

F GAS INDICATOR

	CONTENTS	PAGE
1.	GENERAL	1
2.	DESCRIPTION	1
3.	TESTING AND SETTING UP INDICATOR	2
4.	OPERATION	5
5.	MAINTENANCE	5
6.	REPLACEMENT PARTS	7

1. GENERAL

1.01 This section describes the F Gas Indicator (AT-8225) used in testing for the presence of natural gases, gasoline vapors, and other similar combustible gases. Information is also included on the modified F Gas Indicator with audible alarm.

1.02 This section is reissued to incorporate the color coded meter face used on the F Gas Indicator and add minor revisions.

2. DESCRIPTION

2.01 The F Gas Indicator, shown in Fig. 1, is a 2-filament, hot-wire gas indicator. It consists of a Wheatstone bridge type detecting element, an indicating meter with a light to facilitate reading at night, and a battery holder housed in a plastic case. An aspirator bulb, a 15-foot length of sampling hose, and carrying straps are provided with the indicator. The indicator weighs about 4 pounds.

2.02 The electrical circuit is a balanced Wheatstone bridge in which two legs are platinum filaments. Both of these filaments are housed in a single block having two chambers as shown in Fig. 2. One chamber is completely sealed and houses the reference filament. The other chamber houses the active filament and is arranged so that air or gas can be drawn through it. When a combustible gas-air mixture is drawn through the chamber containing the active filament, the mixture ignites on the surface of the active filament

increasing its temperature and thereby increasing its electrical resistance. The change in resistance unbalances the bridge, causing current to flow through the meter. The amount of current which flows through the meter is directly proportional to the percentage of gas (by volume) present up to the lower flammability limit (often called lower explosive limit). The current necessary to operate the indicator is supplied by the eight type D flashlight batteries contained in the battery holder of the F Gas Indicator, or six D type flashlight batteries contained in the modified gas indicator.

2.03 The modified F Gas Indicator is similar to the above except that it incorporates an audible alarm. In the normal operation of this instrument, a mixture of combustible gas and air that is above the explosive range is indicated by a rapid movement of the needle into the high range followed by a fall off to the zero area of the scale. To eliminate the possibility of this temporary indication being unnoticed, the audible alarm will sound when an air-gas atmosphere is encountered which is in excess of 10 percent of the lower flammability limit.

