

1. Complete housing base and cover assembly.
2. Two #10 sheet metal mounting screws.
3. Two sampling tube filters.
4. One test magnet.
5. Drilling template.
6. Two 5/16-inch O-rings.
7. Two foam gaskets.
8. Four #6 self-tapping mounting screws for the sampling tube.
9. One filter adapter.
10. One inlet tube end plug.
11. Two #10 speed nuts.

Note 1: The inlet sampling tube must be ordered separately. 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. A smoke detector head (CPX-551 for ionization or an SDX-551 for photoelectronic) must be ordered separately.

WARNING
LIMITATIONS OF DUCT DETECTORS

The National Fire Protection Association has established that 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.

Notifier supports this position and strongly recommends that the user read NFPA Standards 90A, 72, and 101. The DHX-501 is listed per UL 268A.

WARNING: This device cannot operate without electrical power. Frequently, fire situations may cause an interruption of power to the detector. The system safeguards should be discussed with your local fire protection specialist.

WARNING: This device will not sense smoke unless the ventilation system is operating.

CAUTION: For this detector to function properly, it MUST be installed according to the instructions in this manual. Furthermore, the detector MUST be protected from the elements and 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.

INSTALLATION SEQUENCE

	PAGE
Step 1. Verify duct air flow direction and velocity	2
Step 2. Drill the mounting holes	2
Step 3. Mount duct housing	3
Step 4. Install the inlet tube	3
Step 5. Complete the field wiring	5
Step 6. Install the filters	7
Step 7. Perform detector check	7
Step 8. Install the cover	9
Step 9. Perform the final system check (Testing)	9

STEP 1. VERIFY DUCT AIR FLOW DIRECTION AND VELOCITY

The DHX-501 is designed to be used in air handling systems having air velocities of 500 to 4000 feet per minute. 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 to check the air velocity in the duct.

STEP 2. DRILL THE MOUNTING HOLES

Remove the paper backing from the drilling template. Affix the template to the air duct at the desired mounting location. Make sure the template lies flat and smooth on the air duct. Center punch hole targets and remove the template. Drill the holes as indicated on the template. Slide the two speed nuts over the two small holes (Hole A) next to the sampling tube bushing holes (Hole B) previously drilled in the duct. (See Figure 2.)

Maximum alarm output current is 20 mA (terminals 2 and 6).

Relay Contacts

- Minimum contact current must be greater than 500 mA
- 10A @ 30 VDC
- 10A @ 250 VAC

Accessories	Part No.
Remote LED	RA400Z
Piezo Alert Sounder	PA400
Replacement Filters	F36-05-00
Magnet	M02-04-00
End Plug For Sampling Tube	P48-21-00
Installation Kit (Parts bag)	A2650-01
Photoelectronic Replacement Screen	RS24
Ionization Replacement Screen	RS14
Sensitivity Test Kit	MOD400 or MOD400R
Ionization Cover Removal Tool	CRT400
Remote Test Station	RTS451/RTS451KEY
Calibrated Test Card (For photo units only)	R59-18-00

SAMPLING (INLET) TUBES

<u>TUBE</u>	<u>OUTSIDE DUCT WIDTH</u>	
ST-1.5	1 to 2 ft.	(0.3 to 0.6 m)
ST-3	2 to 4 ft.	(0.6 to 1.2 m)
ST-5	4 to 8 ft.	(1.2 to 2.4 m)
ST-10	8 to 12 ft.	(2.4 to 3.7 m)

Programming Specifications/Requirements For Intelligent System Control Panels.

CAUTION: Models CPX-551 and SDX-551 can be used with the DHX-501 if the following constraints are observed.

1. There may be a limit to the number of devices per zone that can have their LEDs latched on. The actual number of devices is determined by the control panel and its ability to supply LED current. As seen with Rev. 4 or earlier AM-2020 Systems, the control panel stops latching device LEDs on after 4 devices indicate an alarm. The maximum number of devices that can be latched in an alarm state at one time is 4. If more than the maximum number of devices are on the same loop, Do NOT use the DHX-501 for control purposes. Control for duct applications would need to come directly from the control panel or by using control modules.

The following applies to the AM 2020 and AFP-1010 Systems that use Revision 5 or higher software, and "R4" type intelligent detectors and modules: the LED restriction does not apply, and all LEDs may be latched on. Consult the AM-2020/AFP-1010 programming manual for additional information.

When System 5000 control panels are used with AIM-200 modules, they may ignore the LED restriction by selecting the "FL" full LED control. Consult the AIM-200 manual for further information.

