UVH-10A,C
AMMONIA DETECTORS

Instruction 95-8130

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DESCRIPTION AND USE

UVH-10A and UVH-10C Ammonia Detectors are designed to sense low concentrations of ammonia and provide an alarm contact closure if concentration exceeds a specified level. The UVH-10A model is calibrated for a 0-50 ppm ammonia concentration range; model UVH-10C is calibrated for a 0-200 ppm ammonia concentration range. These units are employed to detect ammonia leakage in refrigerated systems used to maintain a low temperature in cold storage warehouses.

Ammonia Detectors can actuate either alarms or valves to alert user or initiate control well before ammonia concentration becomes critical. Locations include compressor rooms, warehouses, packing houses, food processing plants, dairies, breweries, and places where items are stored in a controlled atmosphere, such as controlled atmosphere apple storage.

FEATURES

Continuous monitoring of room atmospher.
Not influenced by carbon dioxide or nitrogen.
Ultraviolet detection principle samples controlled atmosphere without conditioning it.
Reliable solid-state circuitry for stability.
Standardization warning – flashing amber light and relay for remote alarm; can re-zero detector by adjusting front panel knob labeled "STANDARDIZE".
Fail safe – relays de-energize to sound alarm; internal electrical failures also sound alarm.
Readout meter for continuous indication of ammonia concentration.
Output for an optional recorder to provide a continuous and permanent record of ammonia concentration.

SPECIFICATIONS

Models
UVH-10A–: For sampling the controlled environment. Operates alarm at a low level of ammonia concentration (0-50 ppm).
UVH-10C–: For use in compressor rooms. Operates at higher levels of ammonia concentration (0-200 ppm).

Size of Protected Area
One detector monitors a room. However, you can use more than one detector per room, but using one detector to monitor more than one room will affect the detector's response time.

Input Voltage and Frequency
UVH-10A2: 120 vac, 50/60 Hz.
UVH-10A1: 240 vac, 50/60 Hz.*
UVH-10C4: 120 vac, 50/60 Hz.
UVH-10C3: 240 vac, 50/60 Hz.*

Power Consumption
65 watts

Alarm Contacts
TPDT, 10 amperes resistive, 5 amperes inductive.
Manual reset.

Warning Light Contact
SPST, 1 ampere.

Sample Flow
40 cfm with clean filter.

Maximum Case Differential Pressure
3 psig - pressure difference between inside and outside of case.

Maximum Vacuum
6 inches of Hg.

Response Time
90% of step change in 2 minutes at full flow.

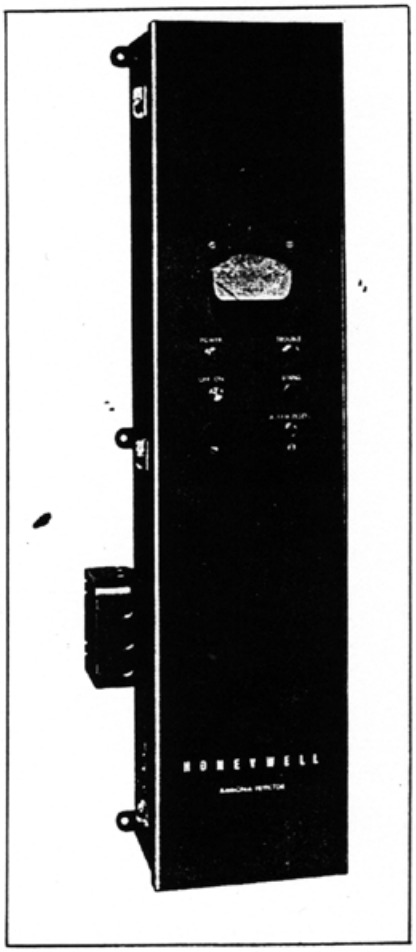
Temperature Range
Operational: −6°C (+20°F) to +46°C (+115°F).
Storage: −34°C (−30°F) to +66°C (+150°F).

Recorder Output
0-10 mv dc for full-scale reading. Output impedance between output terminals to the recorder is 20 ohms. Minimum input impedance for recorder is 1,000 ohms. (An alternate recorder output permits use of a low impedance recorder like the Rustrak.)

Accuracy
Typically ±10%. Maximum error of ±14% of full scale.

Sensitivity
Ranges from 0-50 ppm with full range repeatability of ±5 ppm.

Mounting
Lugs provided for surface mounting on wall or panel. Mount vertically for maximum motor life. Case not suitable for mounting in unprotected outdoor environments. Do not drill holes in case or break its seal.



Mounting Dimensions
See Fig. 2.

ORDERING INFORMATION

Specify –

1. Model number UVH-10A (0 to 50 ppm) for cold storage and food processing areas.

   or

2. Model number UVH-10C (0 to 200 ppm) for compressor room use.
3. Voltage and frequency of power supply.
4. Optional Piping Adaptor Kit, part number ADL 50909 (see page 3 for details).
5. Optional Span Screen (see page 8 and Table 2 for details).

