ReadySET Aspirating Smoke Detection System Installers Handbook

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Content

Important information

Regulatory information

This product has been designed to meet the requirements of NFPA 72 National Fire Alarm Code, UL 864 Standard for Control Units for Fire Protective Signaling Systems, UL 268 Smoke Detectors for Fire Alarm Signaling Systems, UL 268A Smoke Detectors for Duct Application, and ULC S527 Standard for Control Units for Fire Alarm Systems.

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.

Only qualified persons experienced, trained and certified in the installation of this equipment should design, service, maintain, test, install, and configure the ReadySET. They must be familiar and experienced with the wiring diagrams and components, electrical installation, and familiar not only with NEC, relevant NFPA and local codes but also trained and qualified by the manufacturer and/or its associated operating companies. The manufacturer of the components that make up the ReadySET detector is not responsible for its configuration or installation of the product.

It is the responsibility of the professional installer (described above) to properly install, configure and test the systems. Under no circumstances will the manufacturer be liable for improper installation, maintenance, servicing, testing or configuration of the systems.

The technical data contained herein is provided for informational purposes only and should not be used as a substitute for professional judgment and training. Although the manufacturer believes this information to be true and correct, it is published and presented without any guarantee or warranty whatsoever. The manufacturer disclaims any liability for any use of the data other than as set out in this manual.

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.
	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.

Safety summary

This entire manual must be read and understood before installation.

Installation precautions

Adherence to the following will aid in problem-free installation with long-term reliability:

WARNING: Several different sources of power can be connected to this detector. Disconnect all sources of power before servicing. The control unit and associated equipment may be damaged by servicing while the unit is energized. Do not attempt to install, service, or operate this control unit until this manual is read and understood.

Cautions

System Reacceptance Test after Reprogramming: To ensure proper system operation, this system must be retested in accordance with NFPA 72 Chapter 10 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.

All components, circuits, and system operations known to be affected by a change must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices in a single installation that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified, in accordance with NFPA.

This system meets FM and UL 268 requirements for operation at 32 to 100°F (0 to 38°C) and at a relative humidity of 90% (noncondensing) at 90°F (32.2°C). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by continuous operation at these environmental limits. Therefore, it is recommended that this system and its peripherals be installed in an environment with a nominal room temperature of 60 to 80°F (15 to 27°C).

Like all solid-state electronic devices, this system may operate erratically or can be damaged when subjected to lightning induced transients. Although no system is completely immune from lightning transients and interference, proper grounding will reduce susceptibility.

This manual gives information likely to be needed for most installations, but for more detailed information on pipe networks, please refer to the *PipeCAD System Design and Installation User Manual*.

WARNING: The use of overhead or outside aerial wiring is not recommended due to the increased susceptibility to nearby lightning strikes. Consult with the Technical Support department if any problems are anticipated or encountered.

Do not install electronic assemblies prior to mounting and attaching conduit for field wiring to the enclosure. Before making modifications, verify that they will not interfere with battery and printed circuit board locations. Do not overtighten screw terminals. Overtightening may damage threads, resulting in reduced terminal contact pressure and difficulty with screw terminal removal.

This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits so that static charges are removed from the body. Use static suppressive packaging to protect electronic assemblies removed from the control unit.

Follow the instructions in this manual. These instructions must be followed to avoid damage to the control unit and associated equipment. System operation and reliability depend upon proper installation.

Caution: While installing a fire alarm system may make lower insurance rates possible, it is not a substitute for insurance. An automatic fire alarm system or components of a system — smoke detectors, heat detectors, manual pull stations, notification appliances, and a fire alarm control unit with remote-notification capability — can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

General precautions

The following general safety precautions are to be observed at all times.

- All electrical components associated with equipment should be installed and grounded in accordance with NEC and local regulatory requirements.
- Special precautionary measures are essential to prevent applying power to equipment at any time maintenance work is in progress.
- Before working on electrical equipment, use a voltmeter to ensure that the system is not energized.
- When working near electricity, do not use metal rulers, flashlights, metallic pencils, or any other objects having exposed conductive material.
- When connecting a meter to terminals for measurement, use a voltage range higher than expected voltage to be measured.

Chapter 1
Introduction

Summary

This chapter provides information about this manual.

Content

About this manual

This manual provides information on how to install, configure, maintain, and operate the ReadySET Aspirating Smoke Detector. It is organized as follows.

Chapter 1, Introduction: Provides information about this manual.

Chapter 2, Product description: Provides technical descriptions of the detector and its operation. It also provides descriptions of the indicators.

Chapter 3, Installation and configuration: Provides instructions for design and installation of the ReadySET Aspirating Smoke Detection System.

Chapter 4, Commissioning: Provides procedures for commissioning the ReadySET detector.

Chapter 5, Troubleshooting: Provides troubleshooting steps.

Chapter 6, Maintenance: Provides scheduled and unscheduled maintenance procedures.

Appendix A, Communications card: Provides installation information for the optional communications card.

Intended audience

This manual is to be used by qualified and factory-trained personnel, knowledgeable of NFPA standards and any other applicable standards in effect, and is intended to provide guidance to qualified technical professionals for the installation, operation, testing, and maintenance of the ReadySET Air Sampling Detector, referred to in this manual as the *ReadySET* or the *detector*.

Aspirating smoke detection system limitations

An Aspirating smoke detection system — which can be made up of smoke detectors, heat detectors, manual pull stations, notification appliances, and a fire alarm control unit with remote-notification capability — can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

Any fire alarm system may fail for a variety of reasons. The following are only examples:

- Smoke detectors may not sense fire where smoke cannot reach the detectors, such as in chimneys, in walls, on roofs, or on the other side of closed doors.
- Smoke detectors on one level also may not sense a fire on another level or floor of a building. A second floor detector, for example, may not sense a first floor or basement fire.
- All types of smoke detectors — ionization, photoelectric and air aspirating — have sensing limitations. No type of smoke detector can sense every kind of fire caused by carelessness and safety hazards such as smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, children playing with matches, or arson.
- Notification appliances, such as bells, may not alert people if these appliances are located on the other side of closed or partly open doors, or are located on another floor of a building.
- A fire alarm system will not operate without electrical power. If AC power fails, the system will operate from standby batteries only for a limited time.
- Auxiliary Equipment used in the system may not be technically compatible with the control unit. It is essential to use only equipment listed for service with your control unit.
- Telephone lines needed to transmit alarm signals from the protected site to a central monitoring station may be out of service or temporarily disabled.
- The most common cause of fire alarm malfunctions is inadequate maintenance. All devices and system wiring should be tested and maintained by professional fire alarm installers following written procedures supplied with each device. System inspection and testing should be scheduled monthly or as required by national and/or local fire codes and standards. Adequate written records of all inspections should be kept.

Chapter 2
Product description

Summary

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

Content

Introduction

The ReadySET detector is a highly sophisticated “next generation” aspirating smoke detection product that provides early detection and warning of smoke. Designed for easy installation and commissioning, the ReadySET 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. The ReadySET detector can monitor an area of up to 2,500 sq. ft. (232 sq. m).