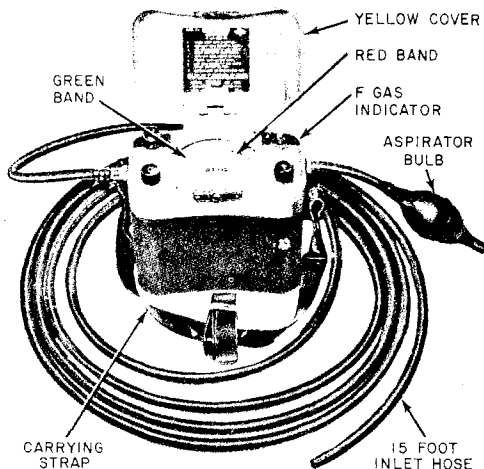


Fig. 1—F Gas Indicator

**Reprinted to comply with modified final judgment.

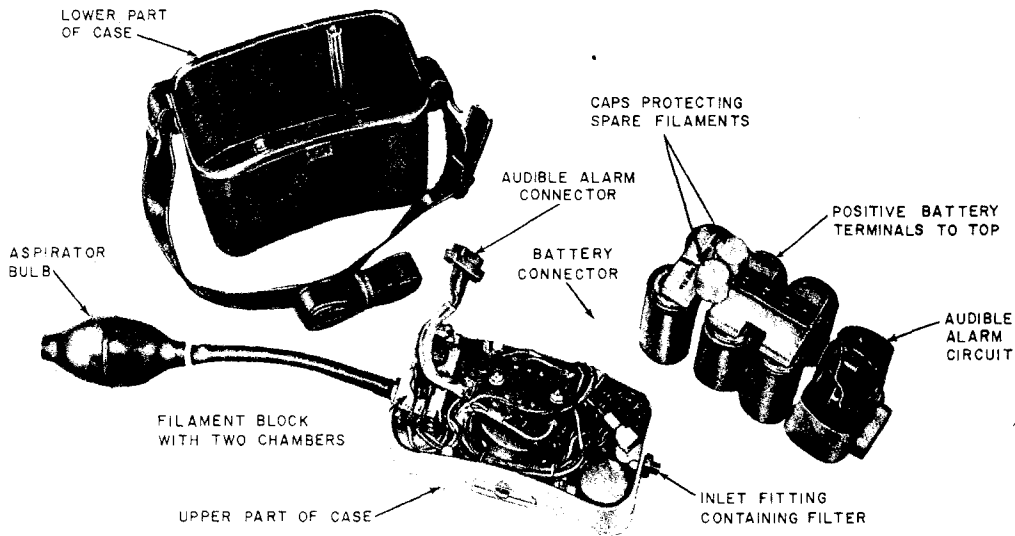


Fig. 2—Modified F Gas Indicator Containing Audible Alarm Feature (Inside View)

2.04 The alarm is mounted in the battery case of the gas indicator in place of two of the eight type D flashlight batteries normally used (Fig. 3). The alarm circuit is separate from the gas detection circuit and does not affect the meter reading. Power to the alarm circuit is supplied by a mercury battery (Eveready 216 or equivalent) and is automatically tested whenever the gas detector is in the voltage check position. The alarm is activated by a latching type fast acting detector circuit which cannot be reset until the meter needle is below the alarm set point. It can then be reset by turning the instrument OFF and then ON. The alarm point is set at 10 percent of the lower flammability limit by the manufacturer and should not be changed in the field. The modified F Gas Indicator is available on an optional basis. Existing F Gas Indicators can only be modified by the manufacturer to accept this added feature.

3. TESTING AND SETTING UP INDICATOR

3.01 The tests outlined in 3.02 through 3.10 shall be made each day before the indicator is used to test a manhole or cable vault. Some shall be made more often as indicated.

3.02 Test for Gastightness: Test the aspirator bulb, its short hose, and the indicator to determine if all are gastight and the bulb outlet valve is operating properly. See Fig. 4 for location of various fittings. Place one finger over the inlet fitting, squeeze and release the bulb. The bulb should remain deflated for at least 10 seconds. If it does so these items are satisfactory. Proceed to 3.05 to test the filter. If the bulb inflates in less than 10 seconds, there is a leak, either in the aspirator bulb, its short hose, or the indicator which must be corrected before the indicator is used. Proceed as described in 3.03.

