Explosimeter®

part no. 89220

combustible gas indicator

model 2A

instruction manual

IMPORTANT WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING, OR SERVICING THE PRODUCT. Like any piece of complex equipment, the Explosimeter® Combustible Gas Indicator Model 2A will perform as designed only if it is installed, used and serviced in accordance with the manufacturer's instructions. OTHERWISE IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE BODILY INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not installed, used and serviced in accordance with the instructions in this manual. Please protect yourself and your employees by following them. We encourage our customers to write or call for a demonstration of this equipment prior to use or for any additional information relative to use or repairs.

MSA

PRODUCT OF U.S.

GENERAL CAUTIONS AND WARNINGS

1. The Explosimeter® Combustible Gas Indicator Model 2A is designed to measure combustible gas or vapor content in air. It will not indicate the combustible gas content in an inert gas background, furnace stack or in a reducing atmosphere. Further, this instrument should not be used where the oxygen concentration exceeds that of fresh air (oxygen enriched atmosphere).
2. Certain materials such as silanes, silicones, silicates and other compounds containing silicon in the tested atmosphere tend to "poison" the detector filament thereby giving erroneous readings. Calibration checks should be made frequently if such materials are suspected to be present in the tested atmosphere (NOTE: See "Warnings and Limitations").
3. The Explosimeter® Combustible Gas Indicator Model 2A detects only combustible gases and vapors in air. It will not indicate the presence of combustible airborne mists or sprays such as lubrication oils, coal dust, or grain dust.
4. When sampling over liquids, be certain that the end of the sampling line does not touch the surface of the liquid. It is recommended that a probe rod be used in tests of this character to prevent the liquid from being drawn into the sample line.
5. Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Explosmeter Model 2A beyond the scope of these maintenance instructions or by anyone other than a certified MSA serviceman, could cause the product to fail to perform as designed and persons who rely on this product for their safety could sustain severe bodily injury or death.

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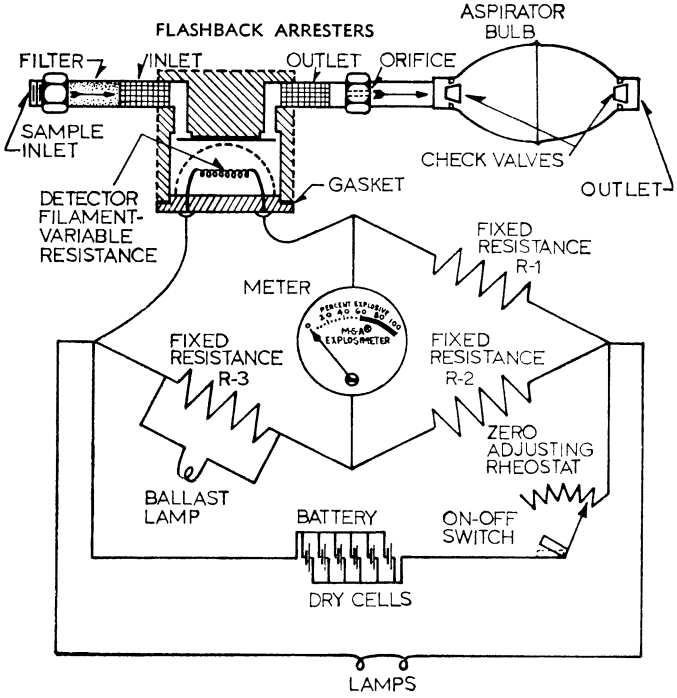

Figure 1—Schematic Flow System and Wiring Diagram.

GENERAL DESCRIPTION

Intrinsically Safe for use in Class I, Division 1, Group D and Non-Incendive for use in Class I, Division 2, Groups A, B, C and D hazardous locations, as defined by the National Electrical Code when used with six size D carbon zinc batteries.

