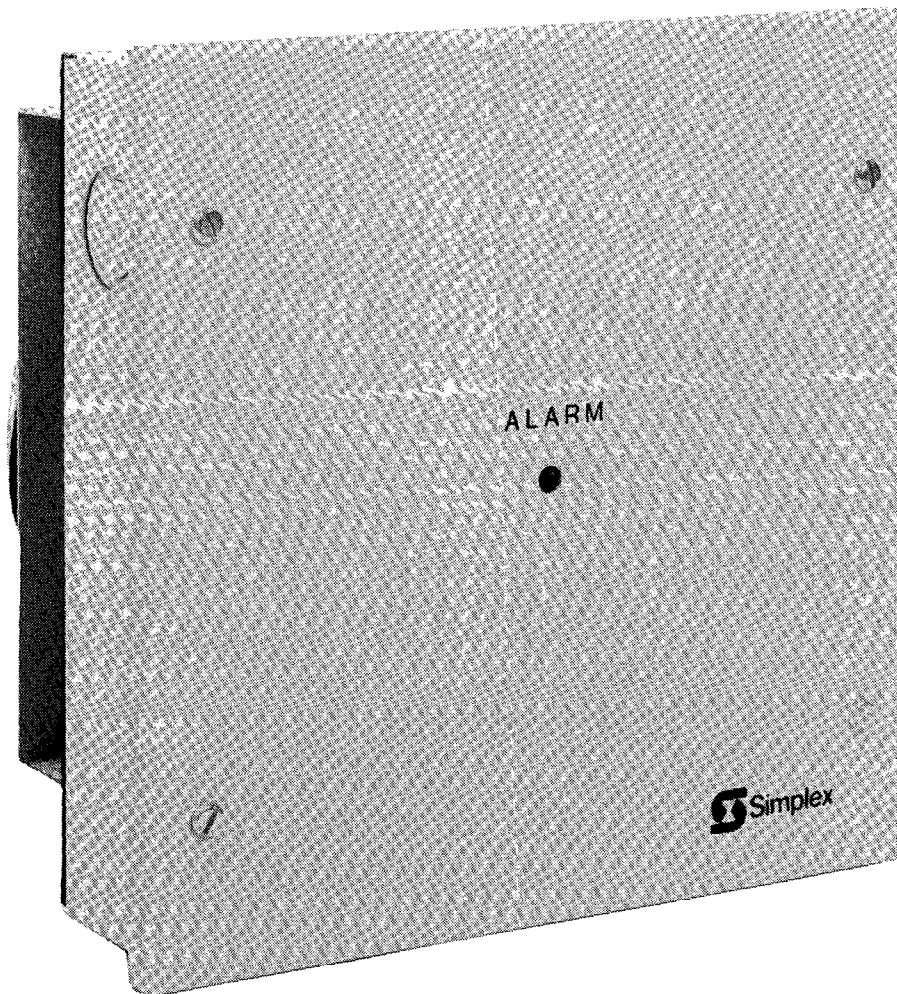




4098-9704, -9705 In-Duct Sensor Assemblies

Installation Instructions



NOTICE

THIS DEVICE IS A LOW VELOCITY, IN-DUCT ASSEMBLY. WHEN PROVIDED WITH SENSOR, IT IS DESIGNED TO SAMPLE THE AIR FLOW PASSING BY IT IN THE AIR DUCT TO DETERMINE WHETHER IT CONTAINS UNACCEPTABLE LEVELS OF SMOKE.

THE EFFECTIVENESS OF A DUCT SMOKE SENSOR IS HIGHLY DEPENDENT UPON:

- THE DESIGN AND OPERATING CONDITIONS OF THE AIR HANDLING SYSTEM IN WHICH IT IS INSTALLED,
- VARIABLES SUCH AS SMOKE DILUTION AND STRATIFICATION OVER WHICH EVEN THE BEST DESIGNED SYSTEMS HAVE NO CONTROL, AND
- PROPER PLACEMENT AND POSITIONING OF THE DUCT SMOKE SENSOR, WHICH IS OFTEN COMPROMISED FOR PRACTICAL REASONS.

FOR THE REASONS STATED ABOVE, THE EFFECTIVENESS OF THIS DUCT SMOKE SENSOR CANNOT BE WARRANTED OR GUARANTEED. UNDER NO CIRCUMSTANCES SHOULD THIS DUCT SMOKE SENSOR BE USED AS OR REGARDED TO BE A SUBSTITUTE FOR THE BUILDING'S REGULAR FIRE ALARM AND DETECTION SYSTEM TO WHICH THIS DEVICE IS ATTACHED AS A SECONDARY DETECTION DEVICE.

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GENERAL DESCRIPTION

The 4098-9704 or 4098-9705 In-Duct Sensor Assembly is designed to sample air and detect smoke in air ducts. Only the 4098-9704 has auxiliary contacts for alarm, supervisory, and control functions.

Each assembly uses the 4098-9701 Photoelectric Sensor (not supplied).

The assembly may be used with square ducts from 8 inches to 36 inches wide. For ducts 37 to 72 inches wide, use a duct sensor on both sides of the duct to provide adequate sampling of the air volume. Although the In-Duct Assembly is not recommended for round ducts, it is ideally suited for use in air return plenums above ceilings or below floors of computer rooms.

Each housing has a red Alarm LED.

Note: A pulsing Alarm LED indicates "Power On."

For detailed information on using smoke sensors in air distribution systems, see NFPA 90A.

The procedures that follow are used to install the 4098-9704 or 4098-9705 In-Duct Sensor Assembly. The instructions provided show how to set the address at each assembly and also how to make electrical connections. Addressable smoke duct sensors are connected to a 2120 Multiplex Communicating Device Transponder (4098-9705 only), 4020 Fire Alarm Panel, 4100+ Fire Alarm Panel, or 4120 Fire Alarm Panel by a single twisted-shielded wire pair (MAPNET II®).