2. The duct control circuitry (auxiliary relay contacts and 12 volt alarm output) may operate (change states) if the sensor is tested and the LED is turned on for more than 4 seconds. If the LED is latched on for less than 4 seconds, the control circuitry of the DHX-501 will NOT operate.
3. The panel must not continuously poll the same unit for more than 4 seconds or the auxiliary relay and 12 volt alarm output may switch states. After 4 seconds of continual polling of a device, the panel must wait a minimum of 100ms before polling or communicating to that same device.
4. Communications must not cease for more than 3 seconds without an additional clock pulse (after Pulse Width 5) to turn off the LED on the sensor.
5. To allow the auxiliary relay and 12 volt alarm output to return to standby (after being in alarm), the panel must wait a minimum of 100ms after turning off the sensor LED before communicating with that device again.
6. The following systems must use the CPX-551 with the DHX-501 models when high sensitivity is selected: 1) System 5000 panels with AIM-200 modules, and 2) AM 2020 Systems with Revision 4, or earlier, software.

pressed air to blow it clean.

- Replace the screen by aligning the arrow on top with the field test slot on the base of the detector. Press the screen into place. It should fit tightly into the chamber.

ION UNITS

- See Figure 11. Remove the detector cover and screen assembly by depressing the three lock prongs on the top of the cover and rotating the cover counterclockwise. The CRT400 Cover Removal Tool makes cover removal easier.
- Carefully pull the screen out of the cover.
- Clean the screen thoroughly with a soft brush or vacuum. (Replacement screens, part no. RS14.)
- Brush or vacuum the inside of the cover. Cover may then be blown out using clean, compressed air.
- Vacuum the sensing chamber before using clean, compressed air to loosen and blow out any remaining debris.
- Press the screen back into the cover.
- Replace the detector cover and screen assembly on the sensing chamber. Rotate it clockwise to lock it into place.

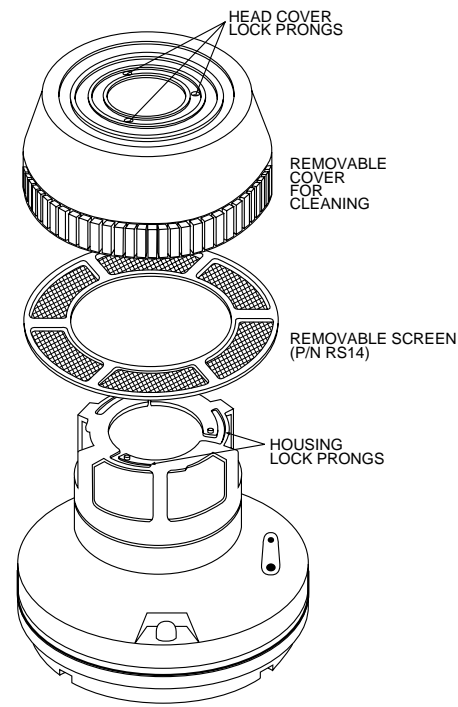


Figure 11. Ion Head Exploded View

(A78-1812-07)

BOTH TYPES OF UNITS

- Reinstall the detector in its housing.
- Restore system power.
- Put detector into alarm using appropriate method described in STEP 7. PERFORM DETECTOR CHECK.
- Notify the proper authorities that testing has been completed and the smoke detector system is back in operation.
- Other checks that should be made during maintenance procedures:
 - Holes or cracks in duct work near the detector.
 - Air leaks where detector housing or sampling tubes are attached to duct.
 - Dust accumulations in or on sampling tubes.
 - Wiring terminal screw tightness.

SPECIFICATIONS

Length:	14.5 inches	(36.7 cm.)
Width:	5 inches	(12.7 cm.)
Depth:	4 inches	(10.2 cm.)
Weight:	4 lbs.	(1.8 kg.)
Operating Temperature Range:	32° to 120°F	(0° to 49°C)
Operating Humidity Range:	10% to 93%	Relative Humidity
Duct Air Velocity:	500 – 4000 ft./min.	(91.4 – 1219.2 m/min.)

Power Supply Electrical Ratings For DHX-501

Power Requirements	120 VAC (102 - 132) mA rms MAX.		240 VAC (204 - 264) mA rms MAX.		24 VAC (20.6 - 26.4) mA rms MAX.		24 VDC (20 - 30) mA DC MAX.	
	Standby	Alarm	Standby	Alarm	Standby	Alarm	Standby	Alarm
Device								
DHX-501A	44	52	25	30	65	182	26	87
PA400*	--	3	--	1.5	--	29	--	15
RA400ZA*	--	1.5	--	1	--	17.3	--	10
RTS451/RTS451KEY*	--	1.5	--	1	--	17.3	--	10
RTS451**/RTS451KEY	11.5	13	5.5	6.5	140	157	95	103

* All accessory currents are additional to DHX-501. There are no additional currents for accessories in standby.

** RTS451/RTS451KEY when the magnet is held in place to initiate an alarm.

Maximum auxiliary power output current is 80 mA (terminals 3 and 6).