The Model 2A explosimeter is an instrument by means of which an atmosphere may be quickly and conveniently tested for concentrations of flammable gases and vapors which it may contain. It depends for its operation upon the heat developed by the actual combustion of the flammable portion of the sampled atmosphere. Tests are made with the instrument by drawing a sample of the atmosphere to be tested over a heated catalytic filament which forms part of a balanced electrical circuit. The current for this circuit is provided by six flashlight dry cells. Combustibles in the sample are burned on the filament which raises its temperature and increases its resistance in proportion to the concentration of combustibles in the sample. The resulting unbalance of the electrical circuit causes a deflection of the meter pointer which indicates on the scale the concentration of combustible gases or vapors in the sample. This scale is graduated in percent of the lower explosive limit.

The electrical bridge circuit of the instrument is designed so that its balance is established at the proper operating temperature of the detector filament. The circuit balance and detector current are adjusted simultaneously by the adjustment of a single rheostat. The proper relation between these two factors is maintained by a special ballast lamp in the circuit.

A schematic diagram of the electrical circuit and flow system of the instrument is shown in Figure 1. The sample is drawn through the filter chamber into the combustion chamber of the instrument by an aspirator bulb. Entering through the inlet flashback

arrester, the sample strikes a baffle plate, diffuses through the combustion chamber, contacts the detector filament, and leaves through the outlet flashback arrester.

Two pea size lamps, built into the meter case, illuminate the meter dial. The effect of the illumination is dependent on the darkness of the area in which the instrument is used. These lamps are illuminated as long as the instrument is turned "ON,"

The Model 2A is listed by UL as follows:

Intrinsically Safe for use in Class I, Division 1, Group D and Non-Incendive for use in Class I, Division 2, Groups A, B, C and D hazardous locations, as defined by the National Electrical Code when used with six size D carbon zinc batteries.

The MSA Explosimeter should be used strictly in accordance with labels, warnings and limitations instructions and within the limitations stated.

The MSA Explosimeter will give efficient and economical service if Instructions for Operation and Maintenance are carefully followed.

WARNINGS AND LIMITATIONS

The Model 2 Explosimeter is not designed for testing mixtures of hydrogen, acetylene or other combustibles in which the oxygen content exceeds that of normal air (oxygen enriched atmospheres).

The instrument has been designed as a general purpose combustible gas indicator, intended to detect the presence of flammable gases and vapors, and the instrument will indicate in a general way whether or not the atmosphere is dangerous from a flammability standpoint. It is important that such information obtained with the instrument be appraised by someone skilled or experienced in interpreting the instrument reading intelligently, in the light of environment, industrial practice, and

exposure. For example, an atmosphere that is indicated as non-hazardous from the standpoint of fire and explosion, may, if inhaled, be toxic to workmen who are exposed for some time. Similarly a vessel which is safe before work is started may be rendered *explosive* by future operations as, for example, stirring or handling bottom sludge in a petroleum storage tank. The latter example indicates the need for frequent repeated tests of questionable spaces while work is in progress.

The instrument will respond to those concentrations of gases or vapors which are drawn through the sampling system. If the combustible is a high boiling point solvent and is tested at normal ambient temperature a relatively low vapor concentration will be shown by the instrument. If the container holding such solvents is subsequently heated as by welding and soldering, it is to be expected that the vapor concentration will increase, and thus the atmosphere of a vessel which was originally shown to contain only a low concentration of vapors may be rendered *explosive.*

If an attempt is made to use such instruments for testing atmospheres contaminated with high boiling point solvents where the questionable space is at a higher temperature than the instrument, it can be anticipated that there may be some condensation of the combustible vapors in the sampling line and in the flow system of the instrument; as a consequence the instrument may indicate less than the true concentration of vapors. For some such instances, condensation can be prevented by heating the sampling line and instrument to a temperature equivalent to or above that of the space to be tested; however, in no instance should these items be heated above 150° F.

The instrument will not indicate the potential explosive hazard of combustible gases and vapors when they are present in concentrations above their

upper explosive limits (see Operating Instructions, Page 6).

Furthermore, the instrument has been designed to measure combustible vapors IN AIR. It is not capable of measuring the percentage of vapors in steam or inert atmospheres, due to the absence of oxygen necessary for combustion on the instrument detector unit. For a test of combustibility the steam or inert gas must be dispiaced with air.