SETTING THE DUCT SENSOR'S ADDRESS

Duct sensor addressing is critical since the 2120 Communicating Device Transponder (CDT), 4020, 4100+, and 4120 Systems report alarms and troubles per duct sensor rather than per zone. Each duct sensor has a unique address. This address is associated with a custom label which identifies its physical location within a building. The duct sensor's address and location must match up with the address listed in the specification sheets of the 2120 Job Configuration Report or Programmer's Report for the 4020, 4100+, or 4120 System. You should have the appropriate specification sheets with you during this part of the installation.

Address Setting for the 2120 CDT System (Use with 4098-9705 only)

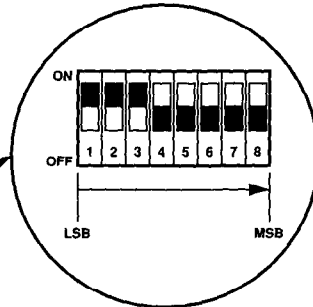
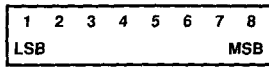
1. Using the 2120 Job Configuration Report, find the entry for the duct sensor you are about to install. The CUSTOM LABEL column provides the location while the DEVICE ADDRESS column provides the switch setting data.
2. Using the switch setting data for the duct sensor you're installing, set the duct sensor's address. Locate the DIP switches on the duct sensor's base. Use a small screwdriver or pen to set the switches.

For the switch setting data in the DEVICE ADDRESS column, "0" means "CLOSED" while "1" means "OPEN."

3. Recheck the location of the sensor and its address before electrical installation.

4020, 4100+, OR 4120 USE ONLY

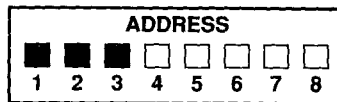
(NOT FOR USE WITH 2120)



SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8		ADDRESS
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 1
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 2
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 3
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 4
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 5
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 6
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	=	ADDRESS 7
OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	=	ADDRESS 8
ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	=	ADDRESS 9
OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	=	ADDRESS 10
ON	ON	OFF	ON	OFF	OFF	OFF	OFF	=	ADDRESS 11
OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	=	ADDRESS 12
ON	OFF	ON	ON	OFF	OFF	OFF	OFF	=	ADDRESS 13
OFF	ON	ON	ON	OFF	OFF	OFF	OFF	=	ADDRESS 14
ON	ON	ON	ON	OFF	OFF	OFF	OFF	=	ADDRESS 15
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	=	ADDRESS 16
ON	ON	OFF	OFF	ON	OFF	OFF	OFF	=	ADDRESS 17
OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	=	ADDRESS 18
ON	ON	OFF	OFF	ON	OFF	OFF	OFF	=	ADDRESS 19
OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	=	ADDRESS 20
ON	OFF	ON	OFF	ON	OFF	OFF	OFF	=	ADDRESS 21
OFF	ON	ON	OFF	ON	OFF	OFF	OFF	=	ADDRESS 22
ON	ON	ON	OFF	ON	OFF	OFF	OFF	=	ADDRESS 23
OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	=	ADDRESS 24
ON	OFF	OFF	ON	ON	OFF	OFF	OFF	=	ADDRESS 25
OFF	ON	OFF	ON	ON	OFF	OFF	OFF	=	ADDRESS 26
ON	ON	OFF	ON	ON	OFF	OFF	OFF	=	ADDRESS 27
OFF	OFF	ON	ON	ON	OFF	OFF	OFF	=	ADDRESS 28
ON	OFF	ON	ON	ON	OFF	OFF	OFF	=	ADDRESS 29
OFF	ON	ON	ON	ON	OFF	OFF	OFF	=	ADDRESS 30
ON	ON	ON	ON	ON	OFF	OFF	OFF	=	ADDRESS 31
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	=	ADDRESS 32
ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	=	ADDRESS 33
OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	=	ADDRESS 34
ON	ON	OFF	OFF	OFF	ON	OFF	OFF	=	ADDRESS 35
OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	=	ADDRESS 36
ON	OFF	ON	OFF	OFF	ON	OFF	OFF	=	ADDRESS 37
OFF	ON	ON	OFF	OFF	ON	OFF	OFF	=	ADDRESS 38
ON	ON	ON	OFF	OFF	ON	OFF	OFF	=	ADDRESS 39
OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	=	ADDRESS 40
ON	OFF	OFF	ON	OFF	ON	OFF	OFF	=	ADDRESS 41
OFF	ON	OFF	ON	OFF	ON	OFF	OFF	=	ADDRESS 42
ON	ON	OFF	ON	OFF	ON	OFF	OFF	=	ADDRESS 43
OFF	OFF	ON	ON	OFF	ON	OFF	OFF	=	ADDRESS 44
ON	OFF	ON	ON	OFF	ON	OFF	OFF	=	ADDRESS 45
OFF	ON	ON	ON	OFF	ON	OFF	OFF	=	ADDRESS 46
ON	ON	ON	ON	OFF	ON	OFF	OFF	=	ADDRESS 47
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	=	ADDRESS 48
ON	ON	OFF	OFF	ON	ON	OFF	OFF	=	ADDRESS 49
OFF	ON	OFF	OFF	ON	ON	OFF	OFF	=	ADDRESS 50
ON	ON	OFF	OFF	ON	ON	OFF	OFF	=	ADDRESS 51
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OFF	ON	ON	ON	ON	ON	OFF	OFF	=	ADDRESS 62
ON	ON	ON	ON	ON	ON	OFF	OFF	=	ADDRESS 63
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	=	ADDRESS 64
ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	=	ADDRESS 65
OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	=	ADDRESS 66
ON	ON	OFF	OFF	OFF	OFF	ON	OFF	=	ADDRESS 67
OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	=	ADDRESS 68
ON	OFF	ON	OFF	OFF	OFF	ON	OFF	=	ADDRESS 69
OFF	ON	ON	OFF	OFF	OFF	ON	OFF	=	ADDRESS 70

SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8		ADDRESS
ON	ON	ON	OFF	OFF	OFF	ON	OFF	=	ADDRESS 71
OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	=	ADDRESS 72
ON	OFF	OFF	ON	OFF	OFF	ON	OFF	=	ADDRESS 73
OFF	ON	OFF	ON	OFF	OFF	ON	OFF	=	ADDRESS 74
ON	ON	OFF	ON	OFF	OFF	ON	OFF	=	ADDRESS 75
OFF	OFF	ON	ON	OFF	OFF	ON	OFF	=	ADDRESS 76
ON	OFF	ON	ON	OFF	OFF	ON	OFF	=	ADDRESS 77
OFF	ON	ON	ON	OFF	OFF	ON	OFF	=	ADDRESS 78
ON	ON	ON	ON	OFF	OFF	ON	OFF	=	ADDRESS 79
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	=	ADDRESS 80
ON	OFF	OFF	OFF	ON	OFF	ON	OFF	=	ADDRESS 81
OFF	ON	OFF	OFF	ON	OFF	ON	OFF	=	ADDRESS 82
ON	ON	OFF	OFF	ON	OFF	ON	OFF	=	ADDRESS 83
OFF	OFF	ON	OFF	ON	OFF	ON	OFF	=	ADDRESS 84
ON	OFF	ON	OFF	ON	OFF	ON	OFF	=	ADDRESS 85
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ON	OFF	ON	ON	ON	OFF	ON	OFF	=	ADDRESS 93
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ON	ON	ON	ON	ON	OFF	ON	OFF	=	ADDRESS 95
OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	=	ADDRESS 96
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OFF	ON	OFF	OFF	OFF	ON	ON	OFF	=	ADDRESS 98
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ON	OFF	OFF	ON	OFF	ON	ON	OFF	=	ADDRESS 105
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OFF	OFF	OFF	OFF	ON	ON	ON	OFF	=	ADDRESS 112
ON	OFF	OFF	OFF	ON	ON	ON	OFF	=	ADDRESS 113
OFF	ON	OFF	OFF	ON	ON	ON	OFF	=	ADDRESS 114
ON	ON	OFF	OFF	ON	ON	ON	OFF	=	ADDRESS 115
OFF	OFF	ON	OFF	ON	ON	ON	OFF	=	ADDRESS 116
ON	OFF	ON	OFF	ON	ON	ON	OFF	=	ADDRESS 117
OFF	ON	ON	OFF	ON	ON	ON	OFF	=	ADDRESS 118
ON	ON	ON	OFF	ON	ON	ON	OFF	=	ADDRESS 119
OFF	OFF	OFF	ON	ON	ON	ON	OFF	=	ADDRESS 120
ON	OFF	OFF	ON	ON	ON	ON	OFF	=	ADDRESS 121
OFF	ON	OFF	ON	ON	ON	ON	OFF	=	ADDRESS 122
ON	ON	OFF	ON	ON	ON	ON	OFF	=	ADDRESS 123
OFF	OFF	ON	ON	ON	ON	ON	OFF	=	ADDRESS 124
ON	OFF	ON	ON	ON	ON	ON	OFF	=	ADDRESS 125
OFF	ON	ON	ON	ON	ON	ON	OFF	=	ADDRESS 126
ON	ON	ON	ON	ON	ON	ON	OFF	=	ADDRESS 127

MAPNET II® Address Chart
FIGURE 2



■ = ON
□ = OFF

MAPNET II® Address Label
FIGURE 3

ELECTRICAL SPECIFICATIONS

An addressable in-duct assembly is connected to a 2120 CDT (4098-9705 only), 4020, 4100+, or 4120 Fire Alarm system by twisted pair-wire (MAPNET II®). The duct sensor obtains both power and data over this pair. (Shielded, twisted pair-wire for the MAPNET II® circuit is required; for exceptions, consult Simplex Sales Engineering.) For relay operation (4098-9704 only), a separate 24VDC or 120VAC source of power is required in addition to the MAPNET II® lines.

4098-9704

Set up the 4098-9704 for the following Electrical Configuration:

MAPNET II® Operation with 24VDC Power for Relay Control (Figure 4)

24VDC Power

- *Input Voltage* — 18 to 32VDC
- *Average Supervisory Current* — 280 microamps.
- *Alarm Current* — 32 mA maximum
- *Control Contacts* — Alarm relay — K1A N.O. (TB1-23, -24); C (TB1-21, -22); N.C. (TB1-16, -17)
— K1B N.O. (TB1-20); C (TB1-18); N.C. (TB1-19).

Note: All relay contacts rated 2A @ 120VAC or 28VDC resistive.

4098-9705

Set up the 4098-9705 (no relay) for the following Electrical Configuration:

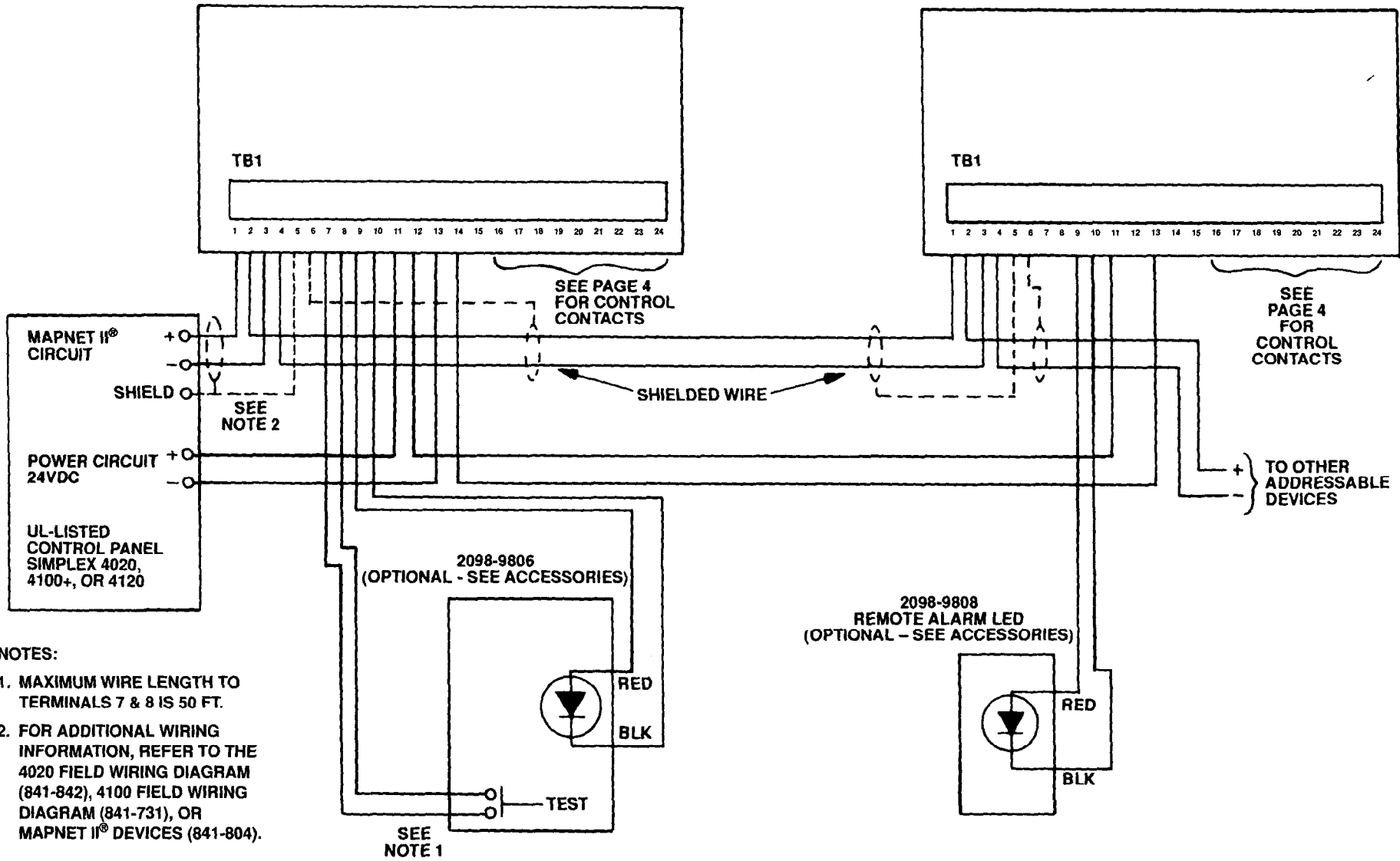
MAPNET II® Operation (Figure 5)

