirm normal operation.

During initial setup, the OK LED will flash for 15 minutes while the detector learns its operating environment. This does not indicate a problem with the detector.

(5) **Flow:** Illuminates to indicate an airflow fault. This may be due to blocked or broken pipes, although it can also occur if, for example, factory warehouse doors are opened on a windy day, a large pressure change occurs, or if industrial air conditioning turns on. Another possible cause is that the aspiration fan connection cable is damaged or disconnected.

(6) **Filter:** Illuminates to indicate that the detector's air filter needs to be changed.

(7) **Laser:** Illuminates to indicate a problem with the detector laser chamber, as might be caused by the laser head connecting cable is damaged or disconnected. It can also be caused by certain kinds of internal systems faults, which appear in the detector's event log as "process errors."

(8) **Front cover securing screw:** Leave sufficient clearance below the detector to allow screwdriver access to this screw.

Inside the detector

Figure 2 below shows the main interior parts of a detector with the cover off.

Figure 2: Internal components
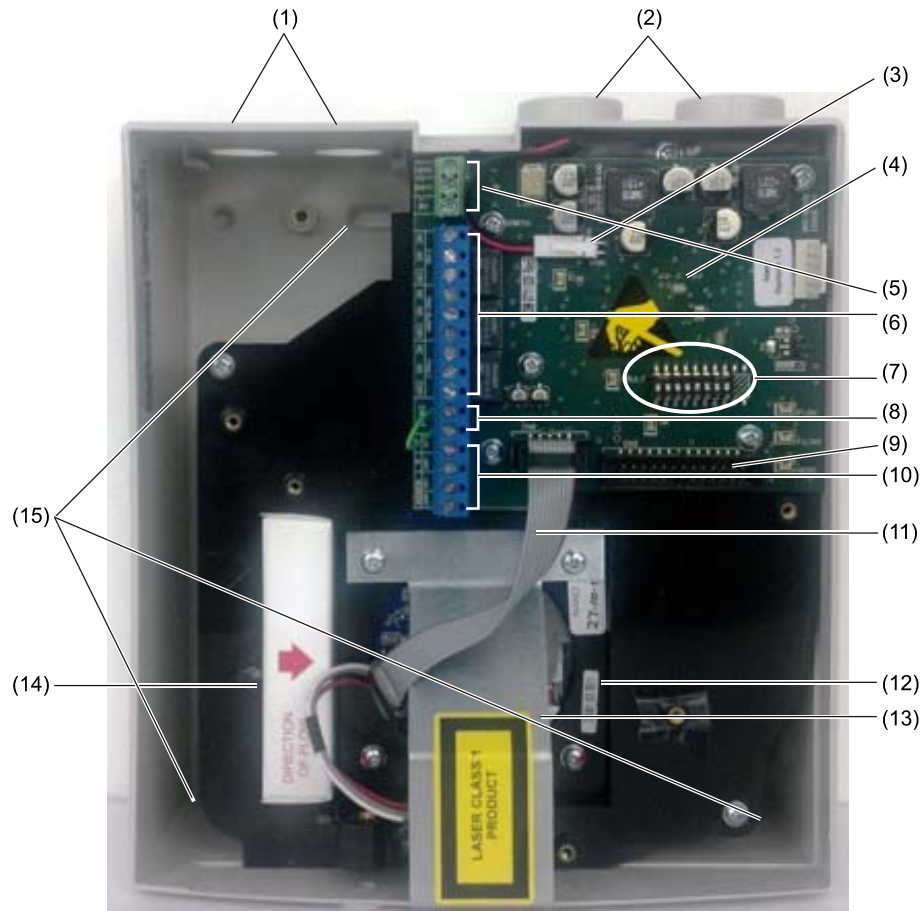
(1)   Two holes for conduit connection. There are two 3/4 in. drilling guides provided on the top of the detector and one on the bottom providing holes for conduit.

(2)   Pipe entries provide a connection for 3/4-inch pipe. A 3/4 in. male to 25 mm female adapter is required when using larger than 1 inch (27 mm) O.D. pipe.

   Note: Do not glue pipes into the detector to allow for future removal.

(3)   Aspirating fan connector lead: If this lead is broken or not connected, the fan will not turn and the detector will indicate a FLOW fault.

(4)   Main PCB: No user-serviceable parts.

   The PCB is fixed in place with 5 M3 x 6 screws. The detector should not be operated with any of the screws missing, as this could cause air leaks and unreliable operation.

(5)   Power supply connection terminals

(6)   Volt-free relay contact terminals

(7)   DIP switch: Used to configure user-selectable detector functions.

(8)   Input switch terminals

(9)   Ribbon cable connection for optional communication card or APIC card

(10) Optional communication terminals: used when the optional communication card is fitted to connect the RS-485 network

(11) Detector laser head ribbon connector: If this lead is broken or not connected, the detector will indicate a HEAD Fault.

(12) Detector laser head assembly: No user-serviceable parts. Do not remove this from the detector, due to the risk of exposure to the laser.

(13) Detector laser head cover plate: This protects the laser head. The plate should not be removed from the detector.

(14) Replaceable dust filter: This simply slides in and out of its mounting. The separator and its replacement have IN written in red on one side, and OUT on the other to indicate correct orientation.

(15) Three mounting holes to mount the detector. Use #10-24 pan-head screws for mounting.

Note: Ensure that the detector is fixed to a flat surface so that the enclosure will not twist and become damaged.

Chapter 2
Installation and configuration

Summary

This chapter provides information necessary to install and configure the detector system.

Content

Introduction

This chapter provides information necessary to install the Nano detector system. Installation consists of the following steps:

1. Unpack the shipping carton. Ensure that the package contains product literature, one ferrite ring, and the detector.

2. Determine the optimum location for the detector.

3. Mount the detector into the selected location.

4. Connect the detector to the sampling pipe network.

Installation should only be done by factory-trained technicians.

Installation should be in accordance with applicable installation requirements. These include:

- NFPA-70, *National Electrical Code*
- NFPA-72, *National Fire Alarm and Signaling Code*
- CSA C22.1 *Canadian Electrical Code, Part 1*
- CAN/ULC-S524 *Installation of Fire Alarm Systems*
- Any other local, national, or installation requirements or standards.

WARNING: Electrocution hazard. All connections should be made with the power turned off.

Antistatic precautions

This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits.

Caution: When handling any electric components or printed circuit boards, antistatic precautions must be followed. Failure to do so may result in component damage.

Static discharge can be reduced by adhering to the following guidelines:

- Always use conductive or antistatic containers for transportation and storage, if returning any item.

- Wear a wrist strap while handling devices and ensure that a good ground is maintained throughout the installation process.

- Never subject a static sensitive device to sliding movement over an ungrounded surface and avoid any direct contact with the pins or connections.

- Avoid placing sensitive devices onto plastic or vinyl surfaces.

- Minimize the handling of sensitive devices and printed circuit boards (PCBs).

System design

Pre-engineered piping designs simplify the installation of the detector pipe network. The following criteria ensure that the airflow and transport times are within the design of the detector. The design parameters listed below must be adhered to for all pre-engineered pipe designs. Pre-engineered piping networks should not exceed the transport time requirement of 120 seconds. During the system test, transport times are often less than 55 seconds.

- The maximum of three elbows and one pipe tee can be used in any pipe network design.

- When using a pipe tee, it must be located within 20 feet of pipe from the detector.

- All capillary tubes will have a maximum length of 3 feet and use a 9/64 inch sampling hole size.

- The first sampling hole must be 10 feet or more from the detector.

- The use of sampling capillary tubes and sampling holes can be mixed in any combination on the pipe network.

- On branch designs, the same number of sampling holes must be used on each branch.

Table 2: Sample pipe network parameters

Total pipe length	Max amount elbows	Max sampling points	Sampling hole size	Capillary tube sample hole size	End cap hole
164 feet	3	10	1/8 inch	9/64 inch	5/32 inch

Note: PipeCAD pipe modeling software is used to design pipe networks outside the above parameters. Refer to the *PipeCAD System Design and Installation User Manual* for complete instructions.

The Nano detector employs a fan designed to detect smoke in relatively small areas. The Nano detector is *not* intended to protect large areas, or to sample from areas where there may be any difference in airflow rates or pressure differentials. If detection in environments conforming to these descriptions is required, other type detectors should be used.

Always locate the sampling points in positions to which smoke may reasonably be expected to travel. It is usually better to locate the sampling pipe directly in the airflow (for example, across the return air register of an air conditioning unit).

Note: There is no substitute for carrying out smoke tests prior to installation of pipework to indicate suitable sampling point location.

Sample pipe networks

Simple designs with short sampling pipes produce the best results. Maximum allowed sampling pipe length is 164 feet (50 meters) in *still air*. In areas or applications where the external airflow rate is greater than 3 feet per second (1 meter per second), the maximum sampling pipe length is reduced to 33 feet (10 meters).

Air handling unit installation

No more than one air handling unit may be protected with one Nano detector. In this application, ensure that the sampling pipe is raised clear of high velocity air in the immediate vicinity of the air intake grill on standoff posts as shown in Figure 3 below.