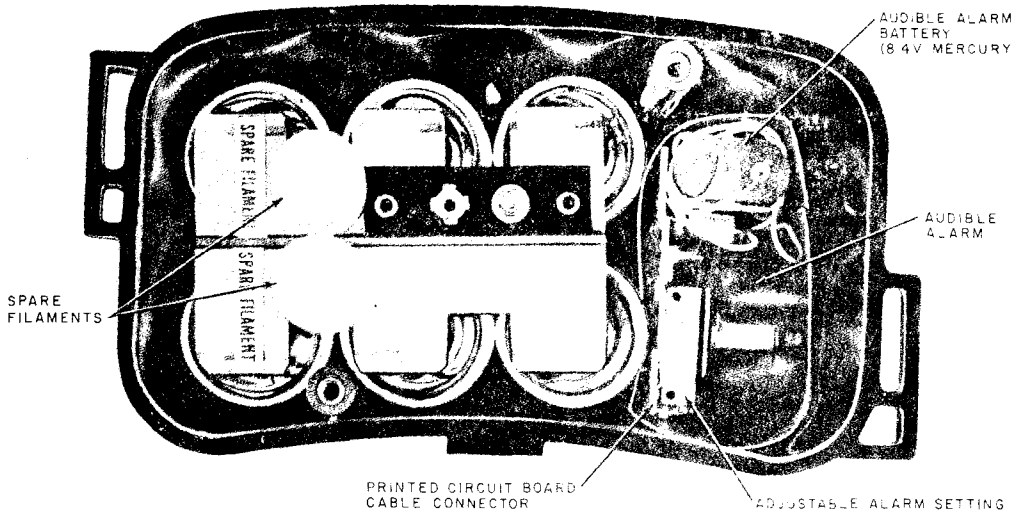


Fig. 3—Top View of Battery Compartment Showing Location of Audible Alarm

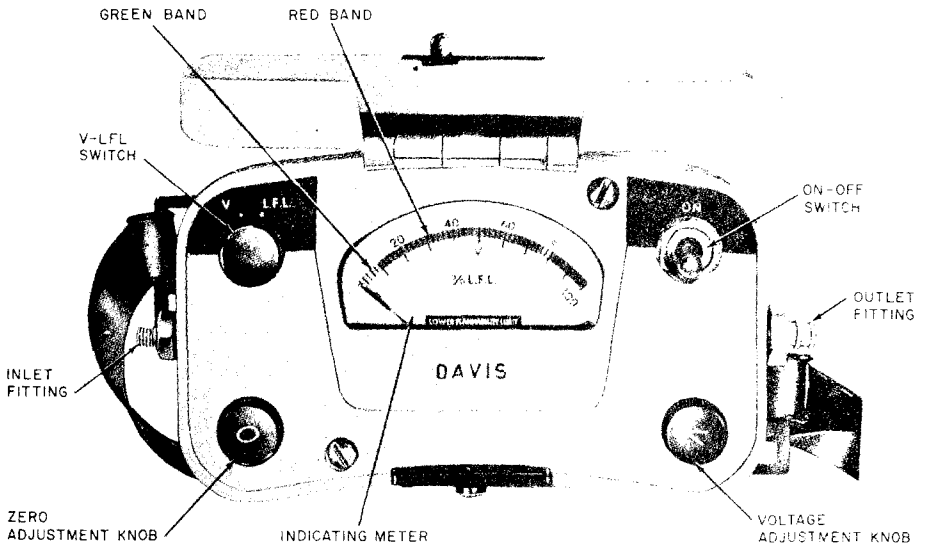


Fig. 4—F Gas Indicator (Top View)

3.03 Aspirator Bulb Test: Test the bulb to determine whether it is in working order as follows:

- (1) Remove the bulb and its hose from the indicator.
- (2) Hold finger tightly over the end of the hose.
- (3) Squeeze and release bulb.

Note: If bulb inflates in less than 10 seconds replace the bulb before making further tests and then repeat 3.02.

- (4) If the bulb operates satisfactorily (remains deflated for at least 10 seconds), reattach the short hose to the indicator and proceed as described in 3.04.

3.04 Indicator Gastightness: If the leak cannot be stopped by tightening the fittings and the filament unit, return the indicator for repair in accordance with local routine. If it is corrected, proceed as described in 3.05.

3.05 Filter Tests: Examine the inlet fitting to determine that the filter is in place. Squeeze and release the bulb with the sampling hose detached. If the bulb does not inflate within 5 seconds, replace the filter and repeat the test.

3.06 Adjustment of the Indicator: These adjustments should be made before each test except as discussed in 4.07. The location of the ON-OFF switch, V-LFL (volt-lower flammability limit) switch, zero adjustment knob, voltage adjustment knob, and indicating meter are shown in Fig. 4. Adjust the F Gas Indicator in free air as follows.

- (1) Operate the ON-OFF (right hand) switch to ON.
- (2) Turn V-LFL (left hand) switch to V.
- (3) Lift knob marked V and adjust meter pointer to green arrow.
- (4) Turn V-LFL (left hand) switch to LFL.
- (5) Squeeze bulb about five times.

- (6) Lift knob marked 0 and adjust the meter pointer to zero.

3.07 Gas Test: The F Gas Indicator should be tested only with the B or C Gas Test Kit (081 Division of the Plant Series Practices). This test should also be made after the indicator has been subjected to a high concentration of gas as outlined in Section 620-140-501. Return defective indicators for repair in accordance with local routine.♦

3.08 Sampling Hose Test: Attach the 15-foot sampling hose to the indicator, constrict or plug the free end of the hose to prevent air from being drawn in the end. Squeeze the aspirator bulb and place a finger firmly over the outlet valve of the bulb. The bulb should not inflate in less than 10 seconds. If the bulb inflates quickly, there is a leak in the hose or hose fittings. If tightening the hose fitting does not stop the leak, the hose must be replaced.♦

3.09 Hose Contamination Test: Test the hose to determine whether it is contaminated by combustible gases or vapors as follows.