MAPNET II® Power

- *Input Voltage* — 18 to 39VDC
- *MAPNET II® Current* — 1 mA

4098-9704

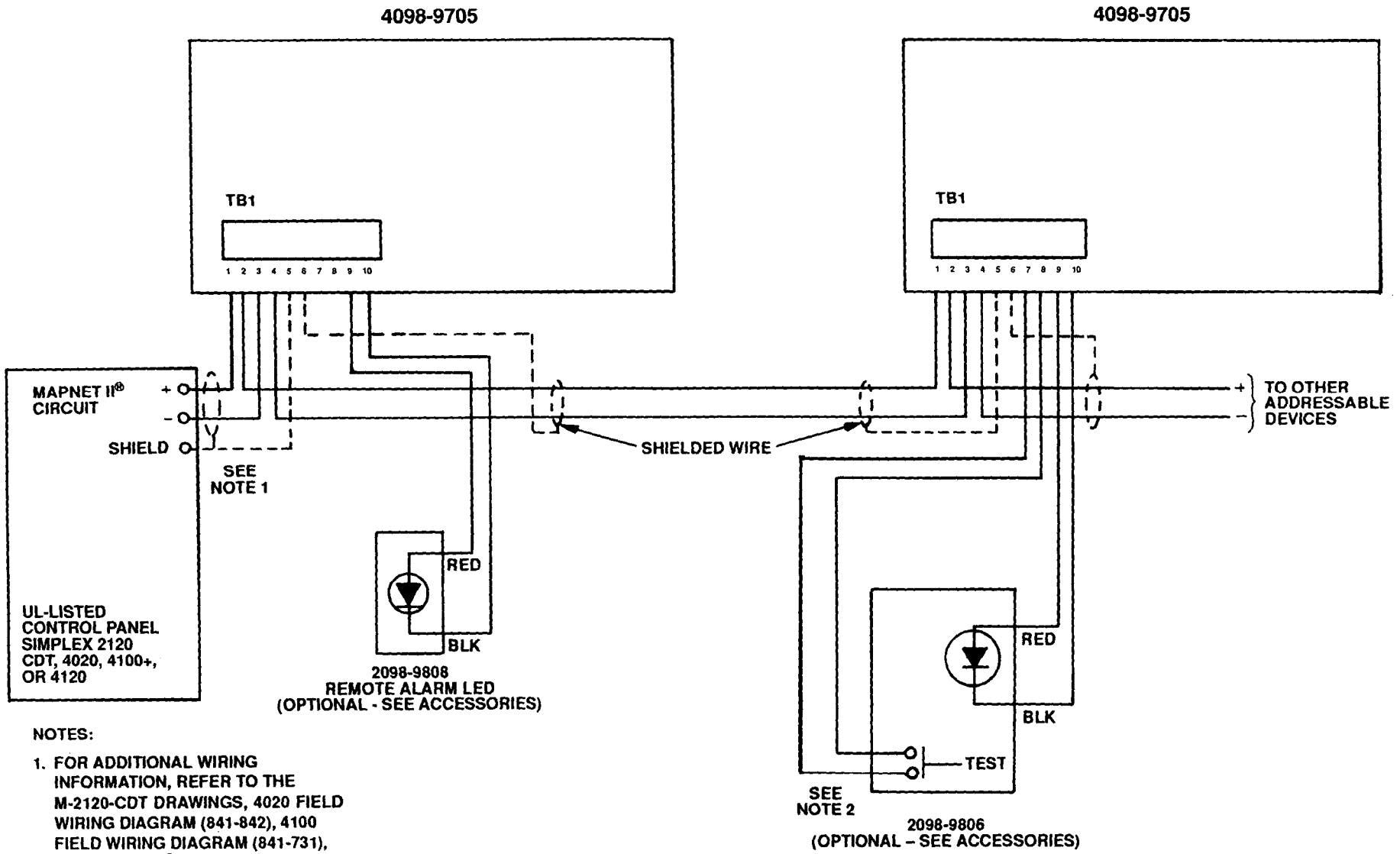
4098-9704



NOTES:

1. MAXIMUM WIRE LENGTH TO TERMINALS 7 & 8 IS 50 FT.
2. FOR ADDITIONAL WIRING INFORMATION, REFER TO THE 4020 FIELD WIRING DIAGRAM (841-842), 4100 FIELD WIRING DIAGRAM (841-731), OR MAPNET II® DEVICES (841-804).

MAPNET II® Operation with 24VDC Power for Relay Control
FIGURE 4



NOTES:

1. FOR ADDITIONAL WIRING INFORMATION, REFER TO THE M-2120-CDT DRAWINGS, 4020 FIELD WIRING DIAGRAM (841-842), 4100 FIELD WIRING DIAGRAM (841-731), OR MAPNET II® DEVICES (841-804).
2. MAXIMUM WIRE LENGTH TO TERMINALS 7 & 8 IS 50 FT.

**Two-Wire MAPNET II® Operation
FIGURE 5**

ACCESSORIES

Accessory installation instructions are provided on Page 11 of this publication.

REMOTE ALARM INDICATOR — MODEL 2098-9808

- Red LED indicator is pulsing when sensor is in normal state; ON when sensor is in alarm or trouble.
- *Alarm Current* — 1mA

REMOTE ALARM INDICATOR/KEY SWITCH — MODEL 2098-9806

- Red LED indicator is pulsing when sensor is in normal state; ON when sensor is in alarm or trouble.
- *Alarm Current* — 1 mA

INSTALLATION

Pre-Installation Routines

The 4098-9704 or 4098-9705 Low Velocity, In-Duct Sensor Assembly should be installed in a location of relatively non-turbulent air flow and within the intended operating velocity range of 35-2000 feet per minute (10.7 to 610 M/min.).

Simplex recommends measurement of air flow and examination of engineering specifications that define expected duct air velocities under all conditions to determine if a location is suitable for duct sensor operation. An Alnor Instrument Co. (Chicago) Model 8500 Thermo-Anemometer or equivalent may be used to check the duct air velocity.

WARNING: READ BELOW BEFORE INSTALLING SENSOR TO ITS BASE.

The sensor comes with a dust cover to protect it from contamination during completion of building construction.

To properly install the sensor to its base:

- A. Remove dust cover from sensor.
- B. Install sensor by: inserting sensor into its base opening, rotating sensor counterclockwise until it drops into the seated position, and then rotating sensor clockwise to latch the contacts. Slide base lock tab to secure sensor to its base.

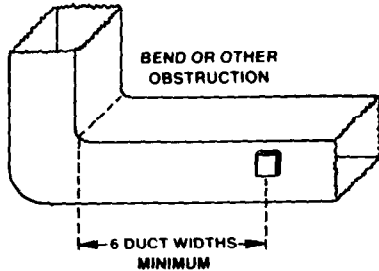
IMPORTANT: An audible “snap” indicates proper contact engagement.

WARNING: System will not operate with dust cover in place.

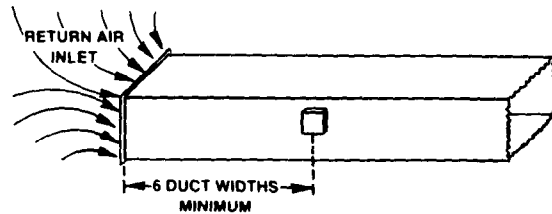
Rules to Follow

1. Whenever possible, locate air sensors a minimum of six duct widths downstream from bends or inlets. Such locations ensure that air flow will be non-turbulent and that smoke will be properly mixed with air in the duct for maximum sensor efficiency. See Figures 6 and 7.

Note: For applications where air return plenums are above ceilings or below floors, keep the same spacing requirements.

