INSTALLATION AND MAINTENANCE INSTRUCTIONS

Innovair flex™

SYSTEM SENSOR®

Pittway Tecnologica Srl,
Via Caboto 19/3, 34147 Trieste, Italy
www.systemsensoreurope.com

D2E Duct Smoke Detector

SPECIFICATIONS

Operating Temperature:	–20° to 60° C
Storage Temperature:	–20° to 60° C
Humidity:	0% to 93% Relative Humidity Non-condensing
Air Velocity:	1.5 to 20.3 m/sec
Rectangular Footprint Dimensions:	37 cm L x 12.7 cm W x 6.36 cm D
Square Footprint Dimensions:	19.7 cm L x 22.9 cm W x 6.35 cm D
Weight:	0.73 kg
Electrical	
Power supply voltage:	8.5-35 VDC
Input capacitance:	0.1 µF max.
Reset Voltage:	2.5 VDC min.
Reset Time (with RTS451/RTS151):	.03 to 0.3 sec.
Reset Time (by power down):	0.3 sec. max.
Power Up Time:	35 sec. max.
Alarm response time:	15 sec.
Sensitivity Test:	See detector label
Current Requirements (Using No Accessories)	
Peak standby current	120µA
Average standby current	60µA
Max. alarm current	130 mA

ACCESSORY CURRENT LOADS AT 24 VDC		
DEVICE	**STANDBY**	**ALARM**
RA400Z/RA100Z	0mA	12mA Max.

Table of Contents **Page**

[1] Limitations of Duct Smoke Detectors 1
[2] General Description 1
[3] Contents of the Duct Smoke Detector Kit 1
[4] Exploded View of Duct Smoke Detector Components 2
[5] Detector Installation 2
[6] Sampling Tube Installation 3
[7] Measurement Tests 3-4
[8] Field Wiring 4
[9] Detector Status Indicator 4
[10] Verification of Operator 5
[11] Dectector Cleaning Procedures 5
[12] Sensor Replacement 6
[13] Optional Accessories 6
Wiring Diagrams 4,6
Warranty 6

The D2E model is a photoelectric detector approved for an extended air speed range of 1.5 m/s to 20.3 m/s and an operational temperature range of −20°C to 60°C.

BEFORE INSTALLING

Read the System Sensor Guide for *Proper Use of Smoke Detectors in Duct Applications* (A05-1004), which provides detailed information on detector spacing, placement, zoning, wiring, and special applications. Copies of this manual are available online at www.systemsensor.com. Refer also to local standards and codes of practice.

NOTICE: This manual shall be left with the owner/user of this equipment.
IMPORTANT: This detector must be tested and maintained regularly. The detector should be cleaned at least once a year.

[1] LIMITATIONS OF DUCT SMOKE DETECTORS

⚠WARNING

DUCT DETECTORS MUST NOT BE USED AS A SUBSTITUTE FOR OPEN AREA DETECTOR PROTECTION as a means of providing life safety. Nor are they a substitute for early warning in a building's regular fire detection system.

This device will not operate without electrical power. Fire situations may cause an interruption of power. The system safeguards should be discussed with your local fire protection specialist.

This device will not sense smoke unless the ventilation system is operating and the cover is installed.

For this detector to function properly, it MUST be installed according to the instructions in this manual. Furthermore, the detector MUST be operated within ALL electrical and environmental specifications listed in this manual. Failure to comply with these requirements may prevent the detector from activating when smoke is present in the air duct.

[2] GENERAL DESCRIPTION

Smoke introduced into the air duct system will be distributed throughout the entire building. Smoke detectors designed for use in air duct systems are used to sense the presence of smoke in the duct.

Model D2E Duct Smoke Detector utilizes photoelectric technology for the detection of smoke. This detection method, when combined with an efficient housing design, samples air passing through the duct allowing detection of a developing hazardous condition. When sufficient smoke is sensed, an alarm signal is initiated and appropriate action can be taken to shut off fans, blowers, change over air handling systems, etc. These actions can facilitate the management of toxic smoke and fire gases throughout the areas served by the duct system.