**Input voltage field selectable by wiring to tapped transformer (factory wired for 240 volts).*

INSTALLATION

Select Mounting Location

Fig. 3 illustrates a typical ammonia detector installation, and includes recommended installation techniques to ensure optimum performance. Consider points stated in Fig. 3 when selecting the mounting location. Also, mount the detector where it can be conveniently monitored and serviced. Note that the detector case is not suitable for mounting in unprotected outdoor environments. The case can withstand differences between inside and outside case pressures up to 3 psig.

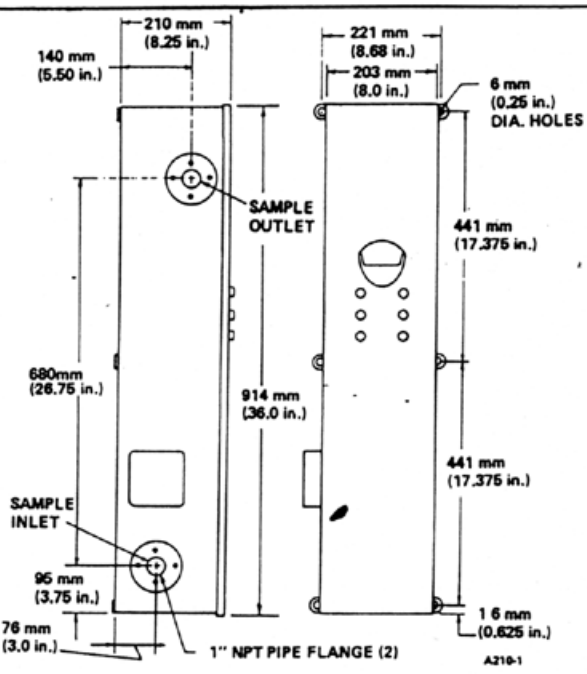


Fig. 2 - Approximate Mounting Dimensions

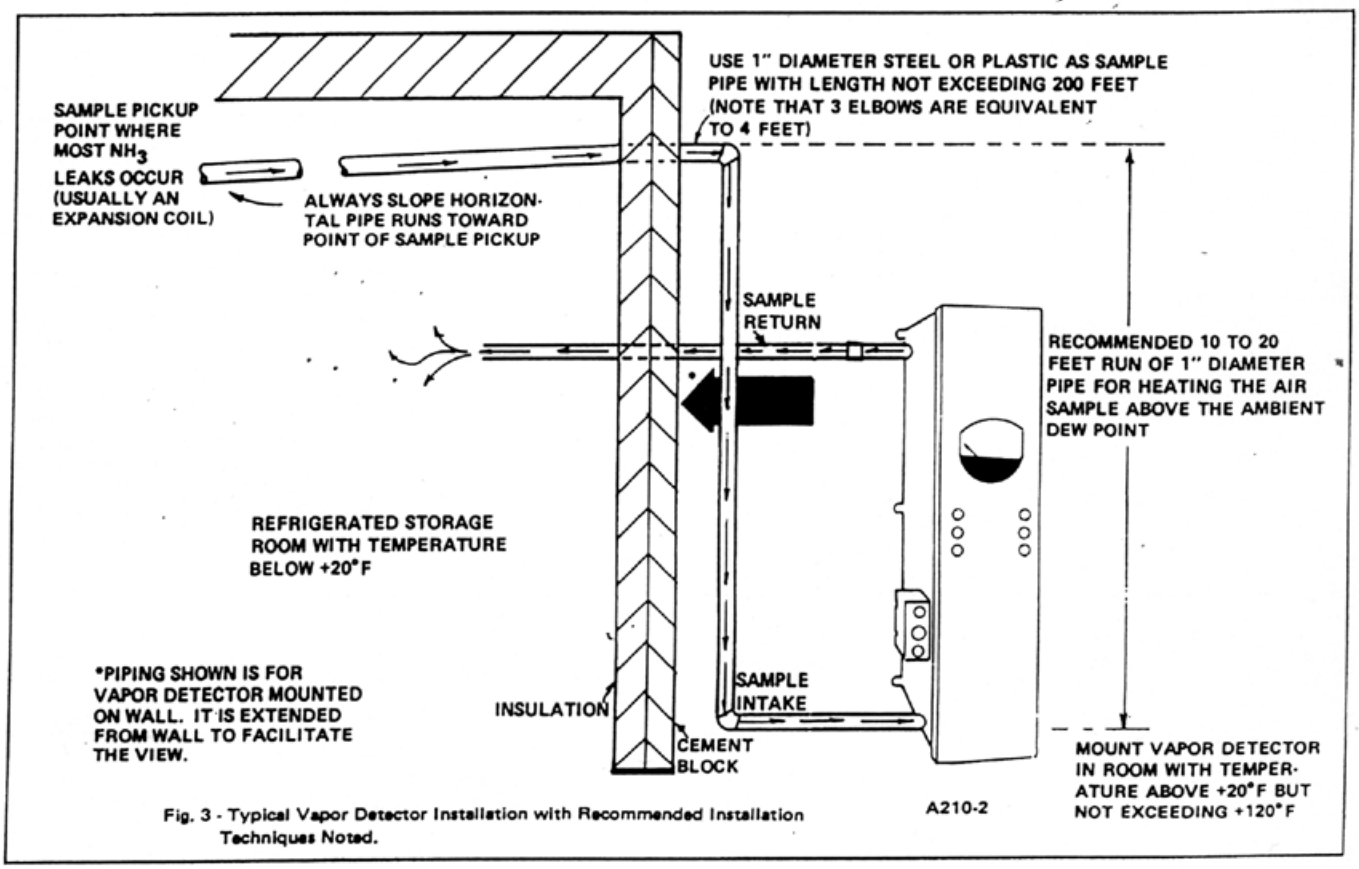


Fig. 3 - Typical Vapor Detector Installation with Recommended Installation Techniques Noted.