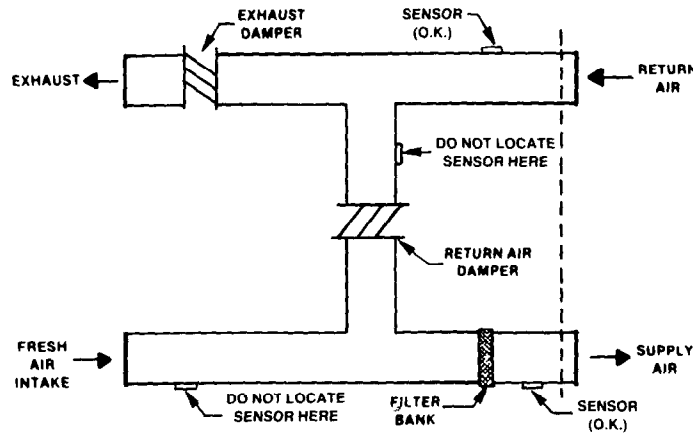


**Duct Sensor Placement -
Location of Bends or Inlets
FIGURE 6**



**Duct Sensor Placement -
Location of Return Air Inlet
FIGURE 7**

2. Locate in-duct assemblies so that dampers do not restrict air flow at the sensor location. See Figure 8.



**Duct Sensor Placement - Location of Dampers
FIGURE 8**

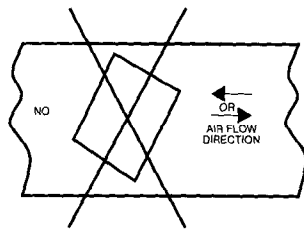
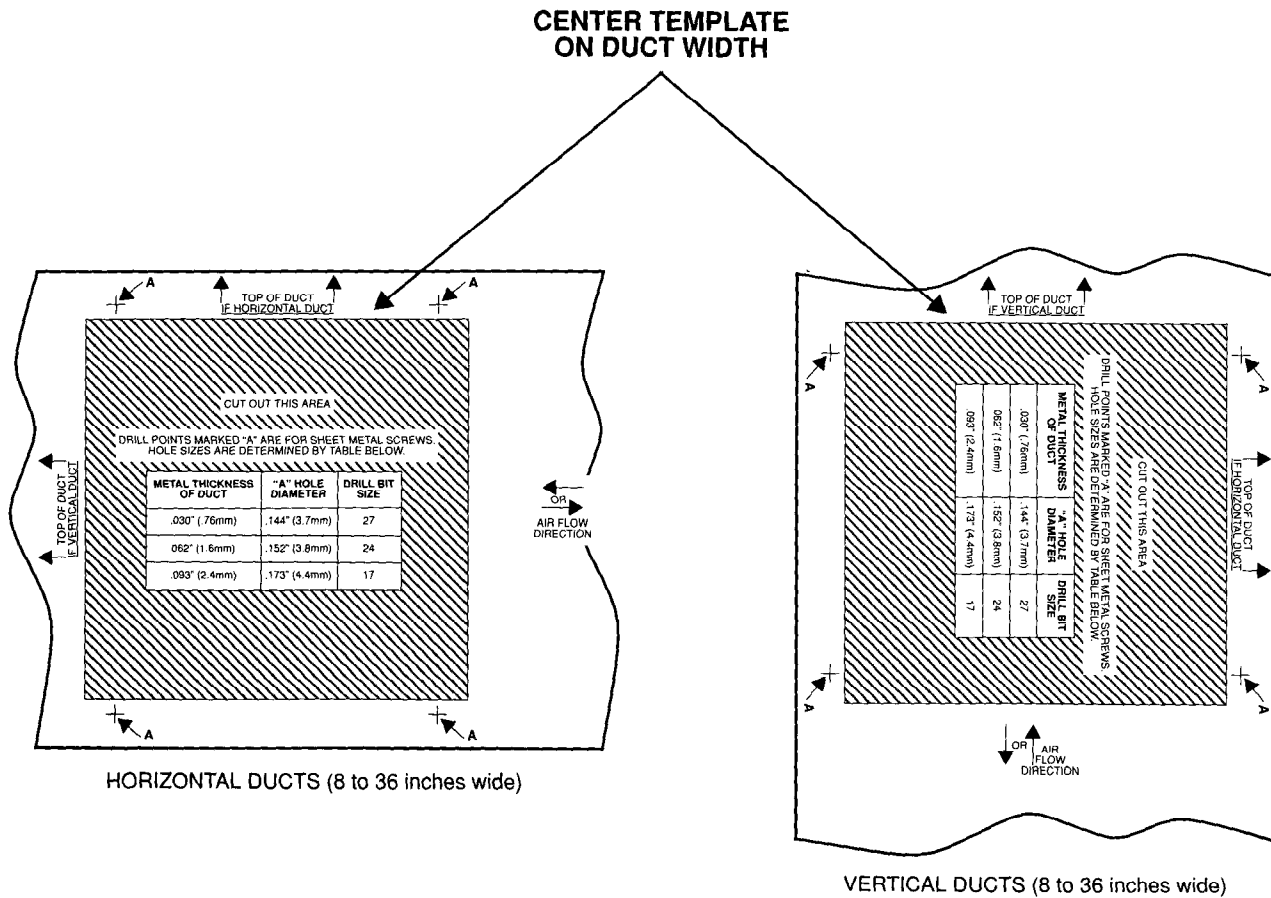
3. Locate duct sensors on the return or supply duct of the equipment's air handling system. However, sensors should NOT be installed in the return air damper branch. See Figure 8.
4. Locate sensors on branch lines if close identification of the alarm source is required.
5. Locate sensors on the *downstream side* of filters to sense fires in the filters. However, should the filters block, sufficient air flow may not be available for proper sensor operation. See Figure 8.
6. Whenever possible, locate sensors where they can be conveniently observed and readily serviced.
7. Locate sensors in return air ducts *ahead* of mixing areas.
8. Do not locate sensors next to outside air inlets unless you want to monitor smoke entry to the handling system from an adjacent area.
9. Locate sensors upstream of air humidifiers and cooling coils.

APPLICATION NOTES

The NFPA states that *duct smoke sensors must not be used as substitutes for open area protection*. The 4098-9704 or 4098-9705 is intended for use in the control of air handling equipment for the purposes of closing dampers or shutting down air handling units.

INSTALLATION PROCEDURES

1. Tape the template (Figure 12) on the duct surface as shown in Figure 9. **DO NOT POSITION THE TEMPLATE WITH EDGES ANGLED WITH RESPECT TO AIR FLOW DIRECTION.**
2. Drill four holes (marked "A" in Figure 12 as determined by metal thickness of duct) and cut out center area as indicated on template (Figure 12).