[2.1] DETECTOR FEATURE SET

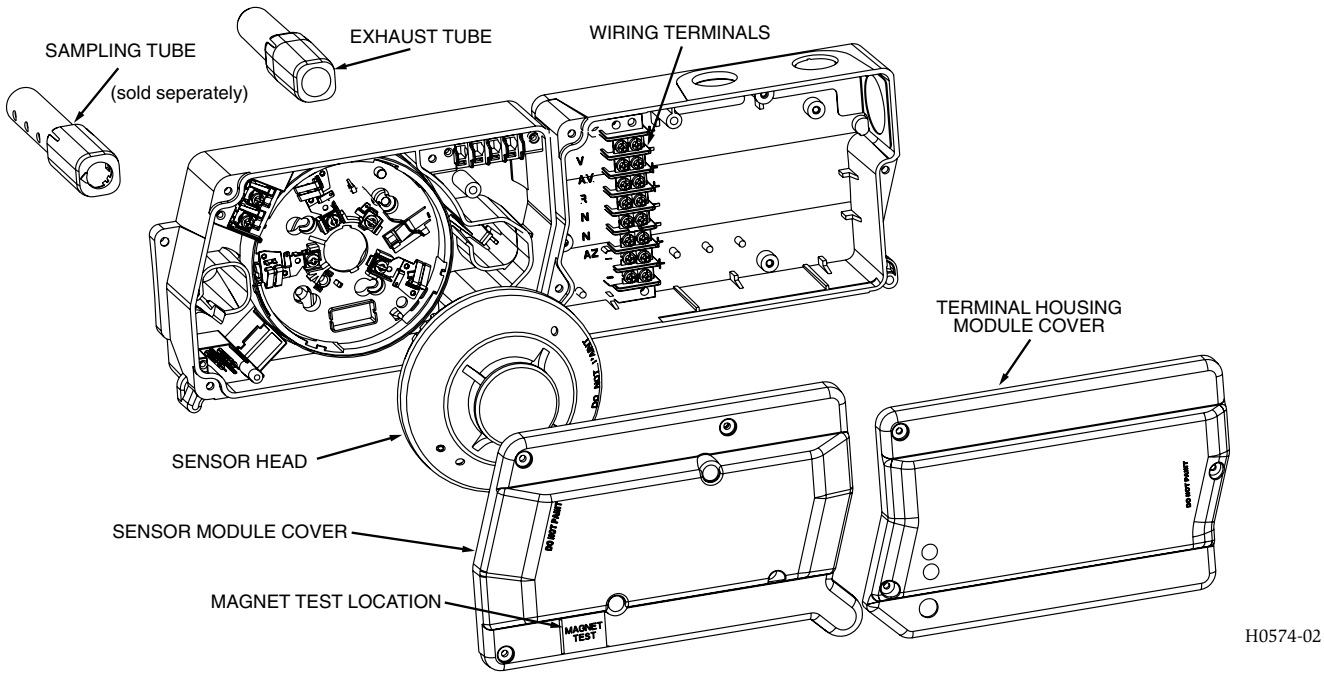
- Uses 2351E, SD-851E, ECO1003 and 2020P Detector Heads
- Sampling tubes installed from front or rear
- Compatible with existing accessories

[3] CONTENTS OF THE DUCT SMOKE DETECTOR KIT

1. Sensor/power board assembly and covers
2. Three #10 sheet metal screws for mounting
3. One test magnet
4. Drilling template
5. One sampling tube end cap
6. One plastic exhaust tube

NOTE: A sampling tube must be ordered to complete the installation. It must be the correct length for the width of the duct where it will be installed. See Table 1 on page 3 to determine the inlet tube required for different duct widths.

[4] FIGURE 1. EXPLODED VIEW OF DUCT SMOKE DETECTOR COMPONENTS:



[5] DETECTOR INSTALLATION

[5.1] VERIFY DUCT AIR FLOW DIRECTION AND VELOCITY

Model D2E detectors are designed to be used in air handling systems having air velocities of 1.5 to 20.3 m/sec. Duct widths from 15.3 to 30.5cm can be accommodated. Be sure to check engineering specifications to ensure that the air velocity in the duct falls within these parameters. If necessary, use a velocity meter (anemometer) to check the air velocity in the duct.