Figure 3: Air handling unit in vicinity of the Nano detector (exhaust pipes not shown for clarity)

(1) Incorrect
(2) Detector
(3) Sampling pipe
(4) Standoff posts
(5) Correct

(6) Detector
(7) AHU
(8) Equipment cabinet
(9) Direction of smoke
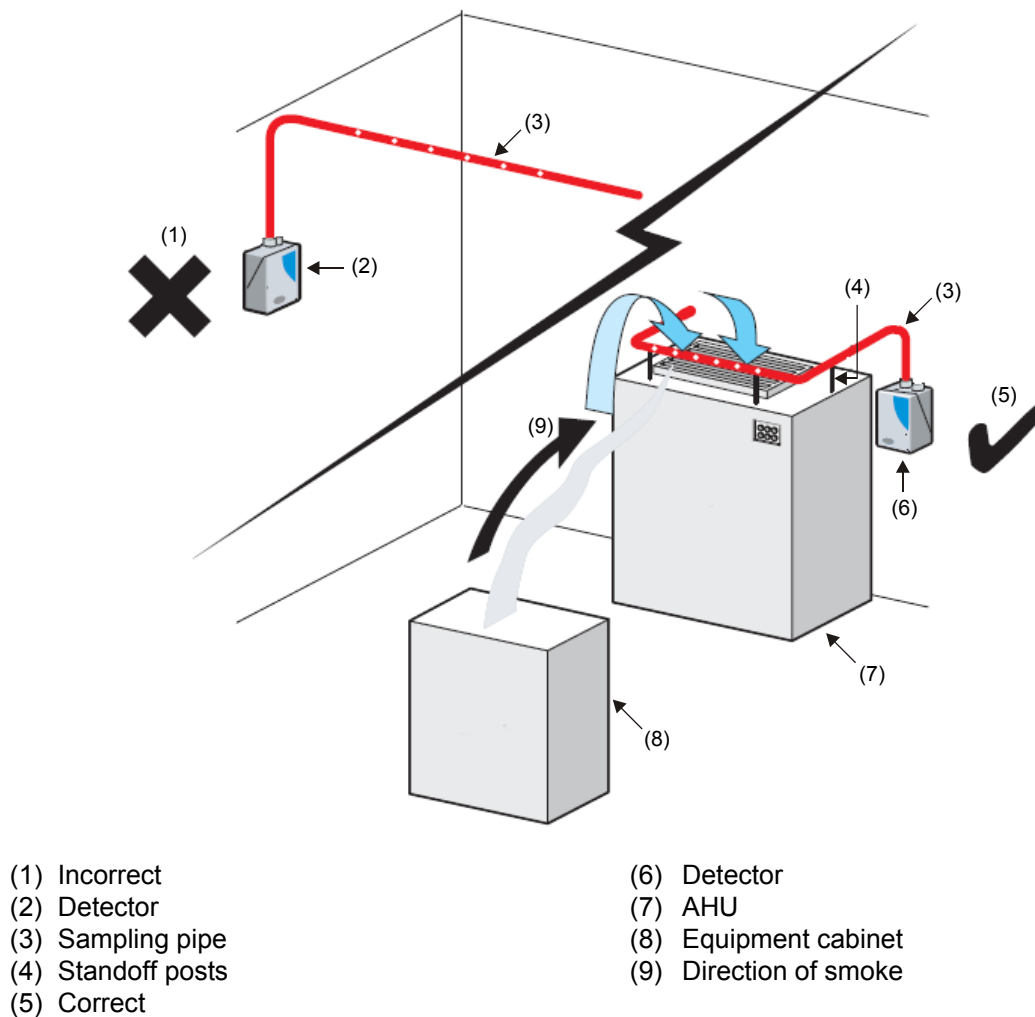
Below or above the ceiling installations

The Nano detector is supplied with an exhaust port (see Figure 2 on page 5). This allows the Nano detector to sample from areas which may be at different air pressure from the detector location. Typical uses are for air-duct sampling and allowing the installation of the detector in under-floor or ceiling voids or when sampling from pieces of computer related equipment. See Figure 4 below and Figure 5 on page 12.

Figure 4: Installation of pipework above ceiling with exposed detector (piped exhaust)
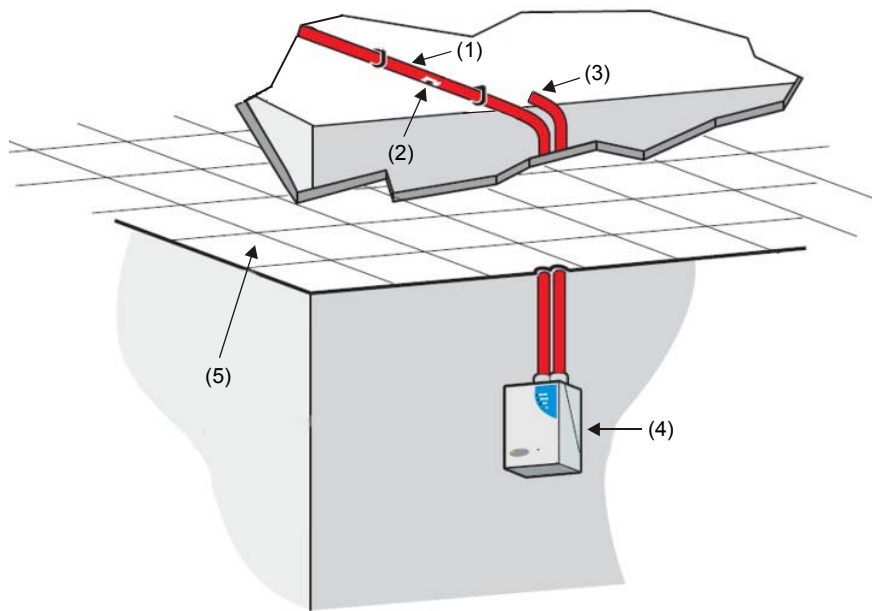
(1) Sampling pipe
(2) Sampling hole
(3) Exhaust pipe

(4) Detector
(5) False ceiling

Figure 5: Installation with detector mounted in ceiling void (no exhaust piping)

(1) Sampling pipe
(2) Sampling hole

(3) Detector
(4) False ceiling

Return air duct sampling method

Duct sampling generally is the most cost-effective method of air sampling because the pipe runs are minimal and a single detector may be used to cover a larger area. The speed of response of the detector to s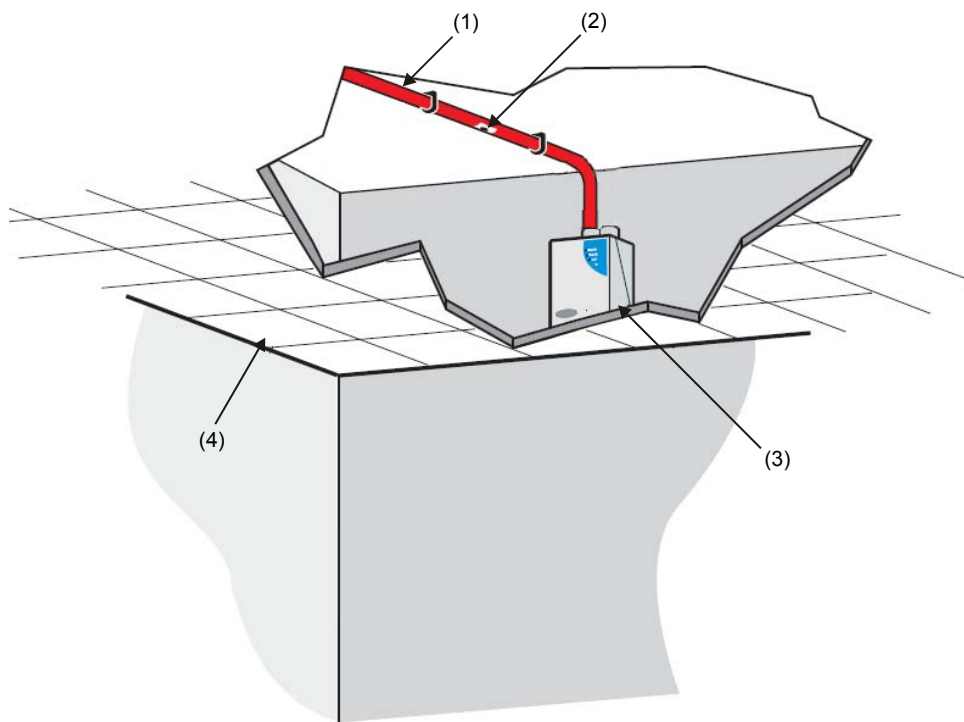moke is given by the exchange rate in the rooms ventilated by the duct ventilation system. This tends to be rapid, giving early warning of any smoke present. This type of sampling is particularly suited to aspirated smoke detection, since the smoke content in the air will tend to be diluted to a level below that of point type detectors. Also, the relatively high airflow in the duct reduces the effectiveness of point-detection devices.

The duct sampling method does have one major disadvantage. If the ventilation becomes inoperative, the air-flow through the duct system ceases and the smoke-detection system becomes ineffective.