The instrument will not indicate the presence of explosive or combustible mists or sprays such as lubrication oil, or explosive dusts such as grain or coal dust.

When sampling over liquids, care should be taken that the end of the sampling line does not touch the surface of the liquid. It is recommended that a probe tube be used in tests of this character to prevent the liquid from being drawn into the sampling tube.

OXY-HYDROGEN AND OXY-ACETYLENE MIXTURES

The Model 2A Explosimeter is not designed for testing mixtures of hydrogen, acetylene, or other combustibles, in which the oxygen content exceeds that or normal air (oxygen enriched atmospheres).

TESTING ATMOSPHERES CONTAMINATED WITH LEADED GASOLINE

When an atmosphere contaminated with leaded gasoline is tested with a Model 2A Explosimeter, the lead produces a solid product of combustion which, upon repeated exposure, may develop a coating upon the detector filament resulting in a loss of sensitivity. To reduce this possibility, an inhibitor-filter is available for insertion in place of the normal cotton filter in the instrument. This device chemically reacts with the tetra-ethyl lead vapors to produce a more volatile lead compound.

Such inhibitor-filters are available in packages of six each and identified by Part No. 47740. Each consists of a glass ampoule wrapped with cotton and filled with chemical. To prepare the item for use, the ampoule should be crushed between the fingers then inserted into the filter chamber of the Model 2A Explosimeter in place of the normal filter.

One inhibitor-filter will provide protection for an instrument of eight hours of continuous testing.

WARNING

Silanes, silicones, silicates and other compounds containing silicon in the tested atmosphere may seriously impair the response of the instrument. Some of these materials rapidly "poison" the detector filament so that it will not function properly. When such materials are even suspected to be in atmosphere being tested, the instrument must be checked frequently (at least after 5 tests). A Calibration Test System (see parts list for accessories required) is available to conduct this test.

The Calibration Test System can also be used to periodically check the instrument calibration. If the instrument reads low on the test gas, immediately

replace the filament and the inlet filter and re-test. See also pages 2, 5 and 11 for additional limitations and cautions.

OPERATING INSTRUCTIONS

The MSA Explosimeter is set in its proper operating condition by the adjustment of a single control. This control is a rheostat regulating the current to the Explosimeter measuring circuit. The rheostat knob is held in the "OFF" position by a locking bar. This bar must be lifted before the knob can be turned from "OFF " position.

In an area known to be free of combustible gas or vapors prepare the 2A Explosimeter for operation as follows:

1. Lift the end of the rheostat knob "ON-OFF" bar and turn the rheostat knob one quarter turn clockwise.

This operation closes the battery circuit. Because of unequal heating of circuit elements there will be an initial deflection of the meter pointer. The meter pointer may move rapidly upscale and then return to a point below ZERO, or drop directly below ZERO.

2. Flush fresh air through the instrument.

The circuit of the instrument must be balanced with air free of combustible gases or vapors surrounding the detector filament. Five squeezes of the aspirator bulb are sufficient to flush the combustion chamber. If a sampling line is used, an additional two squeezes will be required for each 10 feet of line.

3. Adjust rheostat knob until meter pointer rests at Zero.

Clockwise rotation of the rheostat knob causes the meter pointer to move up scale. A clockwise rotation sufficient to move the meter pointer considerably above zero should be avoided as this subjects the detector filament to an excessive

current and may shorten its life.

The Explosimeter is now ready for operation. Place end of sampling line at the point where the sample is to be taken.

1. Readjust meter pointer to zero if necessary by turning rheostat knob.

2. Aspirate sample through instrument until highest reading is obtained.

Approximately five (5) squeezes of the bulb are sufficient to give maximum deflection. If a sampling line is used add two (2) squeezes for each ten (10) feet of line.

This reading indicates the concentration of combustible gases or vapors in the sample.