Mounting and Piping

1. Carefully unpack detector, inspect it for shipping damages and immediately report these to carrier. The detector is shipped as a complete unit with all components in place, and only needs to be mounted, piped, and wired for operation.
2. Mount detector vertically on wall or panel using lugs provided. Do not drill holes in the detector case, it is part of the sampling system.
3. Use 1-inch diameter steel or plastic pipe for sample intake and return piping. Connect piping directly or by flexible plastic hoses to inlet and outlet flanges on detector. A piping adapter kit consisting of two 3-inch long pipe nipples and two 18-inch long plastic hoses is available by ordering part number ADL 50909. Before installing piping, refer to Fig. 3 and review the following considerations.

   (1) Slope horizontal sample intake pipe runs toward point of sample pickup. This prevents possible condensation from going into the detector. A suggested sample pickup point is the area above the coil or refrigeration piping and out of the intake or outlet air steam of the cooling coil. This is most likely point for early pickup of an ammonia leak.

   (2) Provide a 10 to 20 feet run of sample intake pipe outside of refrigeration room to warm the sample air temperature and avoid condensation in the detector case.

   (3) The detector's blower can generate a maximum static pressure of 0.6 inches of water. The blower equipped with a clean filter bag can move 40 cfm through the case's internal piping. A sample intake pipe run of 20 to 50 feet will drop the flow rate to about 5 cfm and will not affect detector's two-minute response time. Pipe runs exceeding 100 feet will reduce flow rate to below 3 cfm and affect response time. A booster blower or oil-free positive displacement pump at the inlet will decrease response time with long pipe runs. This is required to maintain reliable operation in applications where pipe run exceeds 200 feet.

   (4) Vent the sample return pipe run to the refrigerated room.

   (5) Sample intake line must be open for proper detector operation. If sample intake pipe goes through an area that is colder than the sampling point area and becomes blocked by ice, it may be necessary to wrap the pipe with heating tape and insulation to prevent ice formation in the colder area.

Wiring

NOTE: All wiring must comply with local codes, regulations, and ordinances.

Power

Remove the junction box cover for access to the terminal connections. The detector case is connected to ground terminal (G, green wire) as shown in Fig. 4. For the multi-tap voltage models, con-