- (1) Adjust indicator as described in 3.06. Be sure the sampling hose is firmly attached to the indicator by tightening the nut by hand.
- (2) Draw fresh air through indicator (about eight squeezes of the bulb). The needle should rest at zero. If more than slight fluctuation of the needle occurs, the inside of the hose may be contaminated with gas from a previous test. The hose generally can be cleared by aspirating fresh air through it or by flushing it with nitrogen. This test should be repeated if the hose has been subjected to a heavy concentration of gas.

Note: The meter needle will fluctuate slightly each time the bulb is squeezed, an indication of normal operation. The correct reading is the point where the needle rests for a few moments after squeezing is stopped.

3.10 To turn off the indicator, operate the ON-OFF switch to the OFF position, or close the cover of the case. To prolong the life of the batteries, the ON-OFF switch should be in the OFF position except when the indicator is being adjusted or tests are being made.

4. OPERATION

4.01 *Placing Sampling Hose:* Before entering the manhole, place the free end of the sampling hose in the manhole (cover removed) and draw the atmosphere to be tested through the indicator (about eight squeezes of the bulb are sufficient). Make sure that the free end of the sampling hose never touches water in the manhole.

4.02 If, in testing atmosphere an indication of gas is obtained and the needle does not move beyond the graduated scale, keep aspirating until the highest reading is obtained. The needle will fluctuate slightly at each aspiration, indicating that the instrument is functioning properly.

4.03 The graduations on the scale of the meter are in percent of the lower flammability limit of the combustible gas in the atmosphere being tested. A deflection of the needle between 0 and 100 shows how closely the atmosphere approaches the minimum concentration required for an explosion.

4.04 ♦The meter face of the indicator is color coded as shown in Fig. 4 with a green band from 0 to 10 percent and a red band beyond 10 percent. These colors indicate satisfactory and unsatisfactory atmospheres, respectively, as discussed in Section 620-140-501.♦

4.05 *With the regular F Gas Indicator, if the needle moves to the right-hand end of the scale and remains there, the atmosphere is explosive.* If the needle moves rapidly to the right-hand end of the scale and then falls back to a point on the scale or to zero or below, it indicates that the mixture is very rich and may be above the upper flammability limit. To verify this, immediately aspirate fresh air through the indicator; if the needle moves first to the extreme right and then to the left end of the scale, it indicates that the concentration of flammable gas is above the upper flammability limit.

4.06 With the modified F Gas Indicator, the alarm will sound in an air-gas atmosphere in excess of 10 percent of the lower flammability limit.

4.07 In making a series of tests, the balance adjustment should be checked at 3-minute intervals during the first ten minutes of testing and every ten minutes thereafter.

4.08 If the test from the street indicates the manhole atmosphere is satisfactory, the manhole should then be power ventilated for a minimum of two minutes as specified in Section 620-140-501. The gas indicator may then be used in the manhole. Before entering the manhole, tie the free end of the sampling hose to the top rung of the manhole guard. The other end should be lowered into the manhole for subsequent use in adjusting the indicator. Adjust the setting of the needle in the manhole as follows.

- (1) Attach the sampling hose to the indicator.
- (2) Turn the set on.
- (3) Flush the indicator by squeezing the aspirator bulb about eight times.
- (4) Proceed as in 3.06(2) through (6).
- (5) Detach the sampling hose and test for combustible gas. If atmosphere is unsatisfactory, leave manhole and continue ventilation.

4.09 *The operation of the indicator shall not be checked by sampling the vapors from a gasoline container or with acetylene or propane gas. The lead content of gasoline vapors may deposit on the detector filament affecting the sensitivity of the instrument. Acetylene and propane gases could cause damaging flashback in the instrument. Also, these gases and vapors could adhere to the sampling hose causing false readings, unless the tube is purged and checked to determine that it is free of contamination.*

5. MAINTENANCE

5.01 The replacement of batteries, filaments, aspirator bulb, hose, filters, and other parts listed in 6.01 are the only repairs to be made in the field.