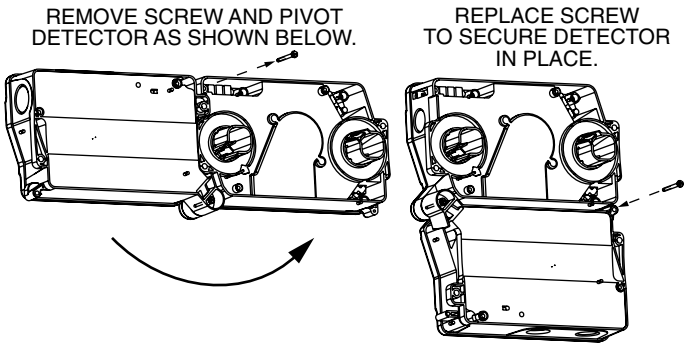
[5.2] DETERMINE MOUNTING LOCATION AND CONFIGURATION

On ducts wider than 45.7cm it is recommended that the detector be mounted downstream of a bend, obstruction in the duct, or the supply or return air inlet.

Exception: Installation of duct detectors can be on or within a commercial packaged rooftop heating and air-conditioning system, fire/smoke dampers and economizers. They may be mounted in either the supply and/or return air section as determined by local code.

Once a suitable location is selected, determine if the detector is to be mounted in a side-by-side "rectangular" configuration or a top-over-bottom "square" configuration as shown in **Figure 2**. If mounting in the square configuration, remove the rear attachment screw, rotate the unit at hinge, and replace the screw into the new attachment hole as shown in **Figure 2**. Do NOT remove the hinge screw during this process. Final installation approval shall be based upon passing section 10.4.2 and 10.4.4 tests.

FIGURE 2:



[5.3] DRILL THE MOUNTING HOLES

Remove the paper backing from the mounting template supplied. Affix the template to the duct at the desired mounting location. Make sure the template lies flat and smooth on the duct.

[5.3.1] FOR RECTANGULAR SIDE-BY-SIDE MOUNTING CONFIGURATION:

Center punch at (4) target centers: (2) "A" for sampling tubes and (2) "B" for the rectangular configuration mounting tabs as shown on mounting template. Drill pilot holes at target "A" centers and cut two 3.5cm diameter holes using a 3.5cm hole saw or punch. Drill 4mm diameter holes using a 4mm drill at target "B" centers.

[5.3.2] FOR SQUARE TOP-OVER-BOTTOM MOUNTING CONFIGURATION:

Center punch at (4) target centers: (2) "A" for sampling tubes and (2) "C" for the square configuration mounting tabs as shown on mounting template. Drill pilot holes at target "A" centers and cut two 3.5cm diameter holes using a 3.5cm hole saw or punch. Drill 4mm diameter holes using a 4mm drill at target "C" centers. If desired, drill an additional 4mm hole at the location of one of the mounting tabs on the lower housing.

[5.4] SECURE THE DUCT DETECTOR TO THE DUCT

Use two (rectangular configuration) or three (square configuration) of the provided sheet metal screws to screw the duct detector to the duct.

CAUTION: Do not overtighten the screws.

[6] SAMPLING TUBE INSTALLATION

[6.1] SAMPLING TUBE SELECTION

The sampling tube must be purchased separately. Order the correct length, as specified in **Table 1**, for width of the duct where it will be installed. It is recommended that the sampling tube length extend at least $^{2}/_{3}$ across the duct width for optimal performance.