The ReadySET detector is a smoke detector intended to provide localized fire detection. It is suitable for use in a wide range of applications, such as small noncompartmentalized rooms, warehouse racking, or pieces of electronic or electromechanical equipment where it is desirable to achieve individual fire reporting. In compartmentalized rooms, each compartment would normally use individual detectors.

The ReadySET 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. Sophisticated, state-of-the-art electronics are used to analyze the sampled air and generate a signal representing the level of smoke present.

ClassiFire intelligence also monitors the detector chamber and dust separator (filter) for contamination, continually adjusting the appropriate operating parameters to counteract the negative effects of any contamination. The ReadySET detector is 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 ReadySET can easily be installed without any specialized tools or software.

An optional communications card can be fitted inside the ReadySET detector to provide an RS-232 serial port and RS-485 network communication. There is also a ReadySET model that is shipped with the communications card factory installed. Refer to Appendix A “Communications card” on page 43.

Features

The following is a list of major features of the ReadySET detector:

- Patented “artificial intelligence” known as ClassiFire (automatically learns environment)
- Laser dust discrimination (LDD)
- Quick and easy installation
- Self-adjusting between the range of 0.4% and 2.0% obscuration
- Pre-engineered sampling pipe network designs
- Up to 2,500 sq. ft. (232 sq. m) area coverage

Specifications

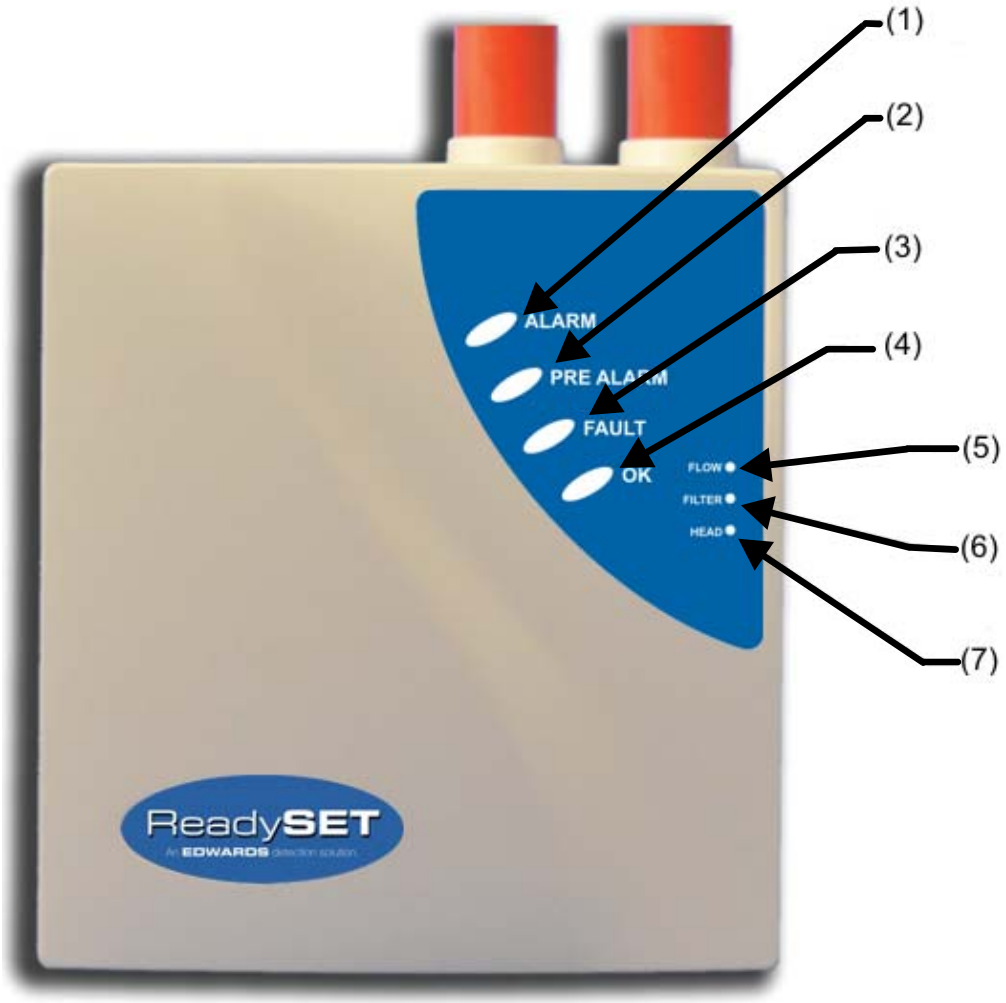
Caution: This equipment is only to be used in accordance with this specification. Failure to operate the equipment as specified may cause damage to the unit, injury, or property damage.

Specification	Value
Supply voltage	22.25 - 26.40 VDC
Current consumption	350 mA
Dimensions	7.5 W x 9.0 H × 4.3 D (in.) 190 W × 230 H × 110 D (mm)
Weight	2.65 lbs. (1.2 kg)
Operating temperature range	32 to 100°F (0 to 38°C) (UL 268 compliance)
Operating humidity range	0 to 90% noncondensing
Coverage area	2,500 sq. ft. (232 sq. m)
Sensitivity range (%obs/ft.) (%obs/m)	 Min. = 7.62%, Max. = 0.122% FSD Min. = 25%, Max. = 0.4% FSD
Maximum sensitivity resolution	0.12% obs/ft. (0.4% obs/m)
Preengineered piping sample hole	0.5% to 1.5% obs/ft. (1.64% to 4.92% obs/m)
Detection principle	Laser light scattering mass detection
Particle sensitivity range	0.0003µm to 10µm
Relay contact rating	1 A at 24 VDC resistive load
Sampling pipe inlets	1
Sampling pipe internal diameter	3/4-inch (20 mm)
Relay outputs	Alarm, Pre-Alarm, and Fault
Chamber service intervals	Greater than 8 years (depending on environment)
Dust separator (filter) replacement intervals	Greater than 5 years (depending on environment)
Laser lifetime (MTTF)	Greater than 1,000 years
Programming	Internal DIP switches
APIC compatible	Yes
Enclosure	NEMA-1

Indicators

Figure 1 below shows the seven indicators on a ReadySET detector.

Figure 1: ReadySET detector indicators



(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.