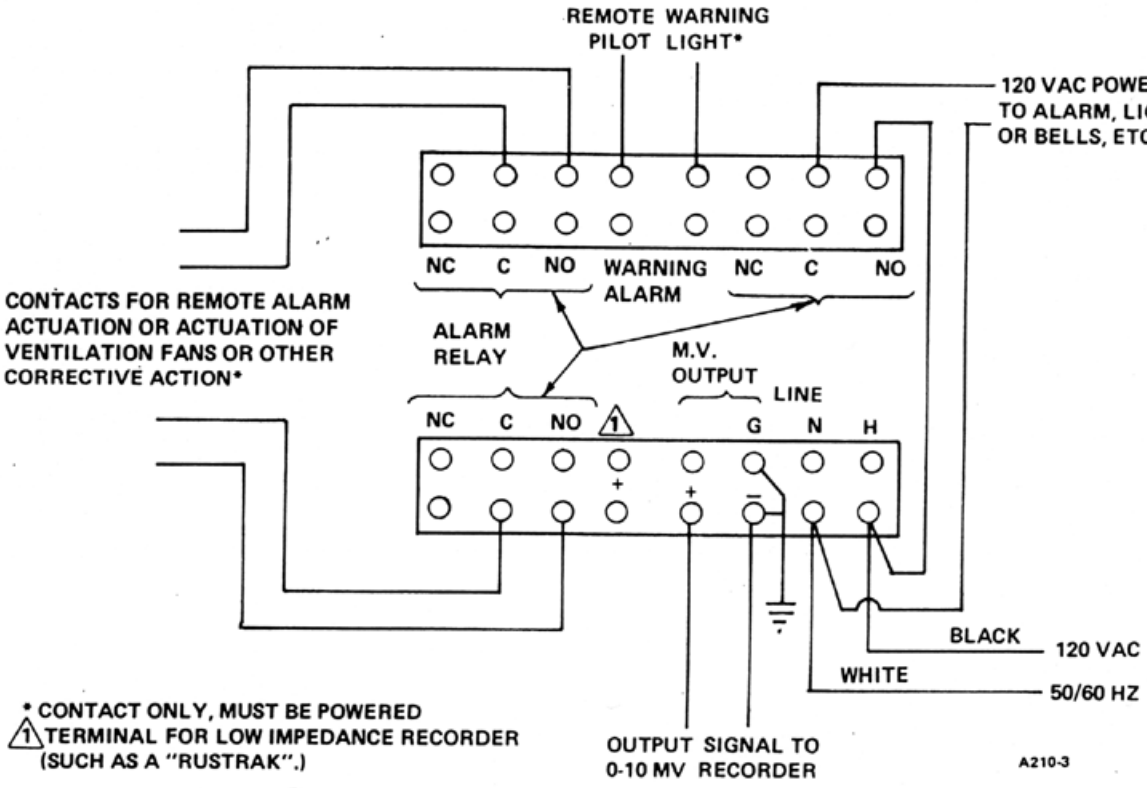


Fig. 4 - Typical Power Alarm, And Recorder Connection Made in the Vapor Detector's Junction Box.

Do { UVH10A @ 1 TO 2 MONTHS
UVH10C @ 3 MONTHS

REPAIR

Replacement procedures for the following detector components are outlined in this paragraph.

1. Ultraviolet source lamp.
2. Ultraviolet detector tube.
3. Amplifier and Alarm circuit boards.

Replacing the Ultraviolet Source Lamp (part number ADL 50034A)

1. Inactivate alarm circuit and turn "ON-OFF" switch to "OFF" position.
2. Loosen three case door latches and swing door open.
3. Disconnect electrical plug from ultraviolet source lamp. Unscrew threaded source lamp holder from tee fitting. The source lamp is sealed in its holder and is replaced as an assembly.
4. Screw new source lamp and holder assembly (ADL 50034A) into tee fitting.
5. Connect electrical plug to source lamp.
6. Close case door and secure latches.
7. Turn switch "ON" and allow restabilizing time before taking readings. Reactivate alarm circuit.

Replacing the Detector Tube (part number 124932A)

1. Inactivate alarm circuit and turn "ON-OFF" switch to "OFF" position.
2. Loosen three case door latches and swing door open.
3. Loosen clamp holding detector tube's cable in place.
4. Carefully unplug electrical connector from tube. Connector contains two in-line resistors. Be careful not to overstress cable and break resistor connections.
5. Note position of detector tube in its holder. Loosen retaining screws in holder and slide detector tube out of its holder.
6. Slide new detector tube into holder, positioning as noted in previous step so its semi-cylindrical cathode plate is centered under sample pipe. Carefully retighten retaining screws securing tube in holder (overtightening could break the tube).
7. Reconnect plug and tighten cable clamp. Wipe off any smudges or fingerprints on the tube.
8. Close case door and secure latches.
9. Turn "ON-OFF" switch to "ON" position and allow restabilizing time before taking readings. Reactivate alarm circuit.

If the meter pointer remains below zero even with "standardize" knob in full clockwsie position, but responds to the opaque card, reposition the detector tube in its holder to reduce its sensitivity. Turn the "standardize" knob two turns counterclockwise from its clockwise stop. Loosen retaining screws in detector tube holder and rotate tube 45 to 60 degrees about its axis, until meter pointer rises above zero. Retighten retaining screws and use "standardize" knob to set zero. As the source lamp ages, the tube can be rotated back to its original position.

It will be necessary to recalibrate after detector tube is replaced. See Calibration Procedure paragraph.

Replacing Amplifier or Alarm Circuit Board

1. Inactivate alarm circuit and turn "ON-OFF" switch to "OFF" position.
2. Loosen 3 case door latches and swing door open.
3. Remove and replace defective circuit board.
4. See Calibration Procedure paragraph.

CALIBRATION PROCEDURE

To perform the following procedures, you will need the span screen specified in the following table for given model number.

CAUTION: Be very careful when working around the electronic package of this instrument with power "ON". Portions of the circuit board receive over 400 volts.

Be sure the meter readings have stabilized as described under the Startup paragraph and a stable zero reading has been obtained before proceeding.

1. Loosen 3 case door latches and swing door open.
2. Slide span screen assembly onto end of case sample pipe with flat side facing blower and tighten setscrew.
3. Close door and allow reading to stabilize for 3 to 5 minutes. Record reading.
4. Refer to Table 2 and calculate calibration point for specific model number.
5. Compare recorded reading with calculated calibration point. If readings differ by more than ±5% full scale, use amplifier gain adjustment to correct

Table 2 — Span Screen and Calibration Point Selection

DEVICE MODEL NO.	METER RANGE	SPAN SCREEN PART NUMBER	
		ADL50905 (30 X 30 mesh) Calibration Point at-	ADL50906 (4 X 4 mesh) Calibration Point at-
UVH10A1	0 to 50 PPM	Do not use.	About 30 PPM - use 1.2 times value stamped on span screen.
UVH10A2	0 to 50 PPM	Do not use.	About 25 PPM - use stamped value.
UVH10C1 (or C)	0 to 200 PPM	Do not use.	Use 4.8 times stamped value.
UVH10C2	0 to 200 PPM	About 100 PPM - use 1.5 times value stamped on span screen,	Do not use.
UVH10C3	0 to 200 PPM	Adjust to midscale dot on meter or value stamped on span screen	Do not use.
UVH10C4	0 to 200 PPM	Adjust to midscale dot or stamped value.	Do not use.