Figure 6: Return air duct sampling

(1) 1/4 to 1/3 of duct width	(5) 2/3 to 3/4 of duct width
(2) 45 degree	(6) Direction of air flow
(3) 11.81 in. (300 mm) minimum	(7) Intake pipe to detector
(4) 45 degree	(8) Exhaust pipe from detector
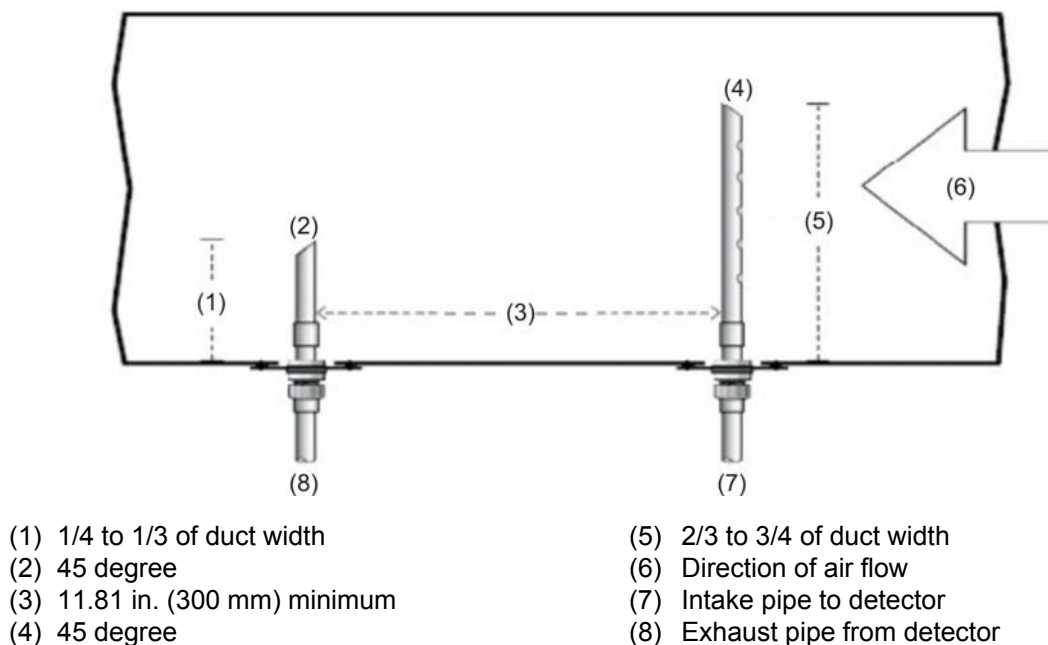
Figure 6 above shows a typical sampling pipe arrangement for an air duct. The right pipe is the sampling pipe and the holes on it are drilled 4 inches apart and face into the oncoming air stream. The left pipe exhausts air from the detector.

The detector is UL 268A and CAN/ULC-S529 approved for duct applications with an operating air velocity range of 300 to 4000 ft./min (1.52 to 20.32 m/sec).

The following guidelines apply:

• Only one duct can be monitored per detector.

• If the air sampling pipe system and aspirating detector is used as the primary smoke detection system, methods should be employed to notify stoppage of airflow in the ducts.

- The exhaust air from the detector must be returned back to the duct using an exhaust-port adapter and associated piping. This requirement assures positive airflow through the detector.

- Locate sampling pipe in the main supply duct return side, downstream of the filters and a minimum of six duct widths from any source of turbulence (such as bends, inlets, or deflection plates) to reduce the effects of stratification. In installations where the filter is capable of removing smoke, install the sampling tube upstream of the filter.

  Note: Where it is physically impossible to locate the sampling pipe in accordance with this guideline, the sampling pipe may be positioned closer than six duct widths, but as far as possible from inlets, bends, or deflection plates.

- Locate the sampling pipe such that dampers do not restrict airflow at the sampling pipe.

- The sampling pipe should be located before air exhausts from the building or before diluting return air with outside air.

- For accurate identification of the source of an alarm, locate sampling pipe as close as possible to the protected area's air entry into the duct system.

- Locate sampling pipe on the downstream side of the filter to sense fire in the filters.

  Note: If filters are blocked, sufficient airflow may no longer be present for proper operation.

- Do not locate sampling pipe near outside air inlets except to monitor smoke entry to the handling system for adjacent areas.

- Whenever possible, locate sampling pipe upstream of air humidifiers and downstream of dehumidifiers.

Note: Deviation from these recommended guidelines may reduce the performance of your air sampling pipe system and detector.

Return air grill sampling method

Return air grill sampling systems are designed with sampling pipes centered in the front of the return air grill. Sampling holes should be spaced so that a minimum of three holes are used for each grill. Larger grills require more sampling holes. The sampling holes should be in the direction of the airflow with an end cap.

When using the air grill sampling without another sampling method, the smoke-detection system will be ineffective when the ventilation system is inoperative. If this method is being used as the primary smoke detection system, the grill should be monitored for stoppage of airflow.

Figure 7 below shows a typical mounting to stand sampling pipe away from high velocity low pressure air at the entrance to the return air grill.

Figure 7: Return air grill sampling method

(1) Air flow
(2) Self tapping screws
(3) Return air grill
(4) Standoff post
(5) Sampling holes
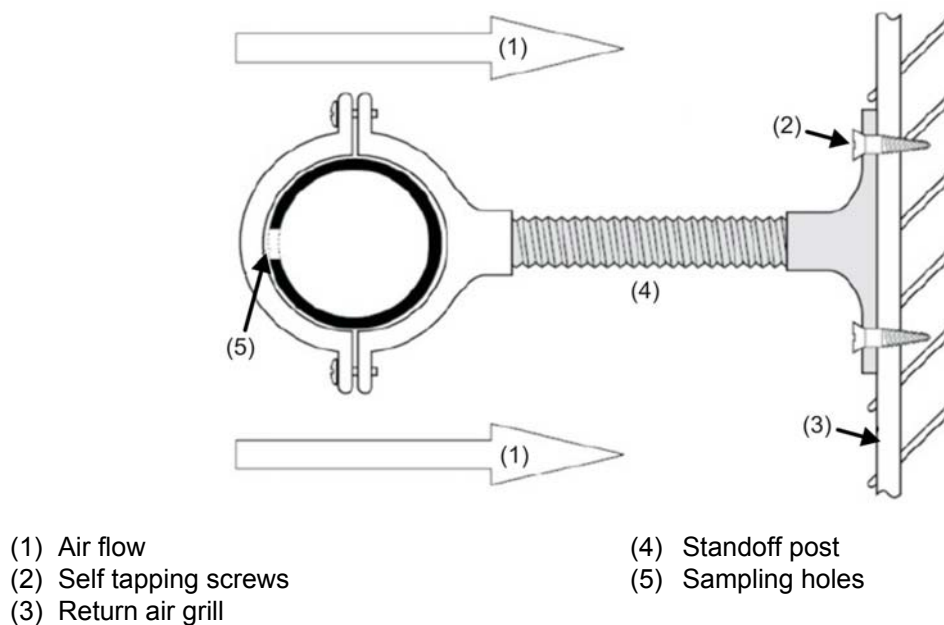
Installation

Installation guidelines

The following is a brief set of guidelines on installing detectors:

- The detector should normally be mounted at a level where there is easy access.

- The exhaust air from the unit must not be impeded in any way. If the detector is mounted in a different air pressure from where the air is being sampled (for example an air duct), then a pipe must be routed from the exhaust port back to the same air pressure zone as the sampling holes.

- All wiring must comply with NEC, NFPA 70, CSA C22.1, local codes and standards, and the requirements of the local AHJ. All signal cables must be suitable for the application.

- The detector must not be placed in areas where either the temperature or humidity is outside the specified operating range.

- The detector should not be placed in close proximity to any equipment expected to generate high radio frequency levels (such as radio alarms) or units generating high levels of electrical energy (such as large electric motors or generators).

Table 3 on page 17 contains a list of procedural guidelines for installation of the Nano detector.

Table 3: Procedural guidelines

Do	Don't
• Ensure that the ClassiFire alarm factor is appropriately set.	• Remove or connect boards when the detector is powered up.
• Ensure that the power and signal cables are correctly connected before powering up by use of cable identifiers or electrical continuity checks. Incorrect connection could damage the detector.	• Attempt to adjust or alter detector settings other than via the user-programmable functions. Any attempts to adjust the laser potentiometer are detectable and will void the warranty on the product.
• Ensure that cable of an appropriate approved type is used for interconnection.	• Drop the detector or use excessive force when fitting sampling pipes as this may damage the detector.
• Place sampling points so that the detector will be able to detect smoke at the earliest opportunity.	• Connect internal 0 volt terminals to local earth.
• Ensure that the detector exhaust is in an area with the same atmospheric pressure as the sample pipes, either by placing the detector physically in the protected area or by leading a pipe from the detector exhaust to the protected area.	• Use sampling pipe of less than 1 inch (27 mm) outside diameter without a suitable 1-inch (27- mm) pipe adapter. It is important that there are no leaks where the pipe connects to the detector.
• Ensure that the environment of the protected area is within the environmental operating parameters of the detector.	• Place the detector so close to other equipment that there is insufficient room to access and change the dust separator (filter) or access the RS-232 connector (if installed).
• Ensure the detector is properly grounded.	• Install the detector near high power RF sources or in damp or exposed areas.
	• Attempt to re-use dust separator (filter) cartridges once removed.

Removing the front cover

To remove the front cover, unfasten the cover securing screw located on the bottom of the unit. The cover may then be removed.

Mechanical installation

Refer to "Inside the detector" on page 5 for conduit, pipe interface information, and mounting hole locations.

The detector is connected to the installed sampling pipework and fixed to the mounting surface using three screws of a type appropriate to the mounting surface. Ensure that the sampling and exhaust pipes are securely seated in the pipe ports before securing. If using a piped exhaust connection, be sure that the sampling and exhaust pipe are fitted into the relevant port as shown in Figure 8 on page 18.