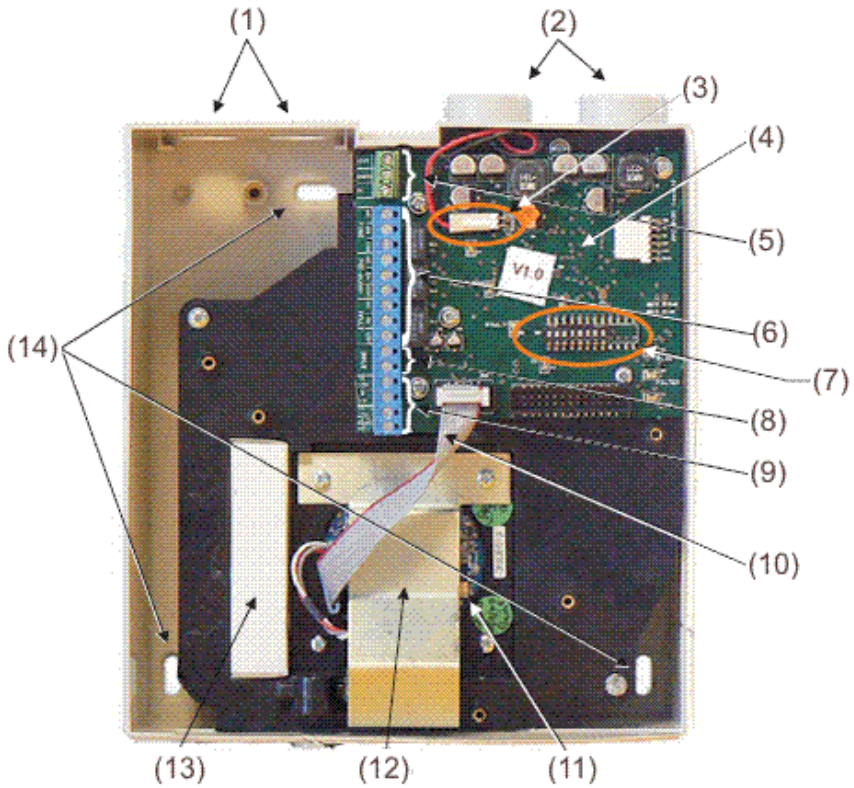
(4) **OK:** Illuminates to show normal operation when there are no faults. The OK lamp will flash during the 15-minute FastLearn period when the detector is first learning about its environment.
Note: During initial setup, the OK LED will flash for 15 minutes while the detector learns its operating environment. 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 filter needs to be changed.
(7) **HEAD:** Illuminates to indicate a problem with the detector laser chamber, as might be caused by the laser head connecting cable being damaged or disconnected. It can also be caused by certain kinds of internal system faults, which appear in the detector's event log as "process errors."
Note: 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.

Inside the detector

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

Figure 2: ReadySET 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.

Note: 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) Configuration DIP switch: Used to configure user-selectable detector functions.
(8) Input switch terminals
(9) Optional communication terminals: used when the optional communication card is fitted to connect the RS-485 network
(10) Detector head ribbon connector: If this lead is broken or not connected, the detector will indicate a HEAD Fault.
(11) Detector head assembly: No user-serviceable parts. Do not remove this from the detector, due to the risk of exposure to the laser.
(12) Detector head cover plate: This protects the laser head. The plate should not be removed from the detector.
(13) Replaceable dust separator: 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.
(14) 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 3
Installation and configuration

Summary

This chapter provides information necessary to install the ReadySET detector system.

Content

Introduction

This chapter provides information necessary to install the ReadySET 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 at the selected location.
4. Connect the detector to the sampling pipe network.

Installation should only be done by factory-trained technicians in accordance with applicable installation requirements. These include:

- NFPA 70, *National Electrical Code*
- NFPA 72, *National Fire Alarm and Signaling Code*
- Any other local, national, or installation requirements or standards.

Note: Power should be turned off during installation.

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 1: 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 ReadySET detector employs a fan designed to detect smoke in relatively small areas. The ReadySET 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 AIR-Intelligence products should be used.

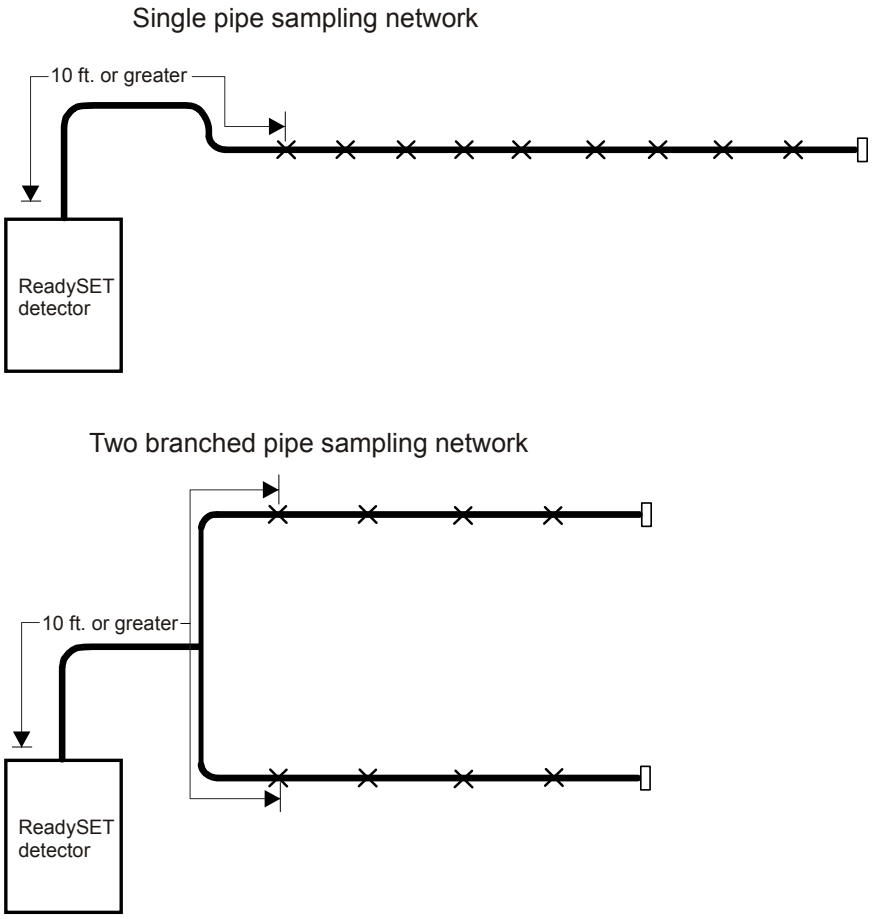
Always locate the sampling points in positions to which smoke may reasonably be expected to travel. It is usually better to locate the sampling pipe directly in the airflow (for example, across the return air register of an air conditioning unit).

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).