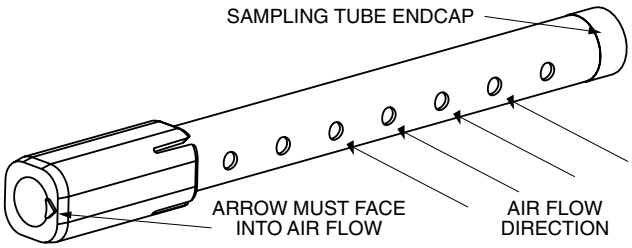
TABLE 1. SAMPLING TUBES RECOMMENDED FOR DIFFERENT DUCT WIDTHS:

Outside Duct Width	Sampling Tube Recommended*
Up to 30.5 cm	DST1
30.5 to61 cm	DST1.5
61 to 122 cm	DST3
122 to 244 cm	DST5
244 to 366 cm	DST10 (2-piece)

***Must extend a minimum of $^{2}/_{3}$ the duct width**

The sampling tube is always installed with the air inlet holes facing into the air flow. To assist proper installation, the tube's connector is marked with an arrow. Make sure the sampling tube is mounted so that the arrow points into the airflow as shown in **Figure 3**. Mounting the detector housing in a vertical orientation is acceptable provided that the air flows directly into the sampling tube holes as indicated in **Figure 3**. The sampling tube and exhaust tube can be mounted in either housing connection as long as the exhaust tube is mounted downstream from the sampling tube.

FIGURE 3. AIR DUCT DETECTOR SAMPLING TUBE:



H0551-00

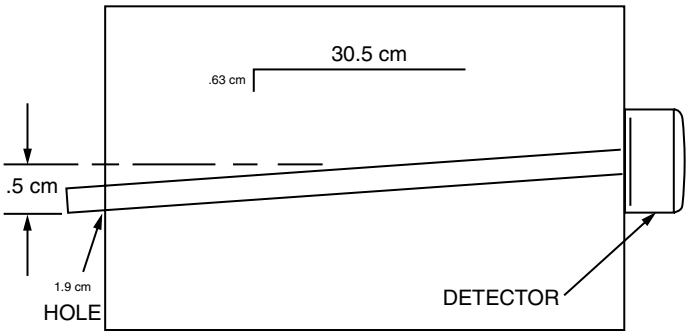
CAUTION: The sampling tube end cap, included with the detector, is critical to proper operation of the duct smoke detector. The end cap is needed to create the proper air flow to the sensor of the duct smoke detector. Once any sampling tube length adjustments are made, plug the end of the sampling tube with the provided end cap.

A plastic exhaust tube is included with the unit to be installed if needed. Install into the housing connection that is downstream from the sampling tube connection. The exhaust tube can be installed from the front of the detector or the back. A longer 30.5 cm exhaust tube, model ETX is available as an accessory in cases where the molded exhaust tube does not extend at least 5 cm into the duct.

[6.2] SAMPLING TUBE INSTALLATION

1. For tubes shorter than the width of the duct, slide the sampling tube, with installed end cap, into the housing connection that meets the airflow first. Position the tube so that the arrow points into the airflow as shown in **Figure 3**. Sampling tubes over 91.4 cm long should be supported at the end opposite of the duct detector. In ducts wider than 244cm, work must be performed inside the duct to couple the other section of the sampling tube to the section already installed using the 4 cm conduit fitting supplied. Make sure that the holes on both sections of the air inlet sampling tube are lined up and facing into the airflow.
2. For tubes longer than the width of the air duct, the tube should extend out of the opposite side of the duct. Drill a 1.9 cm hole in the duct opposite the hole already cut for the sampling tube. Ensure that the sampling tube is angled downward from the duct smoke detector to allow for moisture drainage away from the detector. The sampling tube should be angled at least .63 cm downward for every 30.5 cm of duct width per Figure 4. There should be 10 to 12 holes spaced as evenly as possible across the width of the duct. If there are more than 2 holes in the section of the tube extending out of the duct, select a shorter tube using **Table 1**. Otherwise, trim the tube to leave approximately 2.54-5.08cm extending outside the duct. Plug the end with the end cap and tape closed any holes in the protruding section of the tube. Be sure to seal the duct where the tube protrudes.