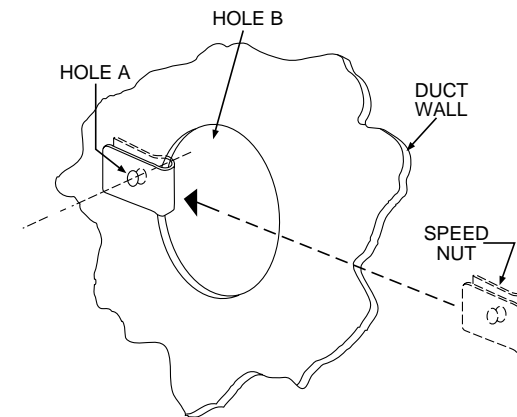
Location of detectors mounted in or on air ducts should be at least six duct widths downstream from any duct openings, deflection plates, sharp bends, or branch connections.

Exception: Where it is physically impossible to locate the detector accordingly, the detector can be positioned closer than six duct widths, but as far as possible from the opening, bend, or deflection plates.

STEP 3. MOUNT DUCT HOUSING

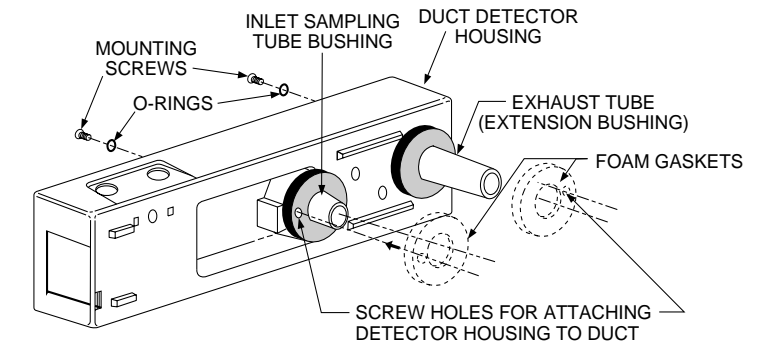
Remove the duct housing cover. Slide the foam gaskets over the tube bushings as shown in Figure 2A. Make sure the two small holes in the gaskets line up with the two duct housing mounting holes. Put one 5/16-inch O-ring over each of the two #10 sheet metal screws. Use the two sheet metal screws to secure the duct housing to the duct.

CAUTION: Do not overtighten the screws.



A78-2046-00

Figure 2. Speed Nut Mounting Location.



A78-2045-00

Figure 2A. Installation of Foam Gaskets Over Sampling Tube Bushings.

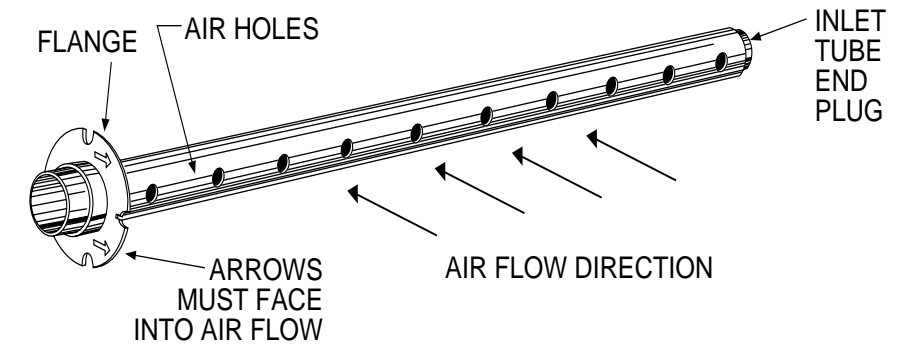
TABLE 1. SAMPLING (INLET) TUBES

TUBE	OUTSIDE DUCT WIDTH	
ST-1.5	1 to 2 ft.	(0.3 to 0.6 m)
ST-3	2 to 4 ft.	(0.6 to 1.2 m)
ST-5	4 to 8 ft.	(1.2 to 2.4 m)
ST-10	8 to 12 ft.	(2.4 to 3.7 m)

STEP 4. INSTALL THE INLET TUBE

The inlet tube (shown in Figure 3) is identified by a series of air inlet holes on the tube. This tube must be purchased separately. Order the correct length, as specified in Table 1, for the width of the duct where it will be installed. The exhaust tube is molded into the base of the duct housing.

The inlet tube should be installed in the inlet sampling tube bushing located in the center of the duct detector housing. See Figure 2A. The air inlet holes must face into the air flow. To assure proper installation, the tube mounting flange is marked with arrows. Mount the inlet tube so that the arrows point into the air flow. Figure 4 shows the various combinations of duct detector and tube mounting configurations with respect to air flow.



A78-2047-01

Figure 3. Air Duct Detector Inlet Sampling Tube.