5.02 To open the case for replacement of batteries or filaments, remove the captive flathead screws positioned diagonally on the face of the instrument, and remove the upper portion which contains the meter and switches.

5.03 The flashlight dry batteries are contained in the battery holder shown in Fig. 5. To remove them, first unsnap the battery connector

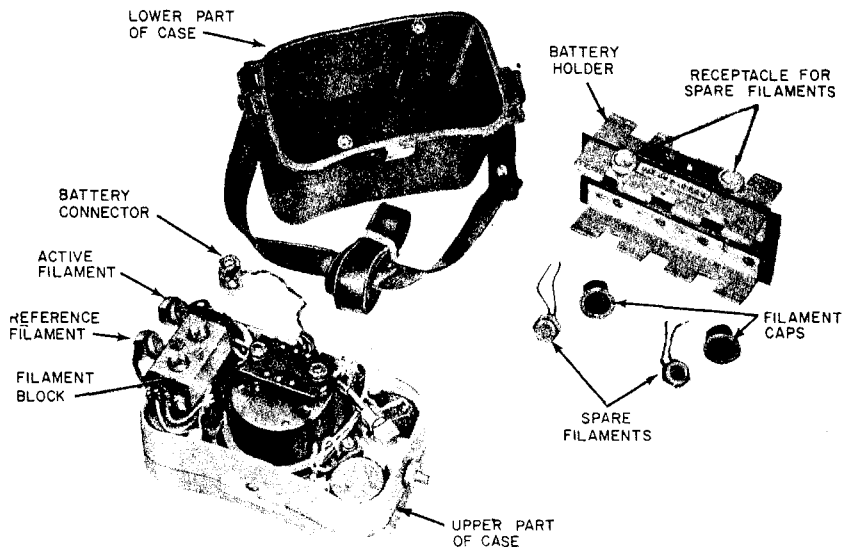


Fig. 5—F Gas Indicator (Inside View Showing Spare Filaments, Active and Reference Filaments, Case Parts, and Battery Holder)

from the battery holder and remove the holder from the lower part of the case. Pull the batteries out of the spring clips securing them in the battery holder and replace them with KS-14711 Dry Batteries or any quality commercial leak resistant batteries. In an emergency, KS-6522 Dry Batteries may be used but should be removed at the conclusion of the testing. The batteries should be replaced as a group when the meter pointer can no longer be adjusted to the green arrow with the switch in the V position. Remove dead batteries from the indicator as soon as possible to avoid serious damage which may result from corroded and leaking batteries.

5.04 The filament block is located as shown in Fig. 5. A filament needs replacement if, with the ON-OFF switch in ON position, the needle of the meter cannot be adjusted to zero. If the needle remains at the right-hand end of the scale, the detector filament is defective; if the needle

remains below the zero position, the reference filament is defective. To change a filament, proceed as follows:

- (1) Loosen the screw holding the pigtails in the filament block.
- (2) Remove the filament. (The filament is hand-tight in the filament block with an O ring seal and may be removed without the use of tools.)
- (3) The spare filament is replaced in the filament block by reversing (1) and (2). Since polarity is not a factor, the leads cannot be reversed.

5.05 Filter: The inlet filter is located at the outer end of the inlet fitting and consists of a small wad of absorbent cotton. If the filter is dirty or clogged, remove it with a pair of long-nose pliers or tweezers and replace with a new filter.

6. REPLACEMENT PARTS

6.01 The following items are available as replacement parts:

Fitting, Inlet

Fitting, Outlet

Ring, "O"

pk Plug, Cotton

Filament

Bulb, Aspirator

Hose, Aspirator, 6 inch

Hose, 15 ft.

Straps, Carrying

Battery, Dry, KS-14711

Lamp, Miniature No. 359

Battery, Mercury, Eveready No. 216

Note 1: "O" Ring for inlet and outlet fittings.

Note 2: Aspirator Bulb provided with check valve and 6 inch hose.

6.02 Orders should be worded:

Battery, Dry, KS-14711

Lamp, Miniature No. 359

Battery, Mercury, Eveready No. 216

All others

(Name of Part), for F Gas Indicators