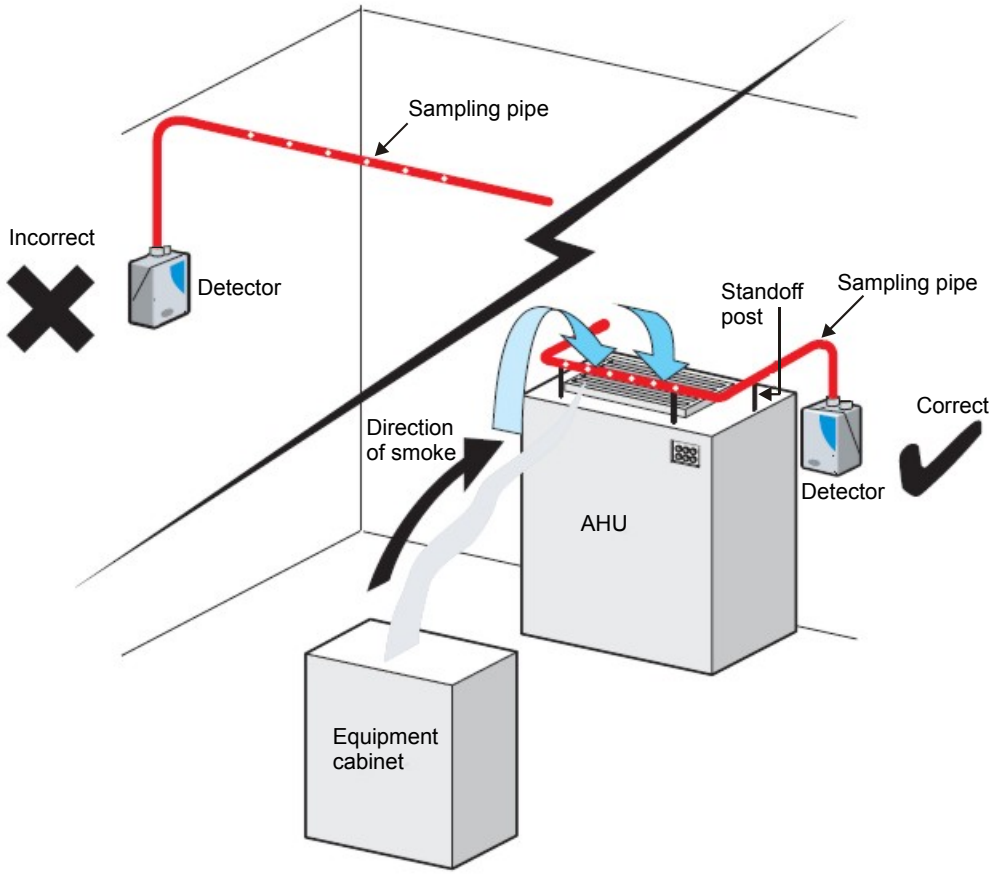
Figure 3: Sample pipe network



Air handling unit installation

No more than one air handling unit may be protected with one ReadySET 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 4 below.

Figure 4: Air handling unit in vicinity of the ReadySET detector (exhaust pipes not shown for clarity)



Below/above the ceiling installation

The ReadySET detector is supplied with an exhaust port (see Figure 2 on page 9). This allows the ReadySET detector to sample from areas which may be at different air pressure than 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 5 on page 16 and Figure 6 on page 16.

Figure 5: Installation of pipework above ceiling with exposed detector (piped exhaust)

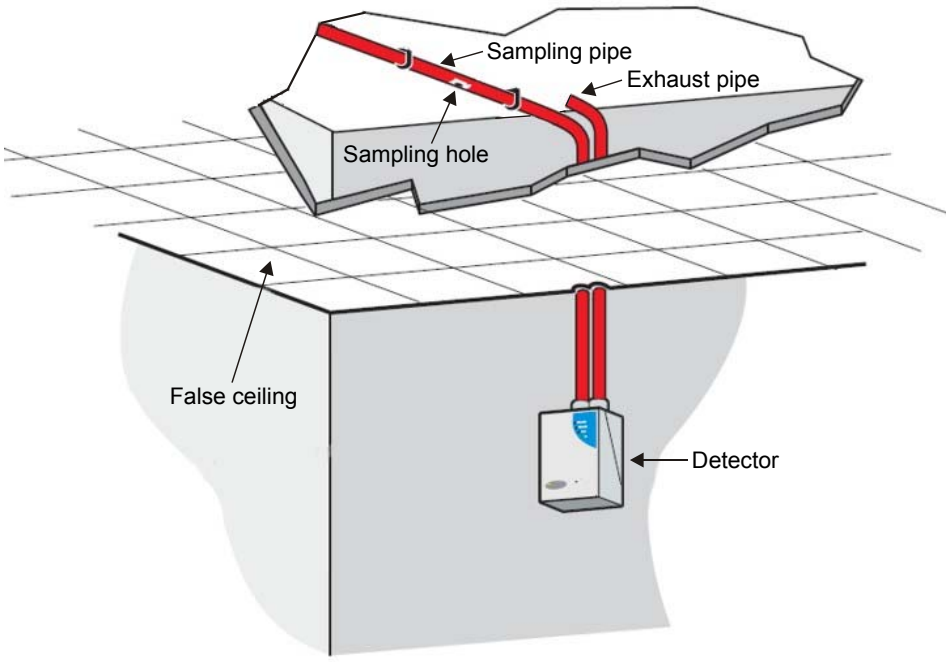
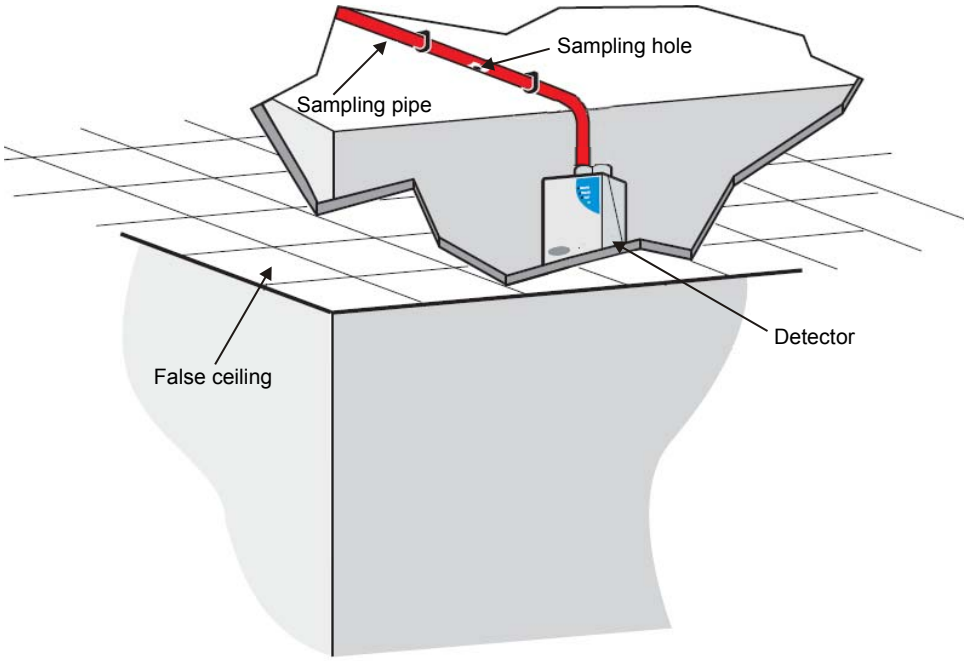


Figure 6: Installation with detector mounted in ceiling void (no exhaust piping)