FIGURE 4:



H0215-01

NOTE: Air currents inside the duct may cause excessive vibration, especially when the longer sampling tubes are used. In these cases, a 7.6 cm floor flange (available at most plumbing supply stores) may be used to fasten the sampling tube to the other side of the duct. When using the flange/connector mounting technique, drill a 2.5 to 3.2 cm hole where the flange will be used.

[6.3] MODIFICATIONS OF SAMPLING TUBES

There may be applications where duct widths are not what is specified for the installation. In such cases, it is permissible to modify a sampling tube that is longer than necessary to span the duct width.

Use a 4.9 mm drill and add the appropriate number of holes so that the total number of holes exposed to the air flow in the duct is 10 to 12. Space the additional holes as evenly as possible over the length of the tube.

NOTE: This procedure should only be used as a temporary fix. It is not intended as a permanent substitute for ordering the correct length tubes.

[6.4] REMOTE SAMPLING TUBE INSTALLATION

The detector arrangement can also incorporate the remote mounting of the sampling tube and/or exhaust tube. In this case both the detector, sampling tube and exhaust tube (if included) should be rigidly mounted to withstand the pressure and vibrations caused by the air velocity. The location of the detector's sampling tube should be such that there is uniform airflow in the cross section area.

The pressure differential across the sampling and exhaust ports in the detector housing shall be verified to be between .25 and 28.2 mm of water. Do so by measuring the pressure difference between the inlet and outlet ports on the detector housing using a manometer as described in Section 10.4.4 of this manual.

[7] MEASUREMENT TESTS

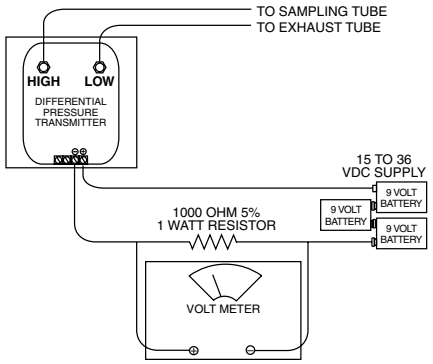
[7.1] AIR FLOW

The D2E is designed to operate over an extended air speed range of 1.5 to 20.3 m/sec. To verify sufficient sampling of ducted air, turn the air handler on and use a manometer to measure the differential pressure between the two sampling tubes. The differential pressure should measure at least .25 mm of water and no more than 28.2 mm of water. Because most commercially available manometers cannot accurately measure very low pressure differentials, applications with less than 2.54 m/sec of duct air speed may require one of the following: 1) the use of a current-sourcing pressure transmitter (per Section 7.2; or 2) the use of aerosol smoke per section 10.4.4.

[7.2] LOW FLOW AIR FLOW TEST USING DWYER SERIES 607 DIFFERENTIAL PRESSURE TRANSMITTER

Verify the air speed of the duct using an anemometer. Air speed must be at least 1.5m/sec. Wire the transmitter as shown in Figure 5. Connect the leads of the meter to either side of the 1000Ω resistor. Allow unit to warm up for 15 seconds. With both HIGH and LOW pressure ports open to ambient air, measure and record the voltage drop across the 1000Ω resistor (measurement 1), 4.00 volts is typical. Using flexible tubing and rubber stoppers, connect the HIGH side of the transmitter to the sampling tube of the duct smoke detector housing, and the LOW side of the transmitter to the exhaust tube of the duct smoke detector housing. Measure and record the voltage drop across the 1000Ω resistor (measurement 2). Subtract the voltage recorded in measurement 1 from the voltage recorded in measurement 2. If the difference is greater than 0.15 volts, there is enough air flow through the duct smoke detector for proper operation.

FIGURE 5. PROCEDURE FOR VERIFYING AIR FLOW:



H0163-04

[8] FIELD WIRING; INSTALLATION GUIDELINES

All wiring must be installed in compliance with local wiring regulations and codes of practice. Proper wire gauges should be used. The conductors used to connect smoke detectors to control panels and accessory devices should be color-coded to prevent wiring mistakes. Improper connections can prevent a system from responding properly in the event of a fire.