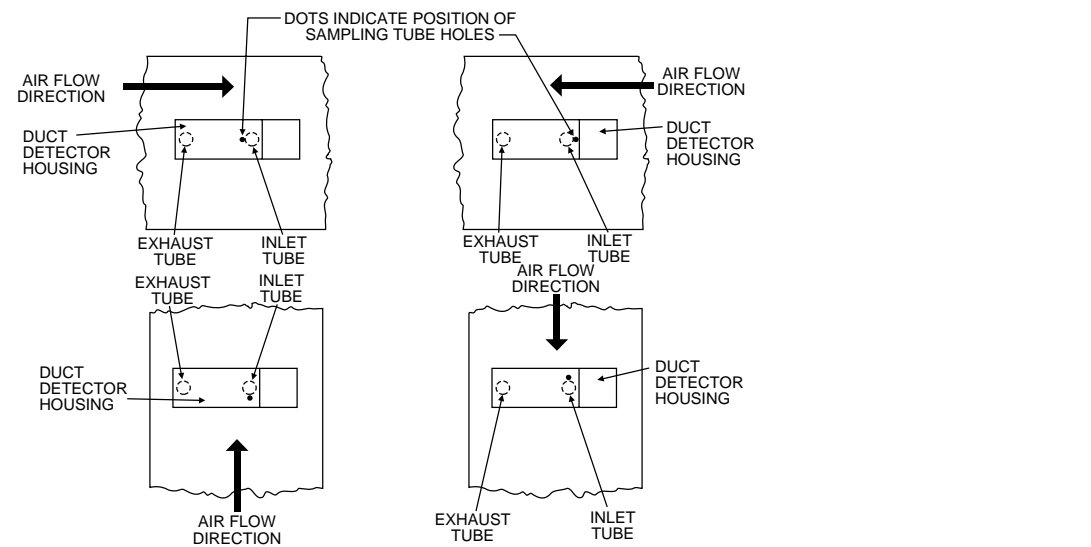


Figure 4. Tube Mounting Configurations with Varying Air Flow Direction and Orientation of Detector Housing. Vertical as well as Horizontal Mounting is Acceptable.

A. INSTALLATION FOR DUCTS LESS THAN 8 FEET WIDE

1. If the inlet tube is longer than the width of the air duct, drill a 3/4-inch hole in the duct directly opposite the hole already cut for the inlet tube.
If the inlet tube is shorter than the width of the air duct, install the end cap into the inlet tube as shown in Figure 3.
2. Slide the inlet tube into the bushing located in the center of the duct housing. Position the tube so that the arrows point into the air flow.
3. Secure the tube flange to the housing bushing with the two #6 self-tapping screws.
4. For tubes longer than the width of the air duct, the tube should extend out of the opposite side of the duct. If there are more than 2 holes in the section of the tube extending out of the duct, select a different tube length using Table 1. Otherwise, trim the end of the tube protruding through the duct so that 1 to 2 inches of the tube extends outside the duct. Plug this end with the tube end plug and tape closed any holes in the protruding section of the tube. Be sure to seal the duct when the tube protrudes.
5. Any inlet tube over 3 feet long must be supported on the opposite side of the duct detector housing.

WARNING: There must be a minimum of 10 holes in the tube exposed to the air stream.

B. INSTALLATION FOR DUCTS MORE THAN 8 FEET WIDE

NOTE: To install inlet tubes in ducts more than 8 feet wide, work must be performed inside the air duct. Sampling of air in ducts wider than 8 feet is accomplished by using the ST-10 inlet sampling tube.

Install the inlet tube as follows:

1. Drill a 3/4-inch hole in the duct directly opposite the hole already drilled for the inlet tube.
2. Slide the inlet tube into the bushing located in the center of the duct housing. Position the tube so that the arrows point into the air flow. Secure the tube flange to the housing bushing with the two #6 self-tapping screws.
3. From inside the duct, couple the other section of the inlet tube to the section already installed using the 1/2-inch conduit fitting supplied. Make sure that the holes on both of the air inlet tubes are lined up facing the direction of air flow.
4. Trim the end of the tube protruding through the duct so that 1 to 2 inches of the tube extends outside the duct. Plug this end with the tube end plug and tape closed any holes in the protruding section of the tube. Be sure to seal the duct when the tube protrudes.
5. Any tube (over 3 feet long) that does not protrude through the duct (on the side opposite the housing) must be supported by other means.

NOTE: An alternate method to using the ST-10 is to use two ST-5 inlet tubes. Remove the flange from one of the tubes and install as described above. After the installation, use electrician's tape to close off some of the sampling holes so that there is a total of 12 holes spaced as evenly as possible across the width of the duct.

7. Replace the cover by gently rotating it clockwise until it locks in place. Secure the duct housing cover.

7.3 MOD400R SENSITIVITY TEST

After verification of alarm capability, use the MOD400R test module with a voltmeter to check detector sensitivity as described in the MOD400R manual. The housing cover must be removed to perform this test.

If the MOD400R readings indicate that the sensor head is outside of the acceptable range, the sensor heads require cleaning. (Refer to **PERIODIC MAINTENANCE REQUIREMENTS**).