S.O.P.

X = UVH10A 0-50 ppm = 1 TO 2 MONTHS

X = UVH10C 0-200 ppm = 3 MONTHS

The maximum recommended interval is X months. If filter becomes dirty before scheduled interval or frequent "standardize" adjustments are required to rezero pointer, establish a more frequent maintenance interval based on these requirements.

Cleaning the Optical Path (See Fig. 5)

1. Inactivate alarm circuit and turn "ON-OFF" switch to "OFF" position.
2. Loosen three case door latches and swing door open.
3. Unhook spring clip securing aluminum sample pipe to its mounting bracket.
4. Swing sample pipe outward and unscrew it from tee fitting.
5. Use cotton wads or soft towel patches moistened with alcohol to swab inside the sample pipe. You can use a shotgun cleaning rod or wooden dowel for this. Reinstall sample pipe.
6. Clean upper surface of ultraviolet detector tube with cleaning tissues and alcohol.
7. Disconnect electrical plug from ultraviolet source lamp.
8. Unscrew threaded source lamp holder from tee fitting. Do not remove source lamp from its holder for routine cleaning.
9. Clean source lamp with cleaning tissue and alcohol.
10. Carefully screw source lamp holder into tee fitting. Reconnect electrical plug.
11. Close case door and secure latches.
12. Turn switch "ON", and allow restabilizing time before taking readings.

The restabilizing time required is related to the length of the time the power was "OFF". Normally, it will take from 10 to 30 minutes for detector to restabilize after routine cleaning. Use "standardize" knob to obtain a stable zero. Reactivate the alarm circuit.

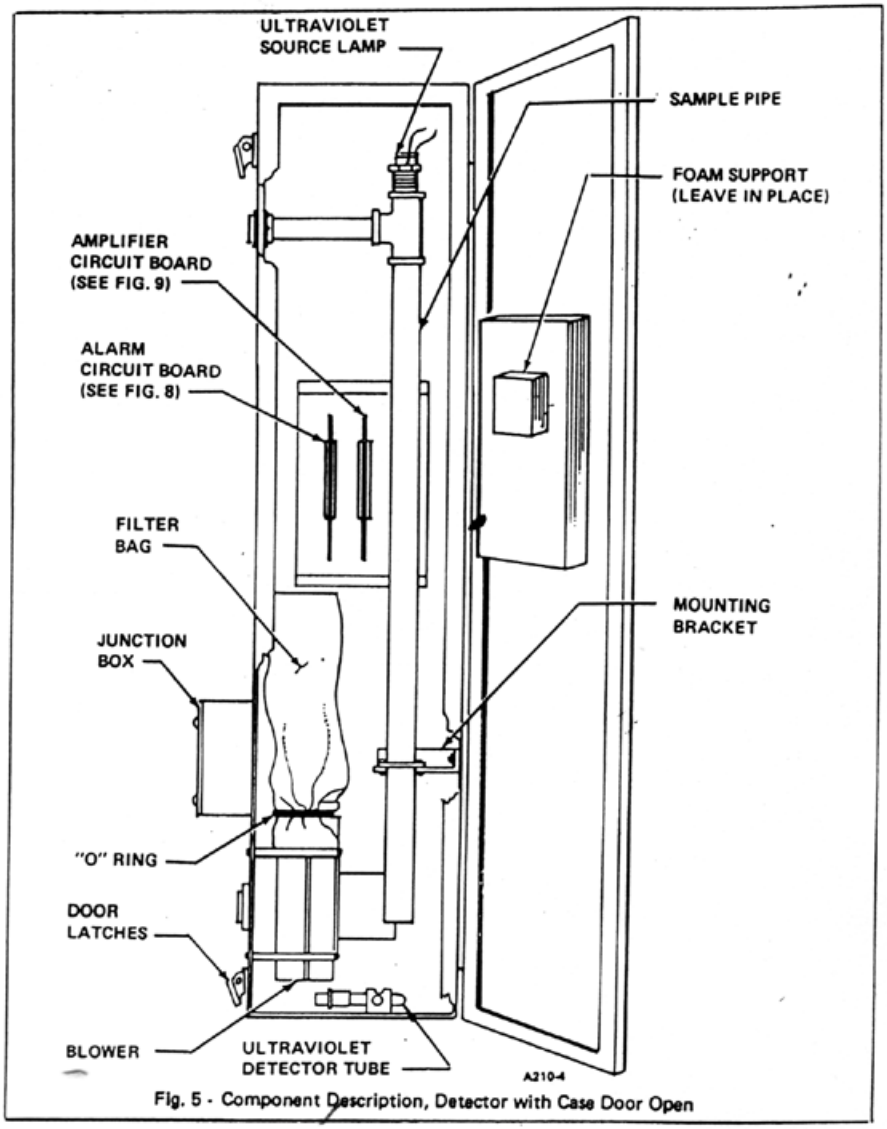


Fig. 5 - Component Description, Detector with Case Door Open

Changing the Filter Bag

1. Inactivate alarm circuit and turn "ON-OFF" switch to "OFF" position.
2. Loosen three case door latches and swing door open.
3. Remove filter bag by rolling rubber "O" ring back toward the blower till bag is free.
4. Install new filter bag (part number ADL 50026) by placing it over filter adapter and carefully roll "O" ring over bag until it seats in adapter groove. Make sure filter bag is sealed around. Replace "O" ring if it is deteriorating.
5. Close case door and secure latches.
6. Turn switch "ON". Reactivate alarm circuit.