For signal wiring, (the wiring between interconnected detectors or from detectors to auxiliary devices), it is recommended that single conductor wire be no smaller than 18 gauge. The duct smoke detector terminals accommodate wire sizes up to 12 gauge.

Smoke detectors and alarm system control panels have specifications for allowable loop resistance. Consult the control panel manufacturer's specifications for the total loop resistance allowed for the particular model control panel being used before wiring the detector loop.

[8.1] WIRING INSTRUCTIONS

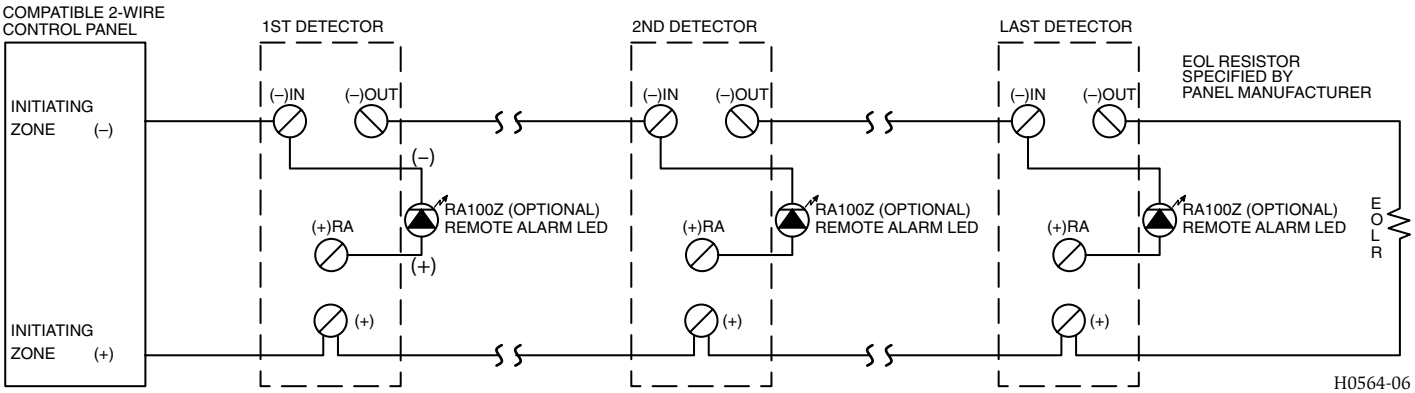
The D2E detectors are designed for easy wiring. The housing provides a terminal strip with clamping plates. Wiring connections are made by sliding the bare end of the wire under the plate, and tightening the clamping plate screw. See **Figure 6A** for negative supply (–) supervision or **Figure 6B** for positive suupply (+) supervision..

[9] DETECTOR STATUS INDICATION

Detector status is indicated by the LED's on the sensor. Refer to relevant detector installation manual for more details.

FIGURE 6A. SYSTEM WIRING DIAGRAM FOR D2E 2-WIRE DUCT SMOKE DETECTORS WITH NEGATIVE SUPPLY (–) SUPERVISION (DETECTORS POWERED FROM INITIATING CIRCUIT):

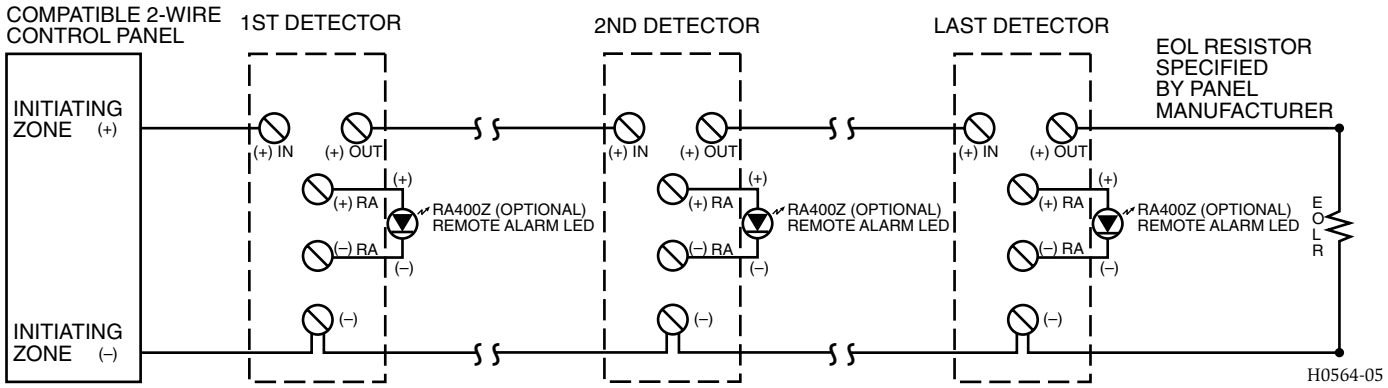
NOTE: FOR POSITIVE SUPPLY (+) SUPERVISION SEE FIGURE 6B.