7.4 TROUBLE TEST

The capability of Trouble detection is tested by removing the detector head from the duct housing. The detector head is removed by turning it counterclockwise about 10 degrees (Figure 8). The system control panel should indicate a trouble condition. Replacing the detector head should clear the trouble indication.

STEP 8. INSTALL THE COVER

Install the cover using the four screws. Be certain filters are installed as specified in Step 6. Make sure that the cover fits into the base groove and that all gaskets are in their proper positions. Tighten the four cover screws to 10 in-lbs.

STEP 9. PERFORM THE FINAL SYSTEM CHECK

Place the magnet in position as shown in Figure 7. The LEDs on the detector should light. Any accessory LED(s) should also light. The system control panel should also indicate an alarm.

PERIODIC MAINTENANCE REQUIREMENTS

Air duct smoke detectors should be maintained at least once a year – more often if the detector heads become obviously dirty. The detectors must also be cleaned immediately after a fire. Failure to properly maintain air duct smoke detectors may cause unnecessary false alarms.

It is recommended that a permanent Detector Test Log be set up and maintained, with a record for each individual smoke detector in each building. Each detector should be clearly described, with information on the type of detector, the model number, the serial number (if any), the location, and the type of environment. Data entries should include test dates, type of test mode, test results, maintenance, and comments. A Detector Test Log is included at the end of this manual.

Recommended Detector Maintenance Procedure

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

1. Turn off power to the system.
2. Remove and inspect the sampling tube filters.
3. If filters are heavily coated with dirt, replace them with new filters. If they are not heavily coated, use a vacuum cleaner or compressed air nozzle to remove dust, then install the filters.
4. Remove the detector from its housing. (See Figure 8.)

PHOTO UNITS

5. Remove the detector cover by inserting a small-bladed screwdriver into the slot located approximately 90 degrees from the MOD400R test jack receptacle, rotating the cover counterclockwise to remove it (see Figure 10.)
6. Lift the screen from the photo chamber. Vacuum the screen and cover before using clean, compressed air to loosen and blow out any remaining debris. (Replacement screens, part no. RS24, are available.)
7. Vacuum the photo chamber before using clean com-

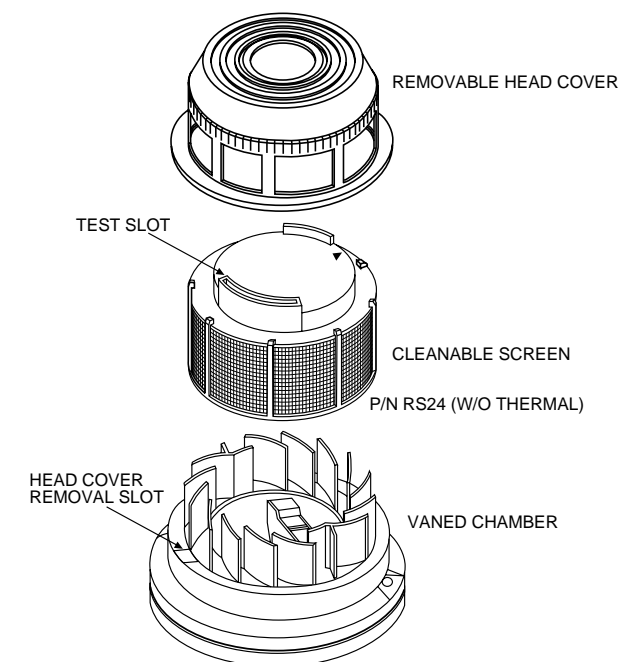


Figure 10. Photo Head Exploded View

- The LEDs on the detector should latch on as should any accessories (PA400, RA400Z, RTS451/RTS451KEY), and the alarm condition should be verified at the control panel. The control panel must be active for an alarm to be initiated.