Parts List
UVH-10 A-E

Replacement Parts List

The following parts have been selected as those most likely to be needed to support repair and maintenance of the Detector. It is advisable to order those parts and keep them in your maintenance stock.

Part no.	Description	Recommended spares spare parts per 1	10
ADL 50026	filter bag (Dirt Devil U)	1	3
ADL 50029	filter bag retainer (metal spring ring)	1	3
Bussman AGC 2	fuse, 2 ampere		
ADL 50034E	ultraviolet source lamp	1	3
124932E	ultraviolet detector tube	1	3
Amplifier Board			
ADL50013A-B.4	range 0-50ppm	-	1
ADL50013B-B.4	range 0-200ppm	-	1
Alarm Board			
ADL50012A-B.1	range 0-50ppm	-	1
ADL50012B-B.1	range 0-200ppm	-	1
Power Transformer			
ADL50089	120 vac		
Motor and Blower Assembly			
ADL50090	120vac		
ADL50010	green		
ADL50011	amber		
ADL50009	potentiometer (standardize)		
ADL50004	alarm relay (3pdt)		
Accessories			
ADL50906	span screen kit-0-50ppm (and UVH10C1)		
ADL50905	span screen kit 0-200ppm		

nect the selectable power wire to the proper lug for the available power. Observe color code when connecting power leads to the terminals.

Alarm

Make connection to tpdt alarm relay contacts to obtain desired alarm action. Fig. 4 shows typical alarm connections for powered and reset position.

Recorder

The ground terminal is used as one side of the 0-10 mv dc output signal. Observing polarity, connect recorder leads to the mv output terminals.

PLACING IN OPERATION

The procedures for placing the detector in operation assume that the detector has been completely installed - mounted, piped, and wired.

Startup

Disconnect the alarm before turning the detector "ON" to avoid false alarms during the stabilizing period. Turn the detector's "ON-OFF" switch to the "ON" position. Allow the detector to operate for 24 to 48 hours to stabilize ultraviolet detector tube. During this period, occasionally observe the meter reading and use the "standardize" adjustment knob on the detector's front panel to bring the meter pointer near scale zero. When the meter reading stabilizes near scale zero (without requiring frequent adjustment of the "standardize" knob), depress reset button on detector's front panel to manually reset the alarm relay and reconnect the alarm. Adjust the "standardize" knob in small steps, waiting a couple of minutes between steps, to obtain best zero.

If a power interruption occurs, allow the detector to restabilize for a period of time relative to the length of time that the power was off. A short interruption requires a short restabilizing period of 10 minutes to one hour; but if the detector is turned off for days or weeks, a longer restabilizing period is required. Inactivate the alarm during this restabilizing period to avoid false alarms that could occur.

IMPORTANT: Detectors employed in low oxygen atmospheres, such as the controlled atmosphere storage of fruit, require a slightly different startup procedure. Operate the detector in ambient air which contains about 21 per cent oxygen during the stabilizing period. Using the "standardize" knob, adjust meter pointer to indicate 6 ppm on the meter scale. After meter reading stabilizes at a point between 5 to 10 ppm on scale, reduce the oxygen content to controlled atmosphere level of 2.5 per cent. The meter pointer will gradually fall toward zero and should stabilize near scale zero for controlled atmosphere. It may be necessary to use "standardize" knob to bring pointer to zero. To check standardization, close off the controlled atmosphere sample line and draw in ambient air. The meter pointer should read at or between 5 to 10 ppm on scale.

Checking the Alarm Point

The alarm relay is factory-adjusted to actuate at approximately midscale — 25 ppm for the 0 to 50 ppm range, or 100 ppm for the 0 to 200 ppm range. The alarm relay actuation point is adjustable from 35% of scale to full scale. Proceed as follows to readjust or check the alarm point.

1. Turn "ON-OFF" switch "OFF" and remove junction box cover.
2. Place an ohmmeter across one set of alarm contacts in junction box.
3. Loosen three door latches and swing case door open.
4. Turn switch "ON".
5. Position ohmmeter so you can see its meter and read the detector's panel meter too. Observing meters, slowly cover end of case sample pipe with an opaque card and note panel meter reading at point alarm relay clicks and ohmmeter shows contact action.
6. Push reset button on front panel to manually reset alarm relay.
7. Change alarm actuation point by adjusting "trip-out" point adjustment on alarm circuit board. Turn switch "OFF". Using a small screwdriver, change "trip-out" point adjustment. Remove screwdriver and turn switch "ON". Allow a few minutes for detector to warm up and repeat steps 5 through 7 until desired alarm actuation point is reached.