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 smoke 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 7: Return air duct sampling

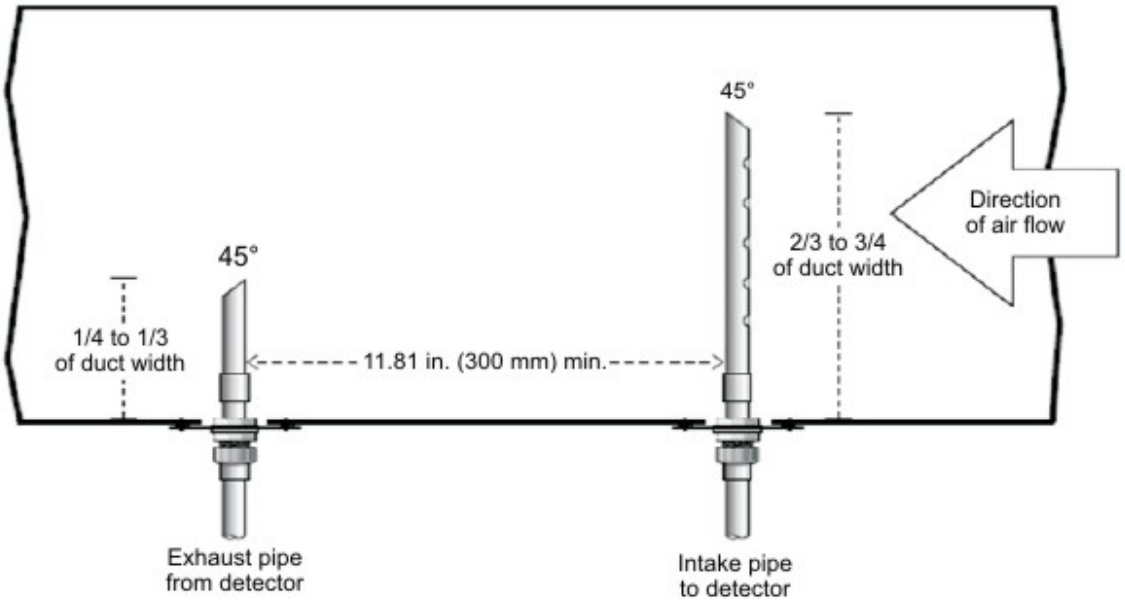


Figure 7 above shows a typical sampling pipe arrangement for an air duct. The right pipe is the sampling pipe and the holes on it are drilled 4 inches apart and face into the oncoming air stream. The left pipe exhausts air from the detector.

The detector is UL 268A and ULC approved for duct applications with an operating air velocity range of 300 to 4,000 ft/min (1.52 - 20.32 m/sec). The following guidelines apply.

- Only one duct can be monitored per detector.

- If the sampling pipe system and ReadySET detector is used as the primary smoke detection system, methods should be employed to notify stoppage of airflow in the duct(s).
- 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.

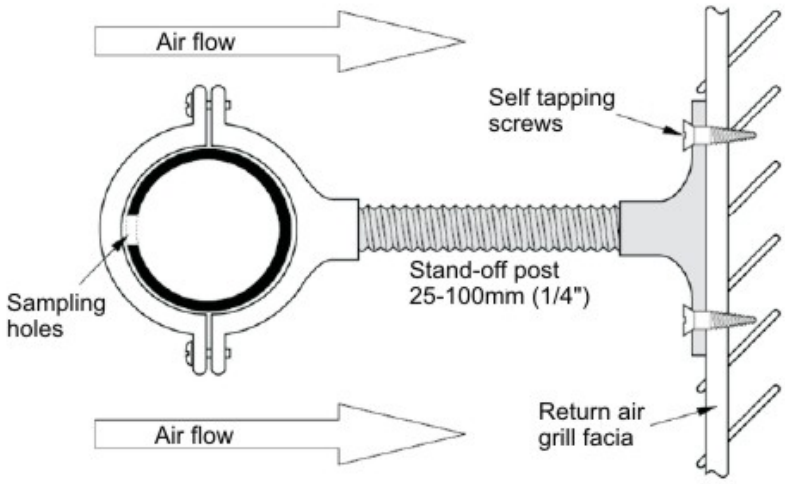
Return air grill sampling method

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 8 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 8: Return air grill sampling method



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 than 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, 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 2 below contains a list of procedural guidelines for installation of the ReadySET detector.

Table 2: Procedural guidelines

Do	Don't
• Ensure that the ClassiFire alarm factor is appropriately set. • 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. • Ensure that cable of an appropriate approved type is used for interconnection. • Place sampling points so that the detector will be able to detect smoke at the earliest opportunity. • 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. • Ensure that the environment of the protected area is within the environmental operating parameters of the detector (32º to 100º F or 0º to 38º C, humidity 0 - 90%, non-condensing). • Ensure the detector is properly grounded.	• Remove or connect boards when the detector is powered up. • 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. • Drop the detector or use excessive force when fitting sampling pipes as this may damage the detector. • Connect internal 0 volt terminals to local earth. • 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. • 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). • 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 9 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 “Inside the detector” on page 9.