Pipework

Figure 8: Pipework
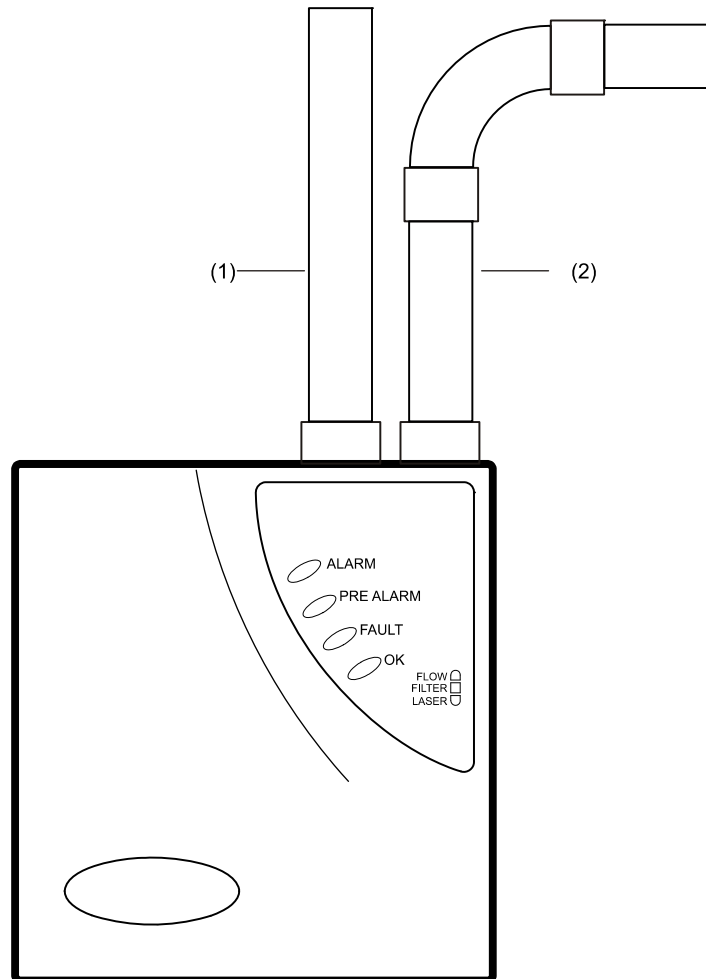
(1) Sampling pipe

> 3/4 in. pipe or 25 mm pipe with a 3/4 in. sleeve adapter.

> The maximum sampling pipe length is 50 m.

> Fit an end cap with an approximately sized hole to optimize airflow through the pipe.

(2) Exhaust pipe

> 3/4 in. pipe or 25 mm pipe with a 3/4 in. sleeve adapter.

> If the protected area is at a lower atmospheric pressure than the location in which the detector is installed (e.g. a closed air conditioned room), fit a return pipe run from the detector exhaust to the protected area in order to equalize the pressure. This will improve detector response.

> Even if the protected area and detector are at the same atmospheric pressure, it is a good practice to fit a pipe stub with a bend to the exhaust to prevent debris from falling into the detector.

Electrical installation

In keeping with good wiring practice, keep cables and individual stripped conductors as short as possible while allowing stress-relieving cable forming.

Power cables should be current-rated at 1A or greater. Signal cable should be 120 ohms or less twisted pair.

Figure 9 below shows the terminal block connections that connect the Nano detector to other electronic components. It is recommended that all connection wires are marked with suitable identification labels or colored rings to aid in the connection process.

Figure 9: Electrical installation
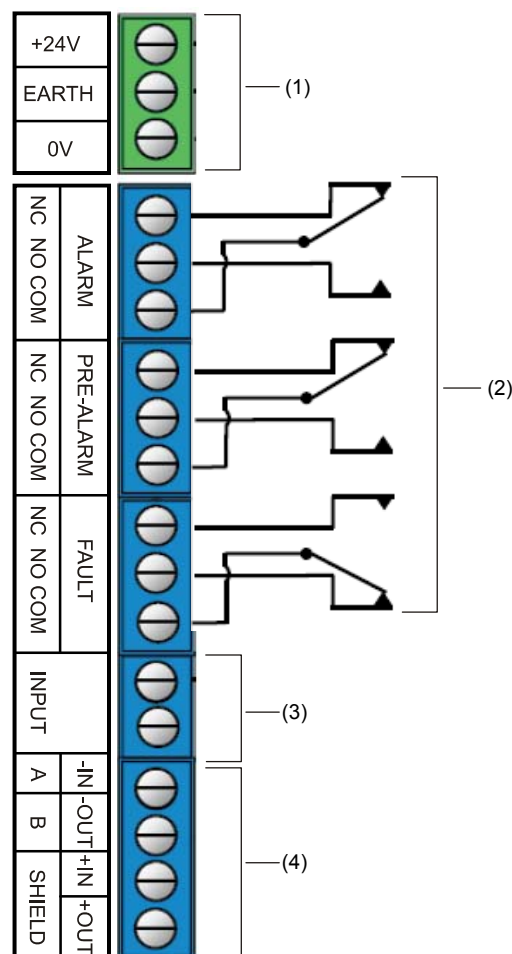
(1) Power supply connections

   Connect to 24 VDC 1A PSU.

   Do not connect 0V to EARTH.

   Use screened cable with screen connected to the detector EARTH terminal.

(2) Volt-free relay contacts rated at 1A maximum at 24 VDC

   All relay diagrams are shown in their contact states with the detector powered up and operating normally.

The Alarm and Pre-Alarm contacts are connected as normally open and change state upon alarm conditions.

The NO/NC (normally open/closed) terminal legends for this relay refer to the contact state in the power-off/fault condition, not to the "normal operation" condition. Fault relay contacts will also change over on power-down.

Use screened cable with screen connected to the detector EARTH terminal.

(3) Remote control input

DIP Switch 7 OFF: connect to PSU fault relay Normally Closed contacts for PSU monitoring.

Note: The INPUT terminals are set by default to monitor the power supply. If power supply monitoring and ClassiFire Override are not required, fit a wire link across the two terminals to prevent a fault condition on power-up.

DIP Switch 7 ON: ClassiFire Override will reduce detector sensitivity by 50% while the input terminals are shorted together, e.g. by a key switch.

Use screened cable with screen connected to the detector EARTH terminal.

(4) External communications terminals

Optional communications card fitted (RS-485 serial communications mode):

Connect Command Module or detector RS-485 (SenseNet) serial bus to A and B.

Set communications card address switches to identify detector.

Use screened cable. Connect screen to SCREEN terminal. Earth the screen at one end ONLY (if using a chain of detectors connected to a Command Module, earth the cable screen at the Command Module only).

Optional APIC card fitted (addressable communications mode):

Connect + and – IN and + and – OUT terminals to fire panel with a communications protocol compatible with the APIC. Set APIC address switches to identify detector.

In a chain of detectors linked to a Command Module, use a serial communications card in each detector, each set to an individual address, and communicate with the fire panel via a single APIC in the Command Module.

Use screened cable with screen connected to the detector EARTH terminal.

WARNING: Electrocution hazard. All connections should be made with the power turned off.

Power supply connections

The grounded power supply cable should be routed through the metal cable gland provided, leaving about 1-1/4 inch (35 mm) of the cable extending from the bottom of the cable gland. Depending on the type of cable used, it may be necessary to increase the diameter of the cable with sleeving or insulating tape to ensure that the cable is firmly held when the cable gland is fully tightened.

Note: If this equipment is part of a fire detection system, power should be supplied from a supervised UL Listed power supply, designed for fire system use.

To connect the power supply:

1. Remove the Nano detector front cover, and then locate the power supply terminal block.

Refer to Figure 2 on page 5 for an illustration of the Nano detector with the front cover removed. Refer to Figure 10 below for a detailed illustration of the power input terminals.

2. Connect 0 V and +24 VDC to the "0V" (-24) and "+24V" screw terminals, respectively.

3. Connect the shielded (screened) wire to the "EARTH" screw terminal.

Figure 10: Power supply terminals

Relay connections

The Nano detector includes an Alarm and a Pre-Alarm relay, which will transfer to the normally open (N.O.) position on alarm. It also includes a general Fault relay, which will transfer to the normally closed (N.C.) position during a fault condition or on power-down.

The relays are of the volt-free type, with a maximum current capacity of 1A at 24 VDC maximum. To comply with radiated immunity requirements, it is recommended that the relay connection wires be looped once around a suppression ferrite (provided). There should be about 1-1/4 inch (30 mm) of wire between the end of the ferrite and the terminal block to give adequate stress relief. To achieve this, it is necessary to strip back the cable shield approximately 5 inches (130 mm). The shield should be terminated under the cable gland cap.

The Nano detector interfaces to fire alarm panels using the detector's ALARM, PRE-ALARM, and FAULT relay contacts.

Make all connections shown in Figure 11 on page 22.

Input connection

The Nano detector is fitted with an "INPUT" connection. This provides an input which can be used to monitor the PSU or to desensitize the detector by using the day/night feature. DIP switch number 7 must be set as described in Figure 11 on page 22.

The INPUT terminals on the detector circuit board are set by default to monitor the power supply. If power supply monitoring and ClassiFire override are not required, fit a wire link across the two terminals to prevent a fault condition on power-up.

Make all connections shown in Figure 11 on page 22.