Warning ("trouble") Light Operation

The warning light signals early warning of an ammonia concentration or an up or downscale drift of zero which must be corrected by adjusting the "standardize" knob to avoid false alarm. The warning light actuation point is not individually adjustable, but will always occur approximately 50% below alarm point setting. For example, if alarm point is set at 25 ppm, warning light blinking signal will occur at 12 - 13 ppm.

Check for Proper Operation

To verify detector operation, moisten a cloth pad with ammonia water and place it near the sample pipe intake. This should actuate the warning ("trouble") light and then the alarm relay within the 2 to 3 minutes response time. If not, check for a blocked sample pipe or air leaking into the sampling system.

The detector will return to normal operation within 10 minutes after the removal of the ammonia moistened pad. Depress the reset button on the detector's front panel to manually reset the alarm relay.

Operation Considerations

Large changes in humidity can cause a shift in the zero. Read the meter at frequent intervals and use "standardize" adjustment knob to correct reading, if required.

The presence of organic vapors in the air sample forms an oily film in the sample pipe and on the surfaces of the ultraviolet source lamp and the detector tube. Sources of such organic vapors are internal combustion exhaust and crankcase emissions, drying paints, vapors from cooking oils, etc. This film absorbs the ultraviolet radiation and causes an upward drift in meter reading. If the meter pointer drifts up to 10 ppm or above, use "standardize" knob to correct reading to zero. After a number of these adjustments, the "standardize" adjustment will near the end of its travel and the optical path must be cleaned as described in the Maintenance paragraph.

Avoid using chemical solvents, such as lacquer thinners, in the sample area because the presence of their vapors in the air sample can cause a meter indication or activate the detector's alarm relay.

MAINTENANCE

To ensure optimum performance, perform the following maintenance procedures at regular intervals.

1. Clean the optical path.

3. Change the filter bag.

HOW IT WORKS

Ammonia vapor concentration is sensed by the ultravoilet absorption principle as illustrated in Figs. 6 and 7. An ultraviolet source lamp located in one end of the sample pipe mounted inside the detector case generates ultraviolet radiation. An ultraviolet detector tube located at the other end of the case sample pipe responds to a specific band of ultraviolet radiation and produces a corresponding signal level in the amplifier. If the air sample drawn through the sample pipe contains an ammonia vapor, the ultraviolet radiation from the source lamp is absorbed by the vapor, decreasing the radiation signal to the ultraviolet detector tube in proportion to the ammonia concentration in ppm. This results in a corresponding change in amplifier signal, and the meter displays in ppm the ammonia cencentration as it differs from a clean air sample. When the ammonia concentration reaches the preset level of concentration, three sets of contacts close to operate an alarm.

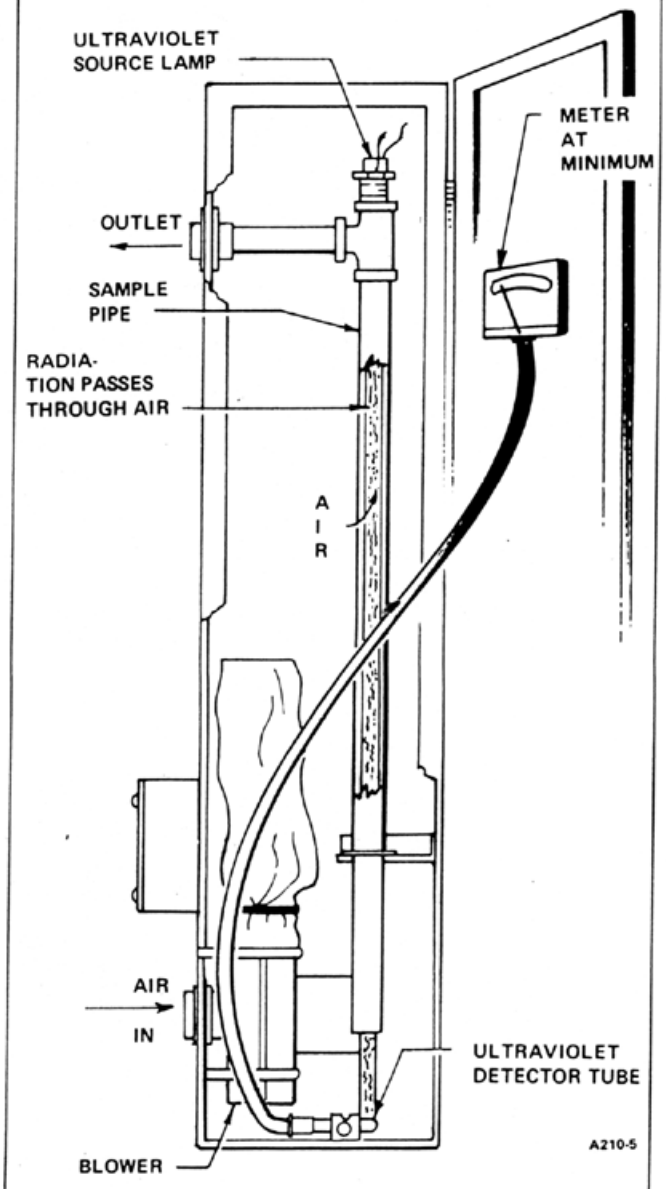


Fig. 6-Functional Diagram of What Happens When The Detector Monitors a Clean Air Sample.