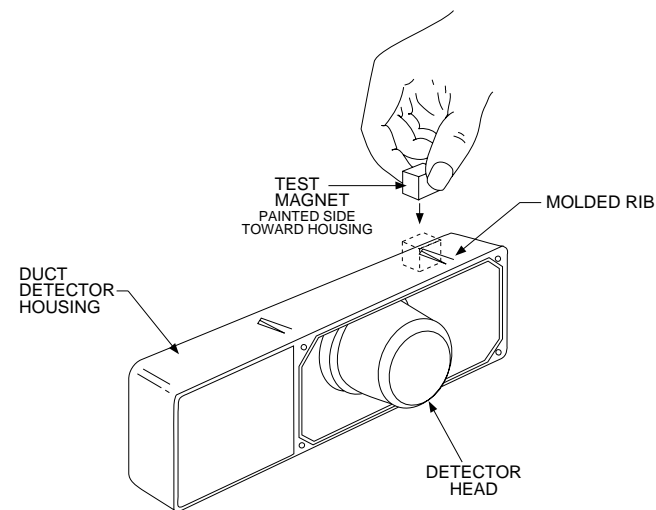


Figure 7. Testing Detector Alarm

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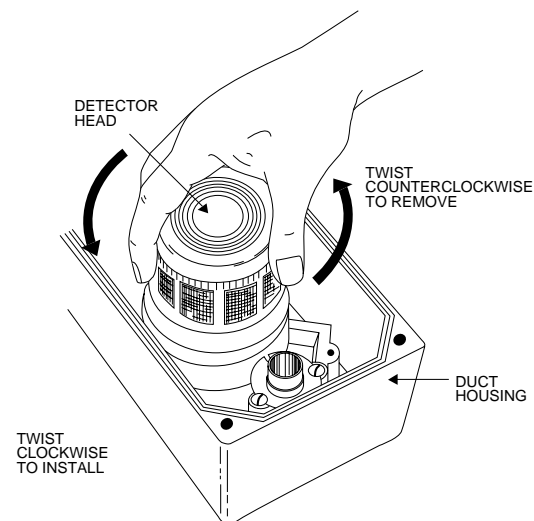


Figure 8. Detector Head Removal

A78-1812-02

B. RTS451/RTS451KEY REMOTE TEST STATION

The RTS451/RTS451KEY Remote Test Station facilitates test of the alarm capability of the duct detector as indicated in the RTS451/RTS451KEY manual. The DHX-501 duct detector cannot be reset by the RTS451/RTS451KEY. It must be reset at the system control panel.

To install the RTS451/RTS451KEY test coil, connect the device as shown in Figure 9. Place the coil in the detector housing with the arrow facing up and pointing toward the detector as in Figure 9. Attach the coil leads to the housing terminals as shown; polarity is not important. Firmly screw the test coil mounting bracket in place over the test coil. The wire run connecting the remote test station to the duct detector must be less than 25 ohms.

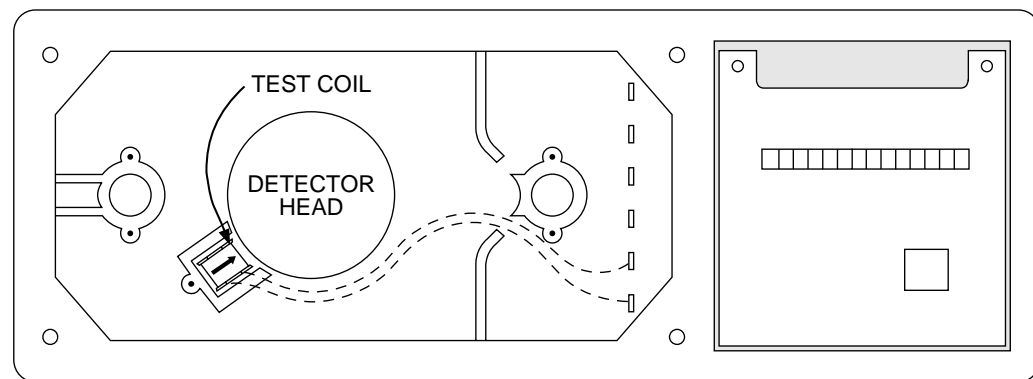


Figure 9. RTS451/RTS451KEY Test Coil Installation

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C. R59-18-00 CALIBRATED TEST CARD (photoelectronic units only)

The R59-18-00 test card may be used to test the detector heads.

- Remove the duct housing cover.
- Remove the detector head from the duct housing as shown in Figure 8.
- Remove the detector head cover by placing a small-bladed screwdriver in the side slot (see Figure 10) of the detector cover, twisting it slightly until the cover can be turned counterclockwise.
- Carefully insert the detector head into the duct housing and wait 50 seconds for power up. Do not hold the swirl chamber to twist the detector head.
- Insert the NO ALARM end of the test card into the test slot and slide counterclockwise until it stops. The detector should not alarm after 20 seconds.
- Remove the test card and then insert the ALARM end into the test slot and slide it counterclockwise until it stops. The LEDs should latch on within 20 seconds. Remove the card and reset the detector at the control panel.

NOTE: Air currents inside the duct may cause excessive vibration. This vibration can slowly open the seal around the tube and permit air to escape. To prevent this from occurring, a 3-inch floor flange, available at most plumbing supply houses, may be used. This flange/connector mounting technique makes the initial installation easier because a 1-inch to 1-1/4-inch hole may be drilled where the flange/connector will be used. It is easier to push the inlet tube through the larger hole.

MODIFICATION OF INLET SAMPLING TUBES

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

Use a 0.193-inch diameter (#11) 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.