H0564-06

FIGURE 6B. SYSTEM WIRING DIAGRAM FOR D2E 2-WIRE DUCT SMOKE DETECTORS WITH POSITIVE SUPPLY (+) SUPERVISION (DETECTORS POWERED FROM INITIATING CIRCUIT):

NOTE: WIRING CARD MUST BE REMOVED FOR POSITIVE SUPPLY (+) SUPERVISION SEE FIGURE 7.



H0564-05

⚠CAUTION

Do not loop wire under terminals when wiring detectors. Break wire runs to provide system supervision of connections.

[10] VERIFICATION OF OPERATION

[10.1] POWER THE UNIT

Apply 12VDC or 24 VDC to terminals marked as (+) and (–)IN, see Figure 6, and electrical specs for details.

[10.2] PERFORM DETECTOR CHECK

VERIFY STANDBY per Section 9 on page 4. The use of a remote accessory is recommended.

10.2.1 COVER TAMPER

Removal of the cover on the sensor side of the housing will result in a trouble condition. The unit with cover removed will remain powered while any units between this unit and the eol resistor will loose power.

[10.3] DUCT SMOKE DETECTOR TEST AND MAINTENANCE PROCEDURES

Test and maintain duct smoke detectors in accordance with local regulations and codes of practice. The tests contained in this manual were devised to assist maintenance personnel in verification of proper detector operation.

Before conducting these tests, notify the proper authorities that the smoke detection system will be temporarily out of service. Disable the zone or system under test to prevent unwanted alarms.

[10.4] VERIFY AIRFLOW TEST PER SECTION 7 HAS BEEN PERFORMED.

[10.4.1] SMOKE ENTRY USING AEROSOL SMOKE

This test is intended for low-flow systems < 2.54 m/sec. If the air speed is greater than 2.54 m/sec, use a conventional manometer to measure differential pressure between the sampling tubes, as described in 7.1.

Drill a .63 cm hole 91.4 cm upstream from the duct smoke detector. With the air handler on, measure the air velocity with an anemometer. Air speed must be at least 1.5 m/sec. Spray aerosol smoke into the duct through the .63 cm hole for five seconds. Wait two minutes for the duct smoke detector to alarm. If the duct smoke detector alarms, air is flowing through the detector. Remove the duct smoke detector cover and blow out the residual aerosol smoke from the chamber and reset the duct smoke detector. Use duct tape to seal the aerosol smoke entry hole.

⚠CAUTION

Canned aerosol simulated smoke (canned smoke agent) formulas will vary by manufacturer. Misuse or overuse to these products may have long term adverse effects on the smoke detector. Consult the canned smoke agent manufacturer's published instructions for any further warnings or caution statements.

[10.5] INSTALL THE COVER

Install the covers making sure that the cover fits into the base groove. Tighten the seven screws that are captured in the covers.