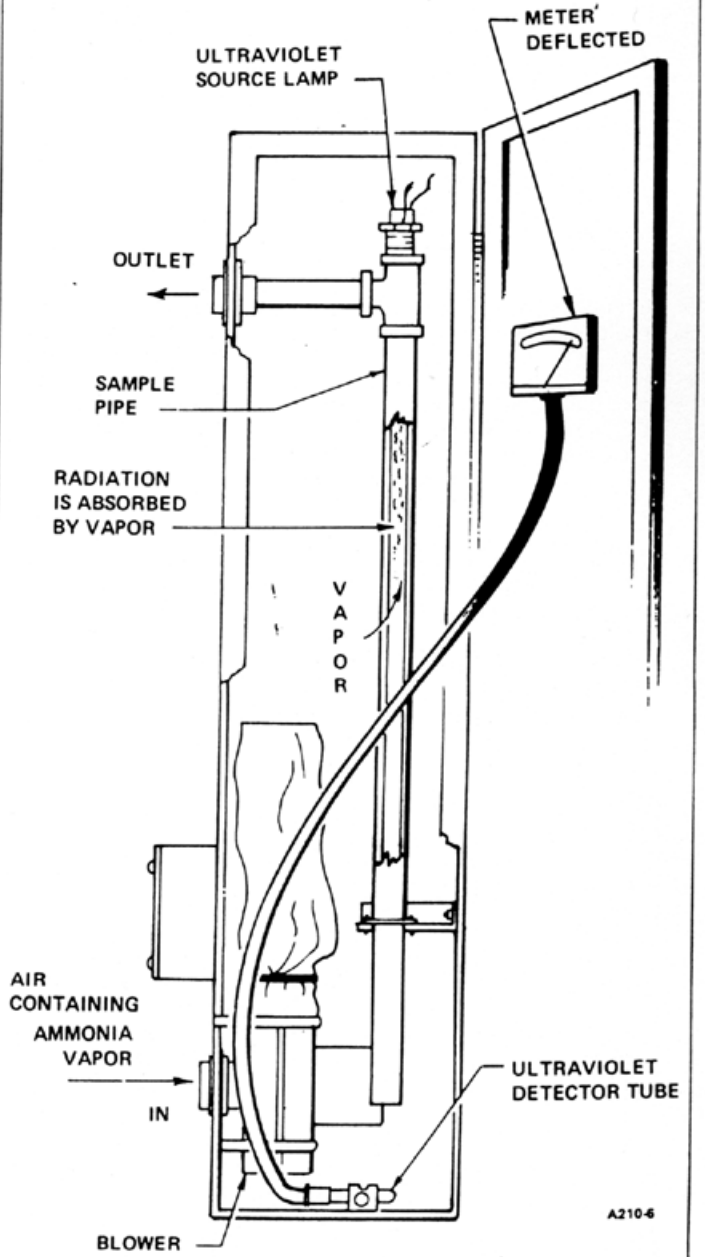


Fig. 7-Functional Diagram of What Happens When The Detector Monitors An Air Sample Containing Ammonia Vapor.

TROUBLESHOOTING CHART

The following chart is designed to locate the problem area rapidly by using meter indication as symptom guide. The chart lists some symptoms, probable causes, and suggested remedies.

Table 1 — Troubleshooting Chart

Symptom	Probable Cause	Remedy
1. Detector dead, power light out with power switch "ON".	Blown Fuse.	Replace fuse.
	Faulty power connection	Check connections and tighten.
2. Blower motor running, meter does not respond to presence of vapor.	Blocked sample intake pipe - check for air flow through system by placing your fingers near sample return outlet.	Open sample intake pipe.
	Dirty filter bag.	Replace filter. See Maintenance paragraph.
	Case not tightly sealed.	Make sure case door latches are secure.
3. Meter pointer drives above full scale, regardless of "standardize" knob position.	Ultraviolet source lamp defective — check for blue violet glow by placing a mirror under end of case sample pipe with detector turned "ON".	Replace source lamp. See repair paragraph.
	Defective ultraviolet detector tube — check by lighting a match near the detector tube's active surface and observing if meter pointer moves downscale. No meter response means the detector tube is defective.	Replace detector tube. See repair paragraph.
	But, if meter does respond, source lamp is weak and must be replaced.	Replace source lamp. See repair paragraph.
	Case sample pipe and detector tube out of alignment.	Align sample pipe and detector tube.
4. Meter pointer below zero, warning "trouble" light blinking, and "standardize" knob in its full clockwise position.	Defective detector tube, check by placing opaque card across end of case sample pipe and if a faint flickering glow is observed around the tube's electrodes, it is defective.	Replace detector tube. See repair paragraph.
5. Checks reveal ultraviolet source lamp and detector tube are operative but detector is malfunctioning.	Faulty amplifier circuit board.	Replace circuit board. See repair paragraph.