Figure 11: Wiring diagram
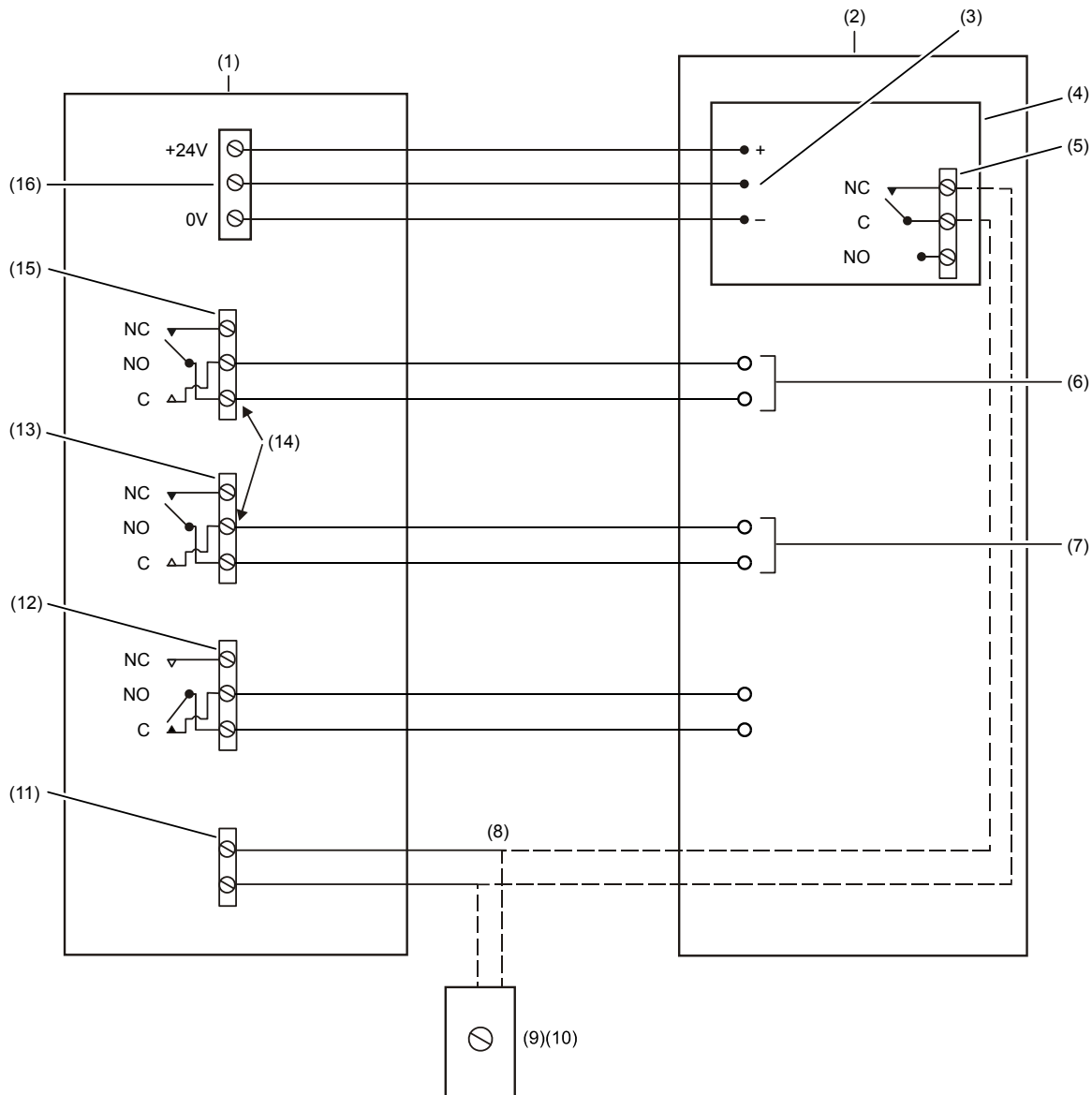
NC = Normally closed
C = Common
NO = Normally open

(1)   Detector
(2)   Fire alarm control panel (FACP)
(3)   Ground
(4)   Power supply unit (PSU)
(5)   Opens on power failure
(6)   Short will indicate Alarm
(7)   Short will indicate Pre-Alarm
(8)   PSU fault monitoring (DIP switch 7 to OFF)
(9)   Key switch
(10) Short to reduce sensitivity by 50% (DIP switch 7 set to ON)
(11) Input
(12) FAULT
(13) PRE-ALARM
(14) EOL resistor must be placed at last daisy chained detector
(15) ALARM
(16) Earth

Configuration

The default settings of the detector meet most application needs. These settings can be customized to meet additional requirements. Customizing the Nano detector requires changing the settings of the eight segments of the configuration DIP switch (Figure 12) mounted on the main PCB. See Table 4 below and the paragraphs following the table to determine the proper switch setting for the application.

Figure 12: Configuration DIP switch

Table 4: DIP switch settings

Setting	Switch 1	Switch 2	Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8
Set detector sensitivity								
Alarm factor 6	**OFF**	**OFF**						
Alarm factor 7	ON	OFF						
Alarm factor 8	OFF	ON						
Alarm factor 9	ON	ON						
Classifire On			OFF					
Fixed alarms			ON					
Flow limit offset								
±40				OFF	OFF			
±20				ON	OFF			
±5				**OFF**	**ON**			
±3				ON	ON			
Flow delay								
240 seconds						**OFF**		
30 seconds						ON		
Input select								
PSU Fault							**OFF**	
ClassiFire Override							ON	
Auto calibration								
Enable								**OFF**
Disable								ON

Note: The settings in **bold** text are the factory default settings.

Alarm factor

The detector calculates sensitivity relative to the ambient pollution level. Higher Alarm Factors provide reduced sensitivity (the alarm threshold is maintained further away from the ambient level). Refer to the Remote Control Software manual for further details.

Note: Changing the Alarm Factor starts a new FastLearn cycle: during the initial 15 minute learning period, the detector is incapable of reporting an alarm, and will take 24 hours to achieve optimum performance, based on the ambient conditions.

ClassiFire

Selecting ClassiFire On allows the artificial intelligence system to continuously adjust alarm thresholds in order to avoid unwanted alarms from environmental changes (recommended).

Note: Disabling this feature means that nuisance alarms due to fluctuations in ambient pollution levels become more likely.

Fixed alarms

Switches the artificial intelligence system off, locking sensitivity to that set at initial setup. This deactivates the dust filter monitoring system (not recommended).

Note: Enabling this feature means that nuisance alarms due to fluctuations in ambient pollution levels become more likely.

Flow limit offset

Flow limit offset sets the sensitivity of the airflow monitoring system. A small offset makes the system very sensitive to air flow changes. EN 54 systems must react to ±20% changes in airflow, which equates to a change in flow sensor reading of +5. Areas with fluctuating air pressures may require a less sensitive setting.

Note: Changing the flow limit offset starts a new flow calibration set up.

Flow delay

Sets the time for which a flow fault must continue before a fault is signaled.

Input select

The detector input terminal may be used to either monitor an associated power supply for faults, or for ClassiFire override (reduces normal sensitivity by 50%).

Note: In the factory default condition, the switch is set to OFF (power supply monitoring). This gives a fault condition if there is an open circuit on the INPUT terminals. Fit a wire link if you do not require power supply monitoring.

Caution: If you fit a wire link across the INPUT terminals, you must set this switch OFF, or else the detector sensitivity is dramatically and permanently reduced by the ClassiFire override function.

Auto calibration

Auto calibration automatically starts a new FastLearn cycle when the detector is powered up. This may be disabled if the previous settings need to be retained.

Final installation

Once the power and signal connections are made, place the detector cover onto the unit and secure the cover to the unit using the cover mounting screw.

Note: The detector is designed solely for operation with the front cover securely fitted using the cover mounting screw.

Removing the detector

Removing the detector is the reverse of the installation process, disconnecting the pipework and wiring connections installed in the unit.

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Chapter 3
Commissioning

Summary

This chapter provides information to commission the detection system.

Content

Introduction

This chapter covers the commissioning procedures for the detector. Commissioning strategy initially depends upon the environment in which the detector is installed. For instance, the test for a computer room (in a relatively clean environment) would be very different from, say, a flour mill, with a high level of airborne particulate content.

A widely accepted standard for computer rooms or EDP areas is British Standard BS6266, equipment overheating at a stage well before combustion. To perform the test electrically overload a 1‑metre length of PVC insulated wire of 10/0.1mm gauge for one minute using an appropriate power supply. The detector has two minutes from the end of the wire burn to give an alarm indication.

For areas with higher levels of background particulate matter testing methodology would be similar to that of standard point detectors.

Commissioning should only be done by factory-trained technicians in accordance with applicable standards.

Precommissioning preparation

Commissioning should be performed after all construction has been completed and cleaned of any lingering post-construction dirt. If ambient monitoring conditions are recorded before the installation is cleaned up, they may not accurately reflect actual normal operating conditions that need to be used as reference data for follow-up maintenance procedures and tests.

Commissioning checklist

The following brief checklist allows quick setup of the detector. This procedure will be adequate for most standard installations.

Caution: Ensure all wiring connections are checked prior to powering up the detector. Incorrect wiring of the detector will cause permanent damage to the detector.

1. Before powering up the detector, visually check all cabling to ensure correct connection. If wire identification is not immediately clear (e.g., by use of different colored wires or wire identification sleeves), an electrical check should be made.