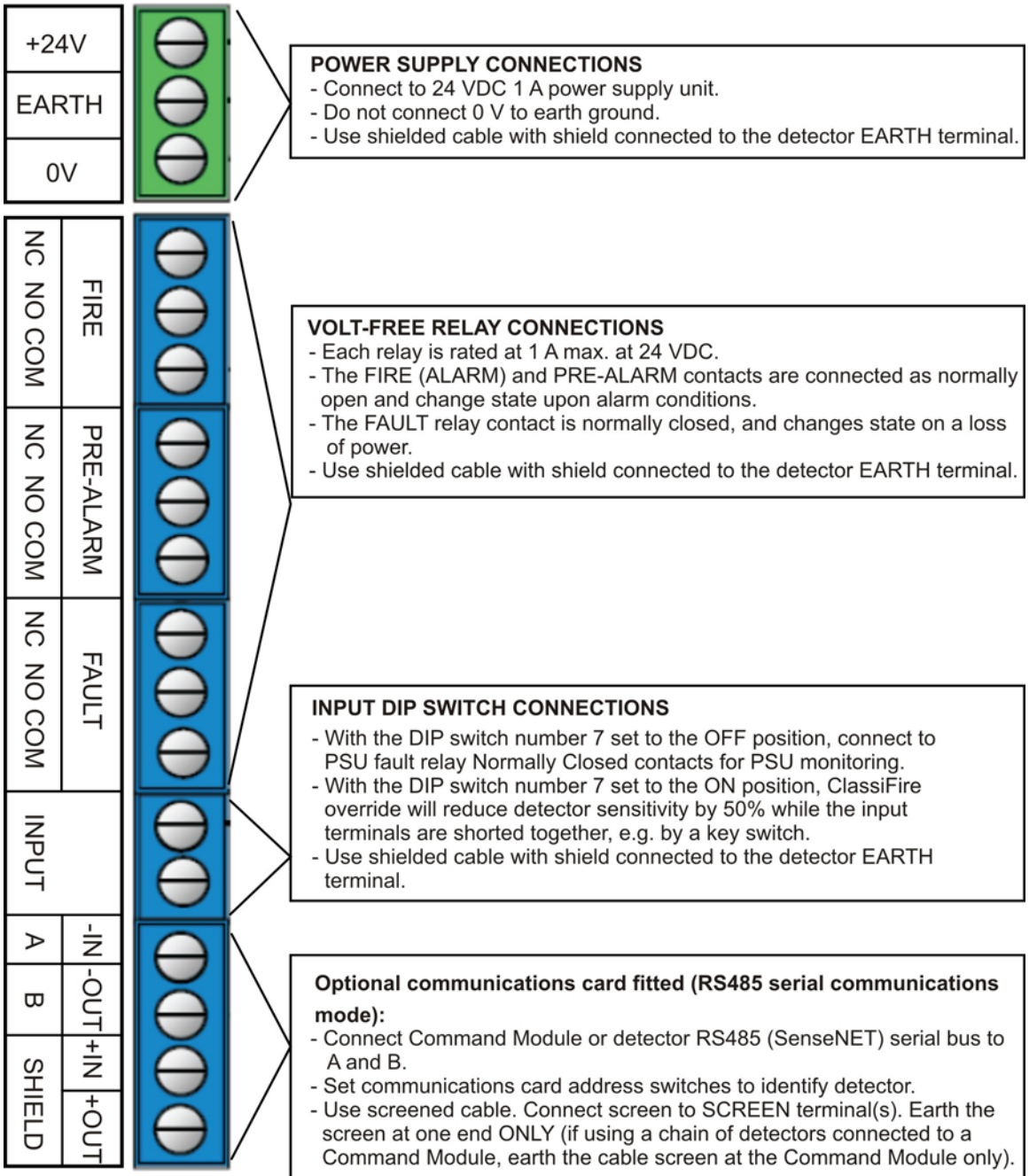
Electrical installation

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 1 A or greater. Signal cable should be 120 Ω or less twisted pair.

Figure 9 on page 22 shows the terminal block connections that connect the ReadySET detector to other electronic components. It is recommended that all connection wires be marked with suitable identification labels or colored rings to aid in the connection process.

Figure 9: Detector terminal block connections



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 ReadySET detector front cover, and then locate the power supply terminal block.

   Refer to Figure 2 on page 9 for an illustration of the ReadySET 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 ReadySET detector includes an Alarm and a Pre-Alarm relay, which will transfer to the normally open (NO) position on alarm. It also includes a general Fault relay, which will transfer to the normally closed (NC) position during a fault condition or on power-down.

The relays are of the volt-free type, with a maximum current capacity of 1 A 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 ReadySET 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 25.

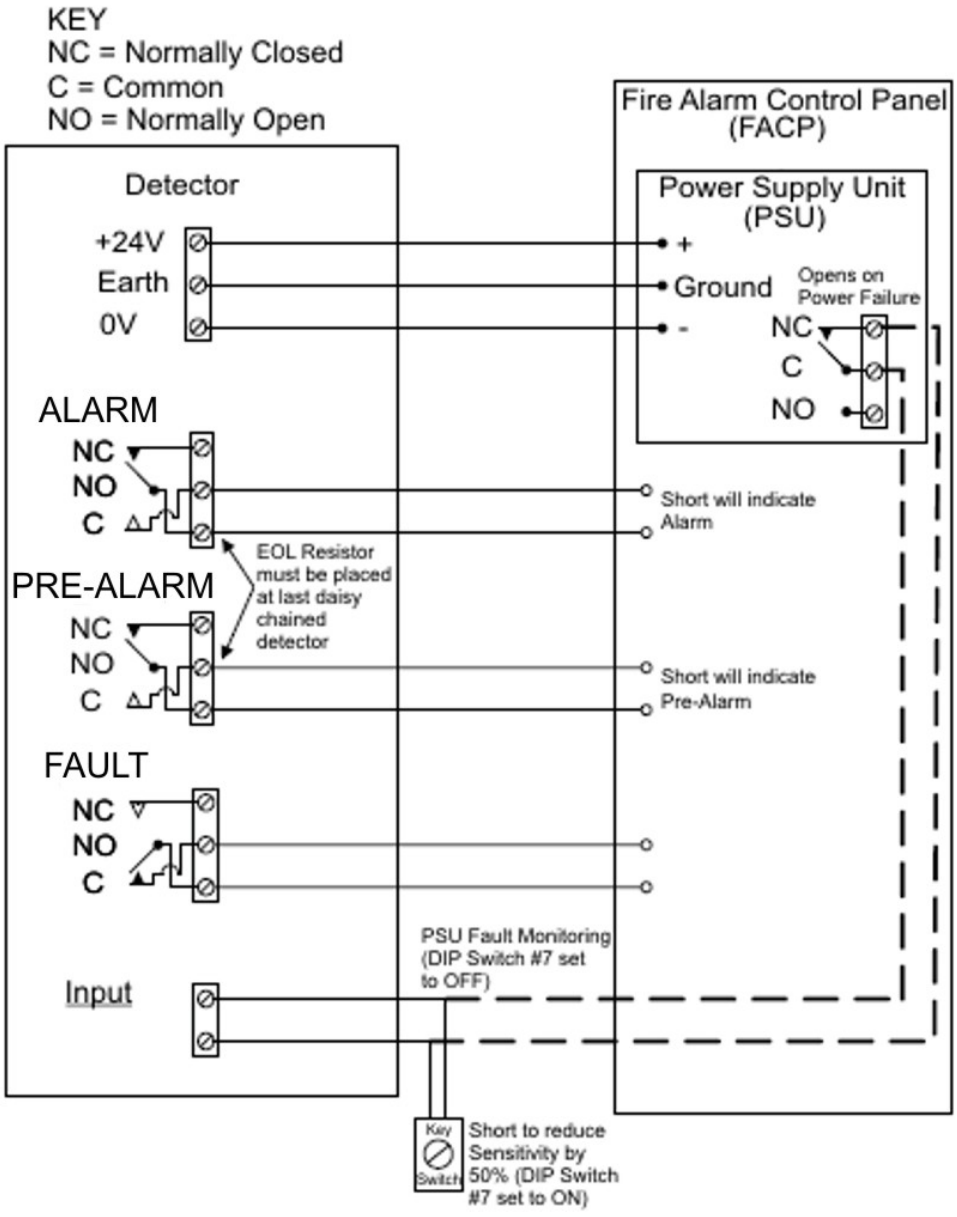
Input connection

The ReadySET 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 25.

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 25.

Figure 11: Wiring diagram



Configuration

The default settings of the detector meet most application needs. These settings can be customized to meet additional requirements. Customizing the ReadySET detector requires changing the settings of the eight segments of the configuration DIP switch (Figure 12) mounted on the main PCB. See Table 3 on page 26 and the paragraphs following the table to determine the proper switch setting for the application.