NOTE: Verify sensor cover gasket is properly seated on cover prior to cover installation

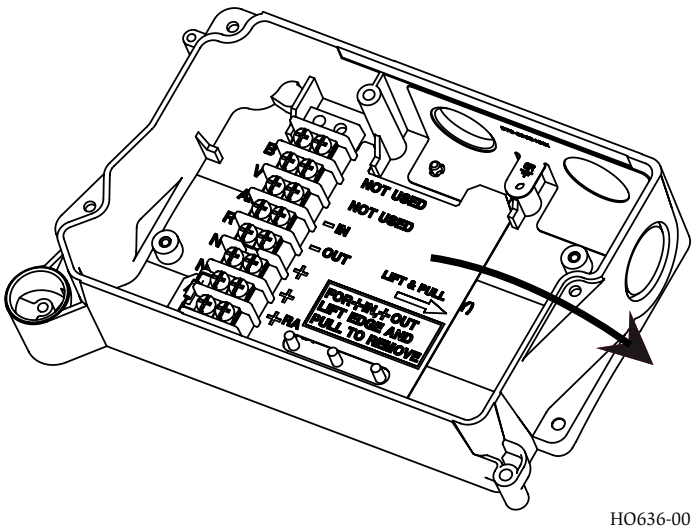
[11] DETECTOR CLEANING PROCEDURES

Notify the proper authorities that the smoke detector system is undergoing maintenance, and that the system will temporarily be out of service. Disable the zone or system undergoing maintenance to prevent unwanted alarms and possible dispatch of the fire department.

[11.1] DETECTOR SENSOR

1. Remove the sensor to be cleaned from the system.
2. Refer to the relevant detector installation manual for cleaning instructions.
3. Re-install the detector

FIGURE 7. POWER BOARD WITH REMOVABLE CARD:



HO636-00

[11.2] REINSTALLATION

1. Reinstall the detector in its housing.
2. Restore system power.
3. Perform Detector Check, Section [10.2].
4. Notify the proper authorities testing has been completed and the smoke detector system is back in operation.

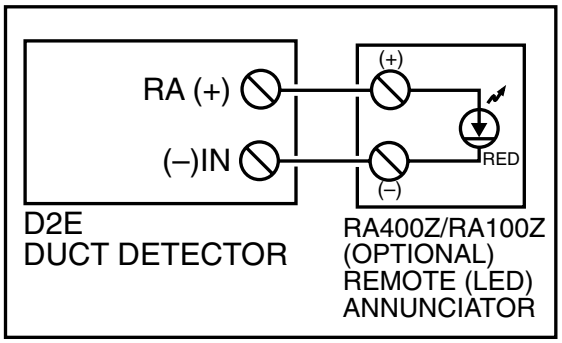
[12] SENSOR REPLACEMENT

1. Remove the sensor head by rotating counterclockwise.
2. Pull gently to remove it.
3. To replace the sensor head, align the mounting features and rotate clockwise into place.

[13] OPTIONAL ACCESSORIES

The D2E duct smoke detector can be used with the RA400Z or RA100Z.

FIGURE 8. WIRING DIAGRAMS FOR OPTIONAL ACCESSORIES:



H0611-06

Please refer to insert for the Limitations of Fire Alarm Systems

THREE-YEAR LIMITED WARRANTY

System Sensor warrants its enclosed product to be free from defects in materials and workmanship under normal use and service for a period of three years from date of manufacture. System Sensor makes no other express warranty for the enclosed product. No agent, representative, dealer, or employee of the Company has the authority to increase or alter the obligations or limitations of this Warranty. The Company's obligation of this Warranty shall be limited to the replacement of any part of the product which is found to be defective in materials or workmanship under normal use and service during the three year period commencing with the date of manufacture. After obtaining a Return Authorization number, send defective units to: Returns Department, RA #_____, Pittway Tecnologica Srl, Via Caboto 19/3, 34147 Trieste, Italy.

Please include a note describing the malfunction and suspected cause of failure. The Company shall not be obligated to replace units which are found to be defective because of damage, unreasonable use, modifications, or alterations occurring after the date of manufacture. In no case shall the Company be liable for any consequential or incidental damages for breach of this or any other Warranty, expressed or implied whatsoever, even if the loss or damage is caused by the Company's negligence or fault. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

©2010 System Sensor