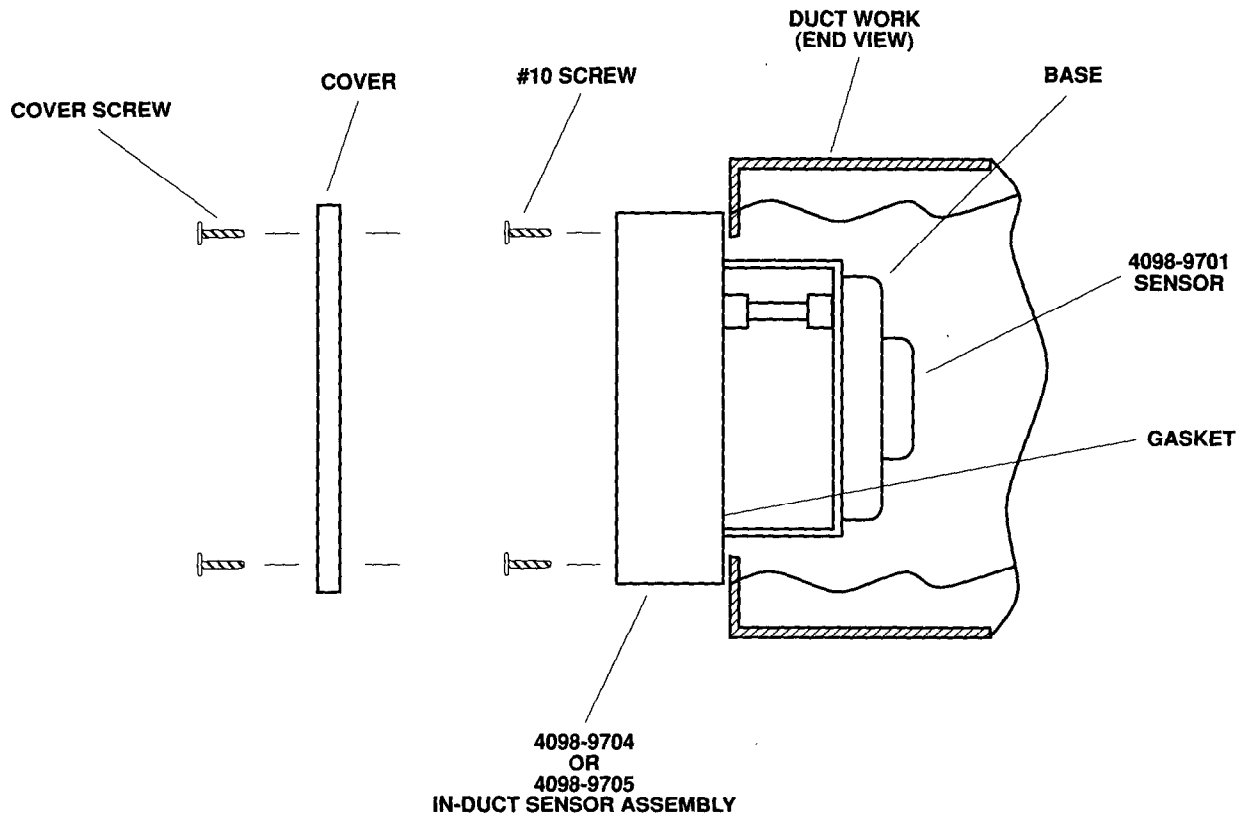


**NEVER MOUNT AT AN ANGLE
WITH RESPECT TO AIR FLOW**

**Template Positioning
Figure 9**

Duct Sensor Installation (See Figure 10)

3. Install the 4098-9701 Sensor to its base located in the 4098-9704 or 4098-9705 In-Duct Sensor Assembly. Slide base lock tab to secure sensor to its base.
4. Using four #10 sheet screws (supplied), secure assembly to the duct.



Duct Sensor Installation
Figure 10

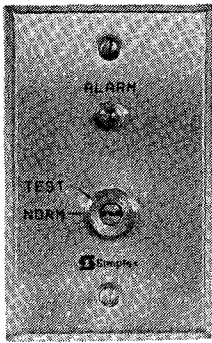
5. Wiring Procedures

- A. Flexible conduit is recommended for ease of sensor removal. If required, route conduit to the most convenient knockout and secure to the in-duct sensor assembly using suitable fittings.
- B. Connect wires to the appropriate terminals within the in-duct sensor assembly in accordance with the system wiring diagram and the appropriate typical installation diagram.
- C. Perform all wiring in accordance with the requirements of the National Electrical Code[®], local codes, and applicable specific system drawings.
- D. Connect the optional accessory as specified in Step 6 and the associated installation and wiring diagrams. **Only one indicator may be connected to each 4098-9704 or 4098-9705.**

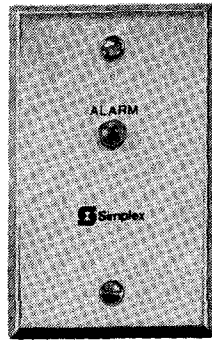
6. Accessory Installation

The 2098-9806 and 2098-9808 accessories are intended for installation to a standard 2 in. x 3 in. outlet box having a depth of at least two inches. See Figure 11 for details. Make wiring connections in accordance with the installation wiring diagram prior to attaching accessory to the box.

2098-9806
ALARM INDICATOR/
KEY SWITCH

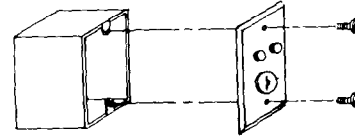


2098-9808
ALARM INDICATOR



LISTED STEEL
DEVICE BOX
(BY OTHERS)

ACCESSORY



ACTUAL ACCESSORY MAY VARY
SLIGHTLY FROM PICTURE SHOWN.

Accessory Installation Figure 11

7. Secure cover to in-duct sensor assembly using screws provided (see Figure 10).

8. Duct Sensor Testing

Caution: Before testing the sensor, make sure that air handling unit is OFF. Then disconnect the city circuit, releasing devices, and extinguishing systems (or for the 4020, '4100+ or 4120 panel, put panel in the Walk Test™ mode).