Figure 12: DIP switch

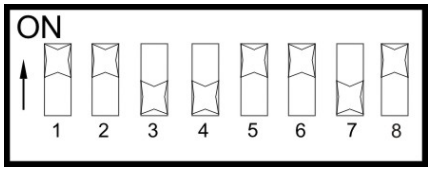


Table 3: DIP switch settings

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.

Note: Changing the alarm factor starts a new FastLearn cycle.

Alarm factor: The ClassiFire system statistically analyzes the background smoke level and sets detector sensitivity to a level giving a statistical probability of nuisance alarm. The software assesses the arithmetic mean and variance (standard deviation) of the “normal” ambient smoke level and places the alarm flags at a certain number of standard deviations from the mean of the distribution.

The number of standard deviations at which the alarm flag is set away from the mean is directly proportional to the ClassiFire alarm factor chosen.

The probability of nuisance alarm and the maximum detector sensitivity are higher when a low level of alarm factor is chosen and lower as the alarm factor is increased. A low alarm factor may be desirable in the case of a high-value computer center where the cost of down-time and call-out costs may be offset by the high value of the protected installation.

On the other hand, this will not be desirable in a machine shop with very variable levels of background smoke. In this case, it may be more important to ensure that an elevated level of smoke really does indicate an incipient fire before alarms are raised.

The probability of nuisance alarm for a given environment also depends on the “stability” of the background smoke level. For example, a clean, controlled environment will unlikely have a smoke level that will vary over time. Under these circumstances, a low alarm factor will not imply a radically increased probability of nuisance alarm.

ClassiFire On

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. This detector 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. 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.

Chapter 4
Commissioning

Summary

This chapter provides information to commission the ReadySET detection system.

Content

Introduction

This chapter covers the commissioning procedures for the ReadySET detector. Commissioning strategy initially depends upon the detector's environment. Commissioning should only be done by factory-trained technicians in accordance with the same applicable standards listed in Chapter 3 "Installation and configuration" on page 11.

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 normal operating conditions.

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.

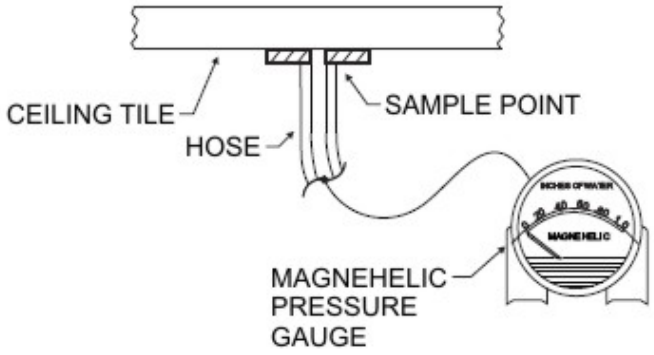
Suction pressure verification

Sample hole suction pressures can be measured and recorded on the checklist for future reference using the steps below.

To perform a pressure test:

1. Attach a flexible hose onto the suction side of the magnehelic pressure gauge.
2. Place the hose against the sampling hole and hold it in place.
3. Hold the gauge in the plane in which it was calibrated and read the suction pressure from the gauge as shown in Figure 13 below.

Figure 13: Magnehelic test setup



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.

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.

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Chapter 5
Troubleshooting

Summary

This chapter provides information about troubleshooting the ReadySET detection system.

Content

Troubleshooting

Troubleshooting the ReadySET detector

This chapter provides some possible solutions if a problem should occur with your ReadySET detector. If the problem is not addressed in this chapter or, if after performing the suggested actions, the problem persists, contact Technical Support.

Problem	Solution or corrective action
Nuisance alarms occur too often	This normally indicates that the detector is set at an alarm factor inappropriate to the installed environment. *Increase the alarm factor to reduce sensitivity*.
	Check that the ClassiFire alarm factor setting is appropriate for the normal working environment of the protected area.
	Check that the ClassiFire override switch is appropriately set to reflect active and inactive periods.
	The sensor chamber may be contaminated. *If so, return the detector to the factory for cleaning and recalibration*.
Elevated smoke levels do not generate alarms	Check that detector is not in FastLearn (if in FastLearn, the OK light will flash). *Check if green OK LED is on and flashing.*
	The detector FastLearn cycle may have been carried out during or immediately after a smoke test. *Reinitialize FastLearn with the detector in a clean environment.*
	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 alarm factor setting has been set. *if the alarm factor is too high, change the alarm factor to a lower, more sensitive setting.*
	Check that the detector has had a 24-hour learning period.
Low mean output	Check that the dust separator cartridge does not require changing (refer to “Replacing the dust separator filter cartridge” on page 40 for details) 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 or corrective action
Flow fault errors (“FLOW” LED illuminated)	These occur when the airflow rate into the detector exceeds the programmed parameters. This usually occurs when there has been some change in conditions. It may indicate that a sampling pipe is damaged, or that the pipe has been blocked, e.g., by nearby building operations. Flow monitoring is too sensitive for the environment. *Increase the flow limit offset.* 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. The airflow may be subject to temporary changes (spikes). *Increase the flow delay to 240 seconds.* Check that installed pipework is fitted with end caps. When used, PipeCAD pipe modeling software prompts for the use of appropriate end caps. Open bore pipes are not recommended.
Long transport times	Sampling pipe may be too long or have too many sampling holes/capillaries or incorrect hole sizes. Check the design with pipe modeling software. For pre-engineered piping, ensure that the piping is within the specified parameters. Sampling pipes, sampling holes and/or the exhaust pipe may be partially blocked by dust or debris. *Clean pipe work with dry compressed air and/or clean the sampling holes.* Fan may be defective. *Send detector to manufacturer for repair.* Electrical lead from fan may be disconnected. *Reconnect lead.*
Detector laser chamber error (“HEAD” LED illuminated)	This occurs when a problem is present in the detector laser chamber. Inspect wires that are connected to the laser head for damage and loose connections.

Contacting technical support

Tel +1 800 655 4497
Fax +1 866 226 2126
AirIntelligence.Techsupport@fs.utc.com

Chapter 6
Maintenance

Summary

This chapter provides scheduled and unscheduled maintenance procedures.

Content

Introduction

This chapter contains maintenance instructions for the ReadySET aspirating smoke detection system. These procedures should be performed on a scheduled basis. In the event that system problems are found during routine maintenance, refer to “Troubleshooting” on page 34. 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. At a minimum, the interval between performance of maintenance procedures should not exceed any applicable regulations. (See NFPA-72 or other local requirements.) This chapter contains minimum maintenance procedures, however, additional and/or more frequent procedures may be required by applicable codes and standards.

Maintenance procedures

The following paragraphs outline general scheduled maintenance procedures.

Visual check

The visual check must be performed at least every six months. This check is to ensure pipe network integrity. Ensure that the design is still valid. Building upgrades can require changes to the piping and detector requirements.

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

Battery status check

Caution: Any battery that has been in service for 36 months or more must be replaced.