2. Disconnect the detector from the fire control unit, if applicable.

3. Power up the detector and wait for the 15 minute FastLearn cycle to finish. The OK LED will be steadily lit when complete.

4. The detector automatically performs a FastLearn cycle which takes approximately 15 minutes. The OK indicator on the front panel will begin to flash. When using day/night switching, check that day start and night start settings reflect site operations.

5. The detector will generate no alarms during the 15 minute FastLearn period and, after this, the detector will operate at a reduced sensitivity for 24 hours while ClassiFire learns and acclimates to the protected environment and sets up appropriate day and night sensitivity settings.

6. Reconnect the detector to the fire control unit, if applicable

Acclimation period

The detector will operate at a reduced sensitivity for 24 hours. ClassiFire will set up the appropriate day and night sensitivity settings. All air handling units, thermostats, and other systems that can have an effect on the operating environment should be turned on to simulate normal operating conditions as closely as possible. Investigate and correct any condition that cannot be accounted for.

Transport time verification

A maximum transport time verification test measures the amount of time it takes for the detector to respond to smoke that enters the sampling point furthest from the detector. The results of this test and the calculated maximum transport time from PipeCAD must be recorded on the checklist if applicable. Measured transport time less than the calculated time is acceptable.

For EN-54 compliance, the transport time of the last sampling hole must be checked following installation and proven to be less than or equal to the value determined by PipeCAD.

To measure the maximum transport time of the system:

1. Determine the furthest sampling point from the detector.

2. Allow test smoke to enter pipe at the furthest sampling point.

3. Record the amount of time for the detector to respond. This is the actual maximum transport time. This time must not exceed 120 seconds.

Gross smoke test

The gross smoke test is a measurement of the amount of time elapsing from the activation of the smoke generating medium, until PRE-ALARM and ALARM states are reached. This test should be repeated at least three times with consistent results. The recommended smoke generating medium is canned smoke or a wire burner. Smoke from a punk or cotton wick is also acceptable.

Caution: Oil-based canisters that are used to test point detectors are *not* suitable for testing aspirating systems, as the particulate is heavy and tends to drop out in the pipe, never actually reaching the detector. Also, the oily residue that is left behind may affect the functionality of the detector.

When using canned smoke, introduce only enough smoke into the protected area to cause a FIRE condition. This may require a number of practice sprays. Follow the manufacturer's instructions.

Wire burner tests

The wire burner test is considered the most representative test of incipient fire hazard detection in telecommunications or computer room environments. The test is performed by applying a voltage to a piece of PVC-insulated cable. Smoke is produced from the overheated PVC insulation by evaporation and condensation of the plasticizer. As the wire becomes hotter, hydrogen chloride (HCl) gas is emitted from the insulation. The by-products of overheated PVC insulation can be detected by the Nano.

Wire burner Test 1 (optional)

The following test is considered unlikely to produce hydrochloric acid vapor. This test may be undertaken in underfloor spaces or ceiling voids.

1. Connect a 6.5-foot (2-meter) length of wire to a 6 VAC source of at least 16 Amps rating per wire for a period of 3 minutes.

2. The system will respond within 120 seconds following de-energization. After this period, very little smoke is given off.

Notes

- The wire is subject to cooling if positioned in direct contact with air flows and may need to be shielded.
- The wire cross-section should be American Wire Gauge (AWG) 10 with the following diameter and area:
  Diameter = 2.59 mm or 0.10189 in.
  Cross-Section Area = 5.0 mm² or 0.00775 in.²

Wire burner Test 2 (optional)

WARNING: The following test is considered to produce sufficiently high temperature to generate small quantities of hydrogen chloride or hydrochloric acid gas. Be sure to keep a safe distance away while voltage is being applied.

Caution: A wire burner/canned smoke test could activate spot-type detectors.

This test may be undertaken in underfloor spaces or ceiling voids where rapid airflow may render Test 1 unsuitable.

1. Connect a 3.25-foot (1-meter) length of wire to a 6 VAC source of at least 16 Amps rating per wire for a period of 1 minute.

2. The system will respond within 120 seconds following de-energization. After this period, most of the insulation should be burned off.

Note: The wire cross-section should be American Wire Gauge (AWG) 10 with the following diameter and area:
Diameter = 2.59 mm or 0.10189 in.
Cross-section area = 5.0 mm² or 0.00775 in.²

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Chapter 4
Troubleshooting

Summary

This chapter provides information to troubleshoot the detection system.

Content

Troubleshooting the detector

This chapter provides some possible solutions if a problem should occur with your detector.

Note: Consult either the *Remote Control Software User Guide* or *SenseNET Software User Guide* for more information about the solutions or corrective actions discussed here.

Table 5: Troubleshooting guide

Problem	Solution/Corrective Action
Nuisance alarms occur too often	Check that the ClassiFire alarm factor setting is appropriate for the normal working environment of the protected area.
	Check that the detector is not in demo mode. This can be ascertained by viewing the event log and checking that the entry demo mode has a higher log entry number than the most recent FastLearn start and FastLearn end entries. Note: Remember that the log entries are in reverse order, with the most recent entries appearing first. If the log shows that demo mode was invoked during the last FastLearn period, start a new FastLearn and allow it to complete its 24-hour cycle.
	From the event log, check that 24 hours have elapsed since the last FastLearn end entry.
	Check that day-night switchover times are appropriately set to reflect active and nonactive periods.
Elevated smoke levels do not generate alarms	Check that detector is not isolated or in FastLearn (if Isolated, the Fault light will be lit; if in FastLearn, the OK light will flash).
	Check that the detector sampling points are in the smoke stream.
	Check that sampling pipes are firmly and cleanly seated in their ports and undamaged.
	Check that the correct ClassiFire alarm setting has been set.
	Check that the detector has either had a 24-hour learning period or that it has been placed in demo mode.
Low mean output	Check that the dust separator (filter) cartridge does not require changing and that the air plenum chamber is clean. The chamber may become clogged when, for example, heavy building activity has occurred near the sampling pipes. If so, the chamber may require factory service. The detector is not designed to handle large quantities of coarse debris and dust.
Detector sensitivity varies over time	There are many reasons why particle densities may vary, and the ClassiFire system is designed to automatically compensate for this in order to reduce the likelihood of nuisance alarms due to normal variations in background smoke density. Within limits set by the ClassiFire alarm factor, this is a normal part of the detector's operation.

Problem	Solution/Corrective Action
Flow fault errors	These occur when the airflow rate into the detector exceeds the preprogrammed parameters. As the detector "learns" the flow setup from the initial installation, this usually means that there has been some change in conditions. A Flow High fault may indicate that a sampling pipe is damaged, and a Flow Low fault may indicate that the pipe has been blocked, e.g., by nearby building operations.
	If the detector input is sampled from one area and the exhaust is in another area with different pressure (e.g., the detector is in a roof space and sampling from an enclosed room), this may lead to flow faults. In this case, it would be necessary to lead a pipe from the exhaust to the protected area to ensure nominal flow.
Low Flow error message	Check that the pipe is not blocked.
	If the pipe is unused, check that the flow sensor for this pipe has been disabled.
	Check that the low flow fault threshold is not set too high.
	In the case of intermittent fault indications, try increasing the flow fault delay time.
High Flow error message	Check that the pipe is seated in the inlet and is not broken or cracked.
	Check that installed pipework is fitted with endcaps. PipeCAD pipe modeling software prompts for the use of appropriate endcaps. Open bore pipes are not recommended.
	Check that the high flow fault threshold is not set too low.
	In the case of intermittent fault indications, try increasing the flow fault delay time.

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Chapter 5
Maintenance

Summary

This chapter provides scheduled and unscheduled maintenance procedures.

Content

Introduction

This chapter contains maintenance instructions for the detector system. These procedures should be performed on a scheduled basis. In the event that system problems are found during routine maintenance, refer to Chapter 4 "Troubleshooting" on page 33. Failure to properly maintain the system may affect the functioning of the system.

Scheduled maintenance

The scheduled maintenance of the system should be performed at an established interval. The interval between performance of maintenance procedures should not exceed any imposed regulations. (See NFPA 72 or other local requirements.)

Local standards and specification requirements must be adhered to. A typical maintenance plan is listed in Table 6 below.

Notes

It is prudent to disconnect or isolate the detector from the fire panel during maintenance to prevent unintentional alarm activations.

The detector should be powered down during internal cleaning (use an air duster can or dry air gun).

Table 6: Maintenance plan

Step	Procedure
1	Check detector, wiring and pipework for damage
2	Check original design is still valid, e.g. changes due to building upgrades
3	Check detector for contamination and clean if necessary
4	Check maintenance logs for issues and rectify as appropriate
5	Check transport times against original records: significant increases or decreases in transport times may imply damaged pipes or sampling holes that need clearing
6	Isolate detector from fire panel if required
7	Smoke test to check detector operation and Alarm relay connection
8	Simulate a fault to check the Fault relay and connection
9	Complete and file maintenance records
10	Reconnect detector to fire panel if required

Maintenance procedures

The following paragraphs outline general scheduled maintenance procedures to be performed on an "as necessary" basis.

Visual check

The visual check must be performed every six months. This check is to ensure pipe network integrity.

To perform the visual check, observe the entire piping network and check for abnormalities in the pipes, including any breaks, blockages, crimps, etc.

Gross smoke test

The gross smoke test is a Go/No-Go test which ensures that the detector responds to smoke.