STEP 5. FIELD WIRING

Wiring Installation Guidelines

All wiring must be installed in compliance with the National Electrical Code and the local codes having jurisdiction using the proper wire gauges. The conductors used to connect smoke detectors to control panels and accessory devices should be color-coded to reduce the likelihood of wiring errors. 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 usually recommended that single-conductor wire be no smaller than 16 gauge (1.5 square mm), and that two- or three-conductor wire be no smaller than 18 gauge (1.0 square mm). The last foot or so of conduit should be flexible steel conduit (available in electrical supply houses) which facilitates easier installation and puts less strain on the conduit holes in the housing. Solid conduit connections may be used, if desired.

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.

Wiring Instructions

The DHX-501 is designed for easy wiring. The housing provides a terminal strip with clamping plates. Wiring connections are made by stripping approximately 1/2-inch of insulation from the end of the wire, sliding this bare end under the plate, and tightening the clamping plate screw.

The DHX-501 operates from 120/240 VAC or 24 VAC/DC to operate auxiliary functions. See Figure 5A for operating and wiring details.

Notes on Jumper Wire J5 (see Figure 5A):

- When the detector is used in a 4-wire application (relay circuit is being used to control fans, dampers, etc.), jumper wire J5, located between the two terminal strips on the printed circuit board, must be cut to insure proper power supply supervision.
- When the detector is used in a 2-wire application (relay control is not being used for any control of fans, dampers, etc.), jumper wire J5 must be left in place.

120/240 VAC OPERATION

To complete the wiring for 110/120 VAC operation, connect the power supply wires to terminals 15 and 16 (see Figure 5A). If 220/240 VAC operation is preferred, connect the power supply wires to terminals 16 and 17.

24 VAC/DC OPERATION

To complete the wiring for 24 VAC or DC, connect the power supply wires to terminals 7 and 8. Polarity is not important.

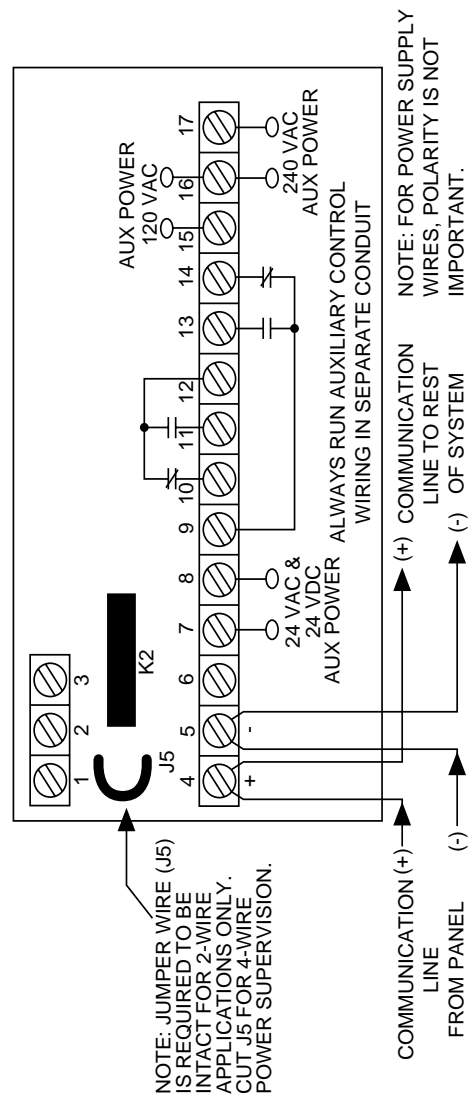


FIGURE 5A

NOTE: FOR POWER SUPPLY WIRES, POLARITY IS NOT IMPORTANT.

NOTE: THE RTS451 RESET CANNOT BE USED ON THE DHX-501.