The battery backup used in the power supply to power the detector must be tested at least every six months.

A battery status check is best accomplished by running the load with the batteries for about one hour. While the load is still on, measure the individual battery voltages. If any battery reads 1.5 V or more below its rated voltage, that battery should be replaced.

Generally, if one of a series set of batteries is low, the others will soon fail. Therefore, it is advisable to replace all the batteries of a series set when one requires replacement.

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 at least 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 detector response must be verified. Smoke from a punk or cotton wick may be used. Canned smoke may also be used.

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.

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 32 for test details.) The transport time verification test must be done at commissioning and at least every year thereafter.

Detector sensitivity test

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

Example:

- Year-one check
- Year-three check

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 filter cartridge

The only part that may require field replacement during servicing is the dust separator filter cartridge. The “FILTER” LED will illuminate when the detector’s air filter needs to be changed.

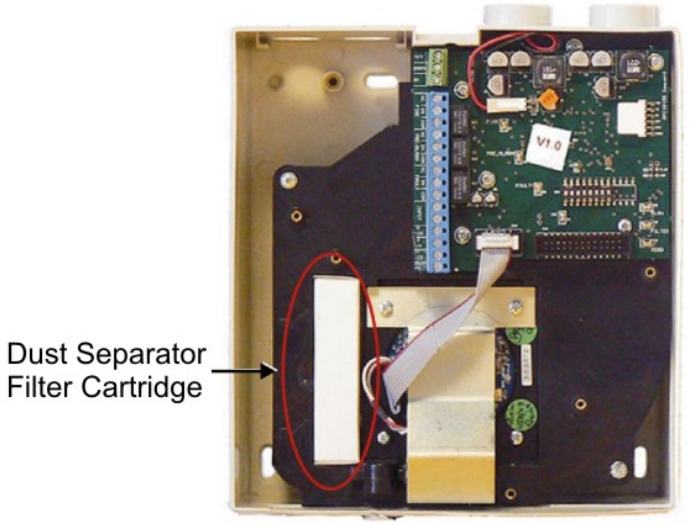
WARNING: If, due to the environment of the area being protected, the dust in the dust separator filter will expose maintenance personnel to health hazards, it is recommended that suitable masks and protective clothing be worn when changing filters. Maintenance work should be performed in compliance with OSHA if applicable.

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

To replace the filter:

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 (part number 33-30755) so that the “IN” mark on the cartridge is on the left as viewed in Figure 14 on page 41.
7. Slide the cartridge all the way into place.
8. Replace the detector cover and secure it into place. Initiate a FastLearn routine by re-energizing the detector.

Figure 14: Location of dust separator (filter) cartridge



Appendix A
Communications card

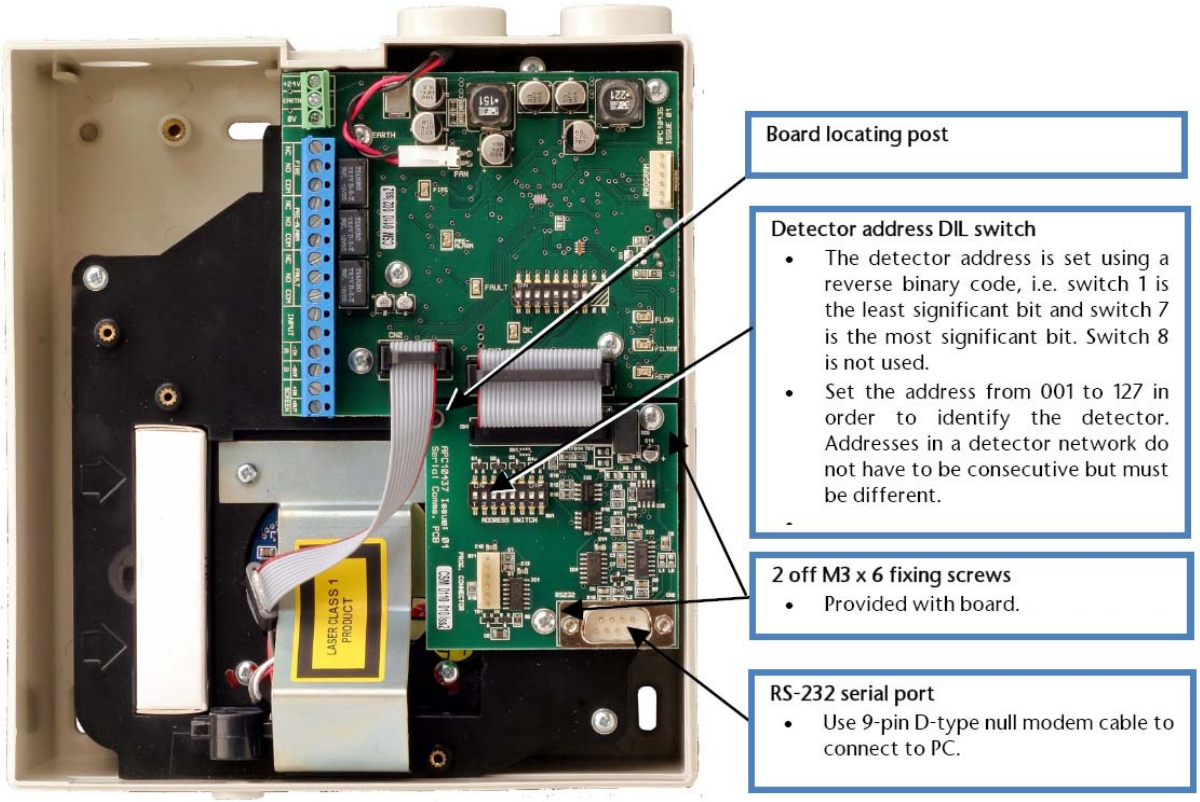
Summary

An optional communications card can be fitted inside the ReadySET detector. The ReadySET is also available in a model that is shipped with the communications card factory installed.

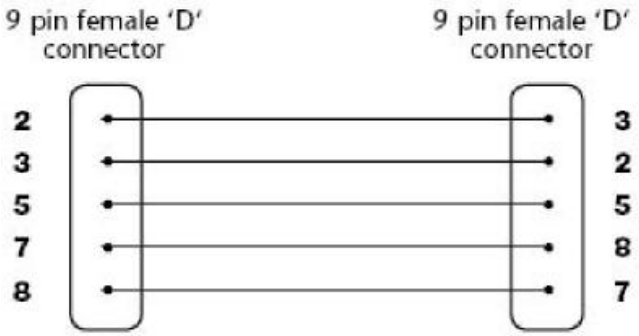
Optional communications card

An optional communications card can be fitted inside the ReadySET detector to provide an RS-232 serial port and RS-485 network communication. A ReadySET model is also available with the communications card factory installed.

Figure 15: Optional communications card



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 the diagram below.



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 Software Configuration 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 configuration 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 (see Figure 9 on page 22). 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.

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
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
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	Picofarads
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

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