This test must be performed at system commissioning and every year thereafter.

To perform this test, smoke must be introduced into the last sampling hole in each branch of the pipe network and the proper response must be verified by the detector. Smoke from a punk or cotton wick may be used. Aerosol test smoke may also be used.

Note: For cleanroom applications, consult with supplier for gross smoke test methods.

Transport time verification test

The maximum transport time of the pipe network must be measured and compared to the recorded transport time at commissioning. (Refer to "Transport time verification" on page 29 of this manual for test details.) The transport time verification test must be done at commissioning and every year thereafter.

Detector sensitivity test

The detector sensitivity test must be performed within one year of installation and every alternate year thereafter.

Example:

- Year-one check

- Year-three check

- If years one and three are OK, go to five-year interval.

The detector employs a self-monitoring, automatically-adjusting calibration for the system. The inspection only requires a periodic visual inspection for a detector fault indication and performing the detector sensitivity test function.

If the self-monitoring feature of the system senses that the operation of the detector head is outside its normal range, a trouble condition will be generated.

Cleaning the detector

The exterior of the detector should be cleaned as necessary. Clean the detector with a damp (not wet) cloth.

Caution: Do not use solvents to clean the detector. Use of solvents may cause damage to the detector.

Replacing the dust separator cartridge

The only part that may require field replacement during servicing is the dust separator (filter) cartridge. Its condition can be checked using the Dust Separator test in the Diagnostics menu of the Remote Control software or SenseNET software, which gives a percentage reading of dust separator (filter) efficiency. When this level drops to 80%, the detector will signal a Separator Renew fault indicating that the dust separator cartridge needs to be replaced.

For more information, refer to either the *Remote Control Software User Guide* or *SenseNET Software User Guide*.

It is recommended that dust separators be changed at an interval of not more than 3 years. After replacing the filter, the detector must be put into FastLearn mode to reset the filter condition reading.

As dust contained in the dust separators may expose maintenance personnel to a "nuisance dust" hazard as defined by the *Control of Substances Hazardous to Health* (COSHH), it is strongly recommended that suitable masks and protective clothing be worn when changing filters.

Note: Used dust separator cartridges are not intended for reuse and should be discarded.

To replace the cartridge:

1. Remove power to the detector.

2. Remove the front cover mounting screw securing the unit's front cover.

3. With the front cover removed, grasp the filter firmly and pull the filter out (directly towards you).

4. Properly dispose of the used cartridge.

5. Locate the orientation markings on the new filter cartridge. The word "IN" is marked on one side and the other is marked "OUT".

6. Insert the replacement filter cartridge so that the "IN" mark on the cartridge is on the left as viewed in Figure 13 on page 41.

7. Slide the cartridge all the way into place.

8. Replace the detector cover and secure it into place.

9. Initiate a FastLearn routine by reenergizing the detector.

Figure 13: Location of dust separator cartridge
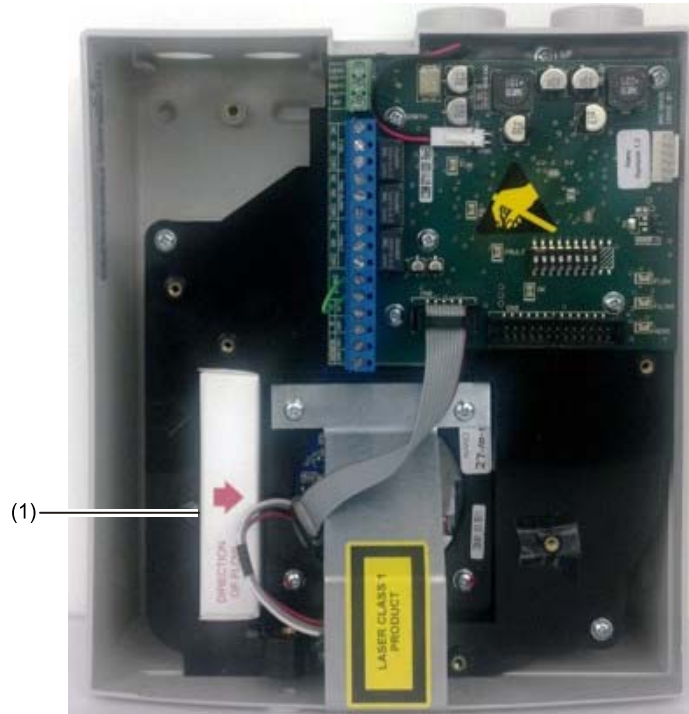
(1) Dust separator (filter) cartridge

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Appendix A
Communications card and APIC

Summary

This appendix provides information about the communication card and the APIC.

Content

Optional communications card

An optional communications card can be fitted inside the Nano detector to provide an RS-232 serial port and RS-485 network communication.

Figure 14: Optional communications card
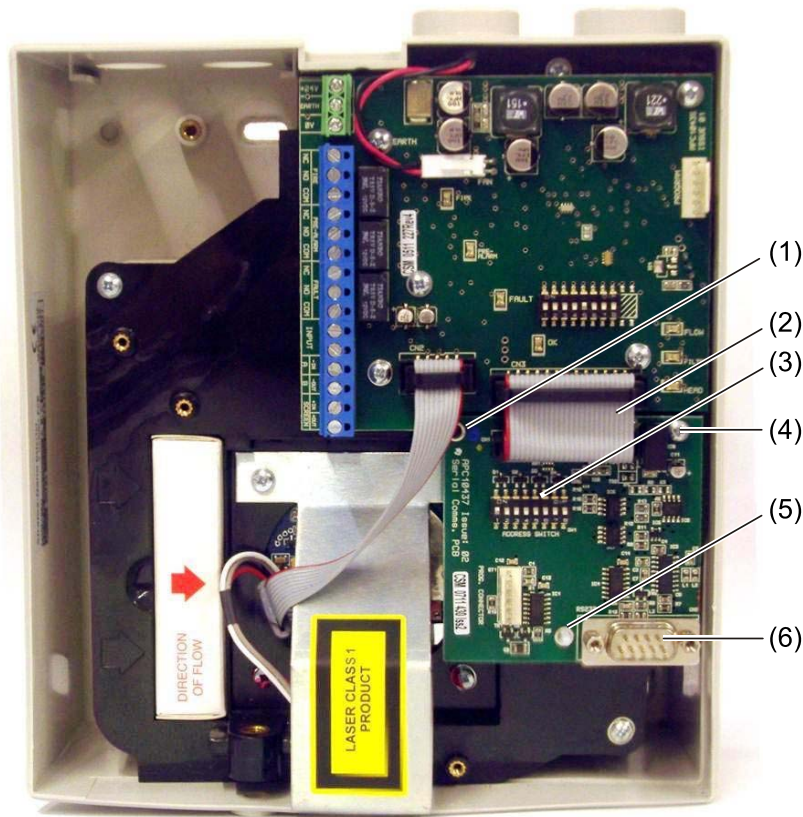
(1)   Card locating post
(2)   Ribbon cable connection on detector main PCB
(3)   Detector address DIP switch
(4)   M3 x 6 fixing screw (provided with the card)
(5)   *Support spacer, nylon (provided with the card)
(6)   RS-232 serial port: Use 9-pin D-type null modem cable to connect to a PC.

* If the communication card is not factory installed, you must install the adhesive back support spacer onto the detector housing. A recess is provided in the housing to ensure proper placement of the support spacer.

Direct connection of a PC to the communications card is done using a 9-pin RS-232 interface on the communications card, using a null modem cable configuration, as shown in Figure 15 on page 45.

Figure 15: RS-232 cable connections
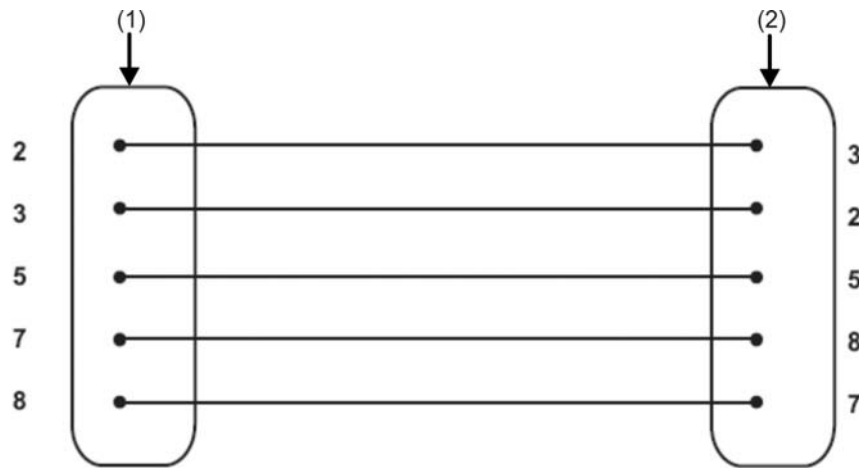
(1)   9-pin female "D" connector
(2)   9-pin female "D" connector

A connected PC can access the detector event memory to review previous or current events, such as detector alarms or faults. The detector internal chart recorder can also be accessed to allow analysis of detector behaviour (refer to the *Remote Control User Manual* for further information). The PC cannot be used to configure the detector except to enter time and date settings for the detector event log and chart recorder to be viewed in the remote control software. The detector does not incorporate a real-time clock, so the time and date need to be re-entered if the detector is powered down for any reason.