Test Equipment Available

2098-9822 (553-394) Extendable Smoke Generator
553-406 Smoke Punk Sticks
2098-9814 (553-536) Test and Removal Tool
2098-9815 (553-553) Test and Removal Tool Holder

Testing

Smoke sensor sensitivities are set and continuously monitored by the control unit. Dirty or out-of-range sensors are annunciated by the control unit. This functionality complies with NFPA 72, Chapter 7. When functional testing of the sensors is required per NFPA 72, use the test methods listed below.

Test Methods

For the Preferred and First Alternate Test Methods, you must remove the in-duct sensor assembly from the duct to properly test the 4098-9701 Sensor.

(Preferred Method)

NFPA minimally requires annual testing of sensors at their installed location using smoke. To perform this annual test, use the 553-394 Extendable Smoke Generator.

(First Alternate Method)

Note: The following Alternate Test Methods are suitable for functional checks during installation; however, testing with smoke must be performed to comply with NFPA requirements.

Using the 2098-9814 (553-536) Test and Removal Tool mounted in the 2098-9815 (553-553) Test and Removal Tool Holder, place the test ring around the sensor while positioning one of the magnets near the word "TEST" found on the sensor base. (Testing a sensor with a magnet will report a value of 255 for actual/peak. Since any future peak values are invalidated, clear peak value after test using P134; then reset the Fire Alarm Control panel.)

(Second Alternate Method)

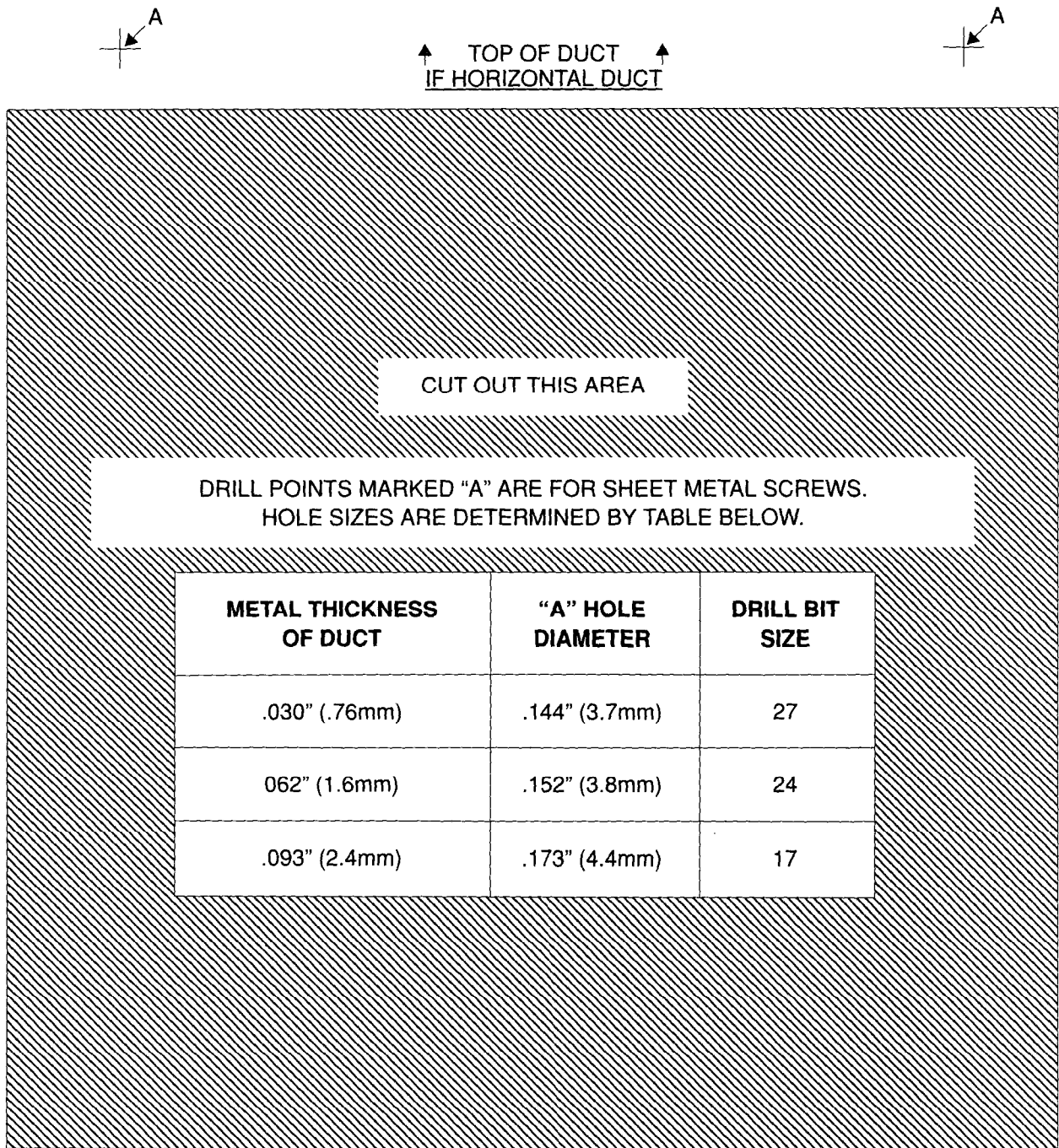
Using the remote alarm indicator/key switch (2098-9806), insert key into test switch and turn key clockwise to Test position.

To restore the system after using the Preferred Testing Method above, begin by clearing smoke from the sensor assembly and re-installing the in-duct sensor assembly. Then reset Fire Alarm Control panel to restore the fire alarm system to normal status. (To restore the system after using the second Alternate Testing method above, turn the key in test switch to its NORM [Normal] position and then reset the Fire Alarm Control panel.)

MAINTENANCE

You should vacuum the sensor's air entry areas every 6 months or as required.

Cleaning programs should comply with NFPA and local environments. Cleaning the internal chamber of the 4098-9701 Sensor should only be done by a Simplex Technical Representative.



**Template
Figure 12**





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