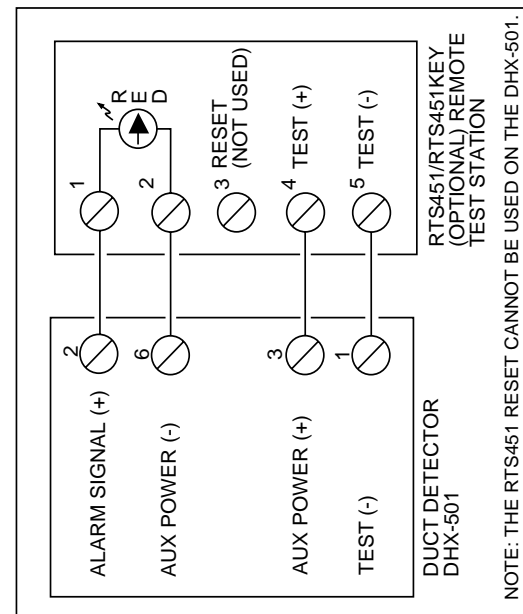


FIGURE 5B

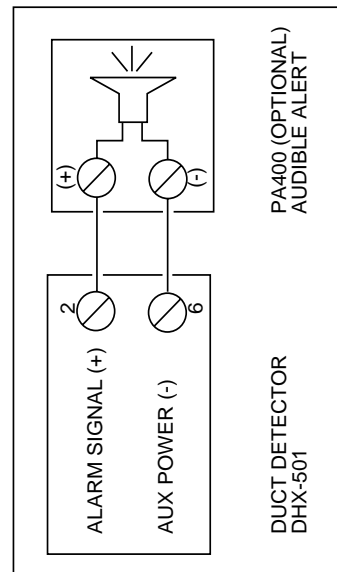


FIGURE 5C

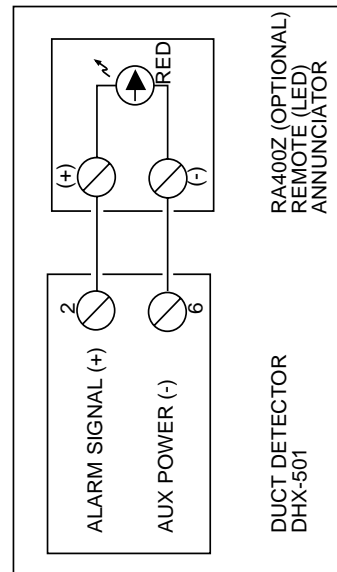


FIGURE 5D

Figure 5. Wiring Diagram

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Note: Auxiliary devices (RA400Z, PA400, RTS451/RTS451KEY) and auxiliary control contacts will not function without auxiliary power. See 5A for voltage/termination.

STEP 6. INSTALL THE FILTERS

Most duct installations are subject to dust accumulation. System filters remove a large percentage of this contamination, but cannot remove all of it. Dust inside the duct detector causes problems. First, very fine particles of dust can enter the detector sensing chamber and cause the unit to go into alarm. Second, the accumulation of dust and dirt

necessitates a more frequent periodic cleaning schedule, which can result in substantial cost and/or down time.

Disposable sampling tube filters can greatly reduce the nuisance alarms caused by dust, and can also significantly extend the maintenance interval. To install the sampling tube filters, press the filter adapter into the exhaust tube, and then push the filter onto the adapter tube on the left, as shown in Figure 6. Then install the other filter over the end of the inlet sampling tube.

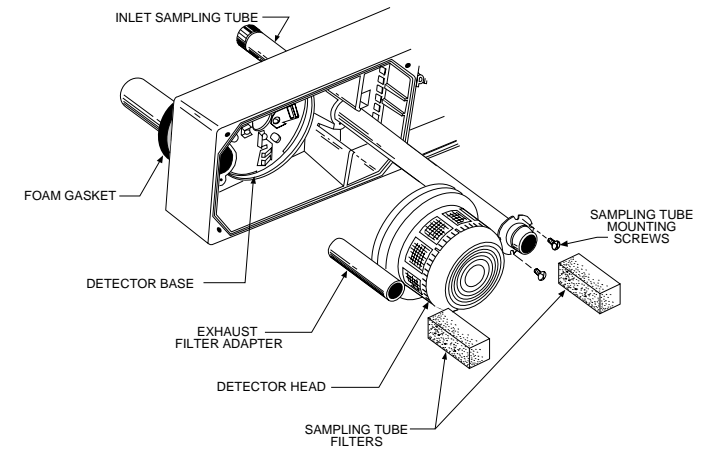


Figure 6. Sampling Tube Filter Installation

(A78-2106-00)

Caution: Filters require periodic cleaning or replacement, depending on the amount of dust and dirt accumulated. Visually inspect the filters at least quarterly; inspect them more often if the dust accumulation warrants it. Replacement filters can be ordered from Notifier – exhaust tube/intake tube filter P/N F36-05-00.

The filters do not substantially affect smoke behavior even when they are up to 90% clogged. Quarterly visual inspection is usually often enough to determine if filters should be replaced because only a high percentage of contamination affects duct detector performance.

STEP 7. PERFORM DETECTOR CHECK

7.1 AIR FLOW

1. To verify sufficient sampling of ducted air, use a manometer to measure the differential pressure created from air flow across the sampling tubes. The pressure should measure no less than 0.01 inches of water and no greater than 1.20 inches of water.
2. To determine that smoke is capable of entering the sensing chamber, conduct a visual examination and note any obscurations around the sensing chamber. If a smoke test is required, smoke a cigarette, cotton wick, or punk smoke may be blown directly at the smoke detector head. It is important to plug the exhaust and sampling tube hole to prevent ducted air from blowing smoke away from the smoke detector head. Record all test records in the Detector Test Log at the end of this manual.

NOTE: REMOVE THE PLUGS AFTER TESTING OR THE DETECTOR WILL NOT SENSE SMOKE IN THE AIR DUCT.

7.2 ALARM TESTS

Before replacing the duct housing cover, check the detector interconnections. Check the DHX-501 as follows:

A. M02-04-00 MAGNET TEST

1. Make sure power is applied to the detector.
2. Position the painted surface of the test magnet against the housing next to the rib molded onto the outside of the housing (see Figure 7).