Installation of the communications card also provides the detector with RS-485 network communication via the A, B, and SCREEN terminals on the detector main board (Figure 9 on page 19). This can be used for simple remote display indication or integration into a larger site wide management and display system, separate from the local fire detection and alarm system.

Setting the detector address

In order to identify itself to the command module or fire panel, each detector needs to have a unique address ranging from 1 to 127. The detector address is set using the DIP switch located at the optional communication board. The switch settings are up for 1 and down for 0, and the detector address is set as a 7-bit binary code (switch 8 equates to a value of 128 and so is outside the usable address range).

Figure 16 shows an example where the address equates to "01100011" in binary, or:

(1 x 1) + (1 x 2) + (0 x 4) + (0 x 8) + (0x 16) + (1 x 32) + (1 x 64) + (0 x 128) = 99

Figure 16: Sample DIP switch settings
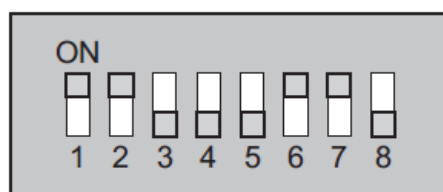
The full range of available addresses and their relevant switch settings are provided in Table 7 for reference.

Note: Addresses chosen for detectors do not have to be consecutive or in a given order as long as they are all different.

Table 7: Address table

Address	1	2	3	4	5	6	7	8	Address	1	2	3	4	5	6	7	8
1	1	0	0	0	0	0	0	0	65	1	0	0	0	0	0	1	0
2	0	1	0	0	0	0	0	0	66	0	1	0	0	0	0	1	0
3	1	1	0	0	0	0	0	0	67	1	1	0	0	0	0	1	0
4	0	0	1	0	0	0	0	0	68	0	0	1	0	0	0	1	0
5	1	0	1	0	0	0	0	0	69	1	0	1	0	0	0	1	0
6	0	1	1	0	0	0	0	0	70	0	1	1	0	0	0	1	0
7	1	1	1	0	0	0	0	0	71	1	1	1	0	0	0	1	0
8	0	0	0	1	0	0	0	0	72	0	0	0	1	0	0	1	0
9	1	0	0	1	0	0	0	0	73	1	0	0	1	0	0	1	0
10	0	1	0	1	0	0	0	0	74	0	1	0	1	0	0	1	0
11	1	1	0	1	0	0	0	0	75	1	1	0	1	0	0	1	0
12	0	0	1	1	0	0	0	0	76	0	0	1	1	0	0	1	0
13	1	0	1	1	0	0	0	0	77	1	0	1	1	0	0	1	0
14	0	1	1	1	0	0	0	0	78	0	1	1	1	0	0	1	0
15	1	1	1	1	0	0	0	0	79	1	1	1	1	0	0	1	0
16	0	0	0	0	1	0	0	0	80	0	0	0	0	1	0	1	0
17	1	0	0	0	1	0	0	0	81	1	0	0	0	1	0	1	0
18	0	1	0	0	1	0	0	0	82	0	1	0	0	1	0	1	0
19	1	1	0	0	1	0	0	0	83	1	1	0	0	1	0	1	0
20	0	0	1	0	1	0	0	0	84	0	0	1	0	1	0	1	0
21	1	0	1	0	1	0	0	0	85	1	0	1	0	1	0	1	0
22	0	1	1	0	1	0	0	0	86	0	1	1	0	1	0	1	0
23	1	1	1	0	1	0	0	0	87	1	1	1	0	1	0	1	0
24	0	0	0	1	1	0	0	0	88	0	0	0	1	1	0	1	0
25	1	0	0	1	1	0	0	0	89	1	0	0	1	1	0	1	0
26	0	1	0	1	1	0	0	0	90	0	1	0	1	1	0	1	0
27	1	1	0	1	1	0	0	0	91	1	1	0	1	1	0	1	0
28	0	0	1	1	1	0	0	0	92	0	0	1	1	1	0	1	0
29	1	0	1	1	1	0	0	0	93	1	0	1	1	1	0	1	0
30	0	1	1	1	1	0	0	0	94	0	1	1	1	1	0	1	0
31	1	1	1	1	1	0	0	0	95	1	1	1	1	1	0	1	0
32	0	0	0	0	0	1	0	0	96	0	0	0	0	0	1	1	0
33	1	0	0	0	0	1	0	0	97	1	0	0	0	0	1	1	0
34	0	1	0	0	0	1	0	0	98	0	1	0	0	0	1	1	0
35	1	1	0	0	0	1	0	0	99	1	1	0	0	0	1	1	0
36	0	0	1	0	0	1	0	0	100	0	0	1	0	0	1	1	0
37	1	0	1	0	0	1	0	0	101	1	0	1	0	0	1	1	0
									102	0	1	1	0	0	1	1	0

38	0	1	1	0	0	1	0	0
39	1	1	1	0	0	1	0	0
40	0	0	0	1	0	1	0	0
41	1	0	0	1	0	1	0	0
42	0	1	0	1	0	1	0	0
43	1	1	0	1	0	1	0	0
44	0	0	1	1	0	1	0	0
45	1	0	1	1	0	1	0	0
46	0	1	1	1	0	1	0	0
47	1	1	1	1	0	1	0	0
48	0	0	0	0	1	1	0	0
49	1	0	0	0	1	1	0	0
50	0	1	0	0	1	1	0	0
51	1	1	0	0	1	1	0	0
52	0	0	1	0	1	1	0	0
53	1	0	1	0	1	1	0	0
54	0	1	1	0	1	1	0	0
55	1	1	1	0	1	1	0	0
56	0	0	0	1	1	1	0	0
57	1	0	0	1	1	1	0	0
58	0	1	0	1	1	1	0	0
59	1	1	0	1	1	1	0	0
60	0	0	1	1	1	1	0	0
61	1	0	1	1	1	1	0	0
62	0	1	1	1	1	1	0	0
63	1	1	1	1	1	1	0	0
64	0	0	0	0	0	0	1	0

103	1	1	1	0	0	1	1	0
104	0	0	0	1	0	1	1	0
105	1	0	0	1	0	1	1	0
106	0	1	0	1	0	1	1	0
107	1	1	0	1	0	1	1	0
108	0	0	1	1	0	1	1	0
109	1	0	1	1	0	1	1	0
110	0	1	1	1	0	1	1	0
111	1	1	1	1	0	1	1	0
112	0	0	0	0	1	1	1	0
113	1	0	0	0	1	1	1	0
114	0	1	0	0	1	1	1	0
115	1	1	0	0	1	1	1	0
116	0	0	1	0	1	1	1	0
117	1	0	1	0	1	1	1	0
118	0	1	1	0	1	1	1	0
119	1	1	1	0	1	1	1	0
120	0	0	0	1	1	1	1	0
121	1	0	0	1	1	1	1	0
122	0	1	0	1	1	1	1	0
123	1	1	0	1	1	1	1	0
124	0	0	1	1	1	1	1	0
125	1	0	1	1	1	1	1	0
126	0	1	1	1	1	1	1	0
127	1	1	1	1	1	1	1	0

Optional APIC

When a command module is being used to manage one or more detectors (the maximum limit is 127) an addressable protocol interface card (APIC) is required to decode detector status information in the command module and convey to the Fire Panel via the Addressable Bus 1 and Bus 2 terminal block connections (see "Electrical installation" on page 19 for details). In this configuration only one interface is required and all detector information is available through this interface, one address per device.

Note: Either an optional communication card or an APIC can be installed in the detector, not both. They are mounted the same and use the same connection on the detector main PCB.

APICs plug into the main PCB via a ribbon cable (see Figure 14 on page 44). Once plugged in, the addressable signaling line circuit (SLC) in and out are connected to the main PCB addressable bus terminals and the address DIP switches are set to the SLC address. Refer to the APIC installation sheet for details.

Note: Some addressable protocols may limit the maximum number of device addresses to less than 127. Some protocols may not support all of the available alarm levels, and fault reporting is usually a general fault with no detailed fault information.

Glossary

°C	Degrees centigrade
°F	Degrees Fahrenheit
A	Ampere
AC	Alternating current
ADA	Americans with Disabilities Act
AH	Ampere hour
AHJ	Authority having jurisdiction
ARC	Automatic release circuit
AWG	American wire gauge
APIC	Addressable protocol interface card
CSFM	California State Fire Marshal
DACT	Digital alarm comm. transmitter
DC	Direct current
DET	Detector
EOLD	End of line device
EOLR	End of line resistor
FM	Factory Mutual
FSD	Full scale deflection
ft.	Feet
HSSD	High sensitivity smoke detector
Hz	Hertz (frequency)
in.	Inches
LCD	Liquid crystal display
LED	Light emitting diode
MEA	Materials and Equipment Acceptance Division of the City of New York
NAC	Notification appliance circuit
N.C.	Normally closed
NEC	National Electrical Code
NFPA	National Fire Protection Association
N.O.	Normally open

NYC	New York City
PCB	Printed circuit board
pF	Pico farads
P/N	Part number
PSU	Power supply unit
RAM	Random access memory
SLC	Signaling line circuit
TB	Terminal block
UL/ULI	Underwriters Laboratories, Inc.
V	Volts
VAC	Volts AC
VDC	Volts DC
VRMS	Volts root mean square

NYC	New York City
PCB	Printed circuit board

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LaserSense Nano Aspirating Smoke Detector Installers Handbook