The graduation on the scale of the indicating meter are in percent of the lower explosive limit. Thus, a deflection of the meter pointer between zero and 100%, shows how closely the atmosphere being tested approaches the minimum concentration required for the explosion. When a test is made with the instrument and the meter pointer is deflected to the extreme right side of the scale and remains there, then the atmosphere under test is *explosive.*

If the meter pointer moves rapidly across the scale and on continued aspiration quickly returns to a position within the scale range or below zero, it is an indication that the concentration of flammable gases or vapors may be above the upper explosive limit. To verify this, immediately aspirate fresh air (air free of combustible gases or vapors) through the sampling line or directly into the instrument. Then, if the meter pointer moves first to the right and then to the left of the scale, it is an indication that the concentration of flammable gas or vapor in the sample is above the upper explosive limit.

When it is necessary to estimate or compare concentrations of combustible gases above the

lower explosive limit a Dilution Tube may be employed. The use of the Dilution Tube is described in the section entitled "Dilution Tube."

The meter scale is red above 60 to indicate that gas concentrations within that range are nearly explosive. Such gas-air mixtures are considered unsafe where men must work.

3. To turn instrument off: Rotate rheostat knob counterclockwise until arrow on knob points to "OFF." The locking bar will drop into position in its slot indicating that the rheostat is in the "OFF" position.

The terminal voltage of dry cells gradually decreases as the cells are used. This drop in voltage takes place most rapidly in the first few minutes after the current is turned on. The balance of the Model 2A Explosimeter circuit is dependent upon the applied voltage and therefore gradually changes as the instrument is in operation With freshly installed batteries the balance may be expected to change approximately 5% (1 scale division) in 5 minutes. After 10 to 20 minutes of use, the shift of the balance setting should not exceed 1% (1/5 scale division) in 5 minutes.

When it is possible to do so, the bridge circuit balance should be checked before each test. If this is not practical, the balance adjustment should be made at three-minute intervals during the first ten minutes of testing and every ten minutes thereafter.

MAINTENANCE

WARNING: To prevent ignition of flammable or combustible atmospheres, all maintenance must be performed in a non-hazardous location.

REPLACEMENT OF DRY CELLS

The Model 2A Explosimeter is adapted to use six size D carbon zinc batteries.

They will give 8 to 12 hours of continuous service. Considerably loonger life may be expected in intermittent service

The Pointer on the rheostat knob indicates approximately the condition of the dry cells. When the circuit is properly balanced with fresh cells, the pointer on the rheostat knob should be directed toward the left edge of the instrument.

When the meter pointer remains below ZERO and cannot be brought up to ZERO even when the control rheostat is turned to its extreme clockwise position (knob pointer directed at right edge of case) the cells are exhausted and must be replaced.

The dry cells are replaced by removing the bottom of the instrument case which is held in place by two slotted screws. The cells operate in parallel and must be installed with the tops (positive terminal) toward the top of the battery compartment.

The cells should be replaced in groups. Do not use partially discharged cells with new cells.

DETECTOR UNIT

The detector filament of the Model 2A EXPLOSIMETER is made of platinum. The life of the detector unit depends greatly upon the concentrations of gases tested. When the majority of samples tested contain not more than 50% of the lower explosive limit a detector filament will serve for several thousand tests. When higher concentrations, especially above the lower explosive limit (above 100% on the EXPLOSIMETER scale) are frequently encountered, the life of the detector unit will be shortened. It is advisable, when gaseous concentrations above the scale range of the instrument are indicated, to stop sampling and flush the Model 2A Explosimeter with fresh air.

If the pointer of the indicating meter moves to the extreme right side of its scale when the instrument is turned on and cannot be adjusted to ZERO, the detector filament may be burned out and should be replaced.

A spare Detector Unit is located inside the case of the instrument below the panel and may be obtained by removing the three screws that hold the panel in place.

REPLACEMENT OF DETECTOR UNIT

Remove the top of the Model 2A Explosimeter case. Remove the screws holding the two green wires to the terminals in the top of the bakelite head of the detector unit. Unscrew the unit from the combustion chamber. Screw the replacement detector unit tightly into the combustion chamber. The gasket should be clean and properly seated.

When the green wires leading to the terminals on the top of the detector head are replaced, care should be taken that the screws holding them are firmly set and that the two terminal lugs at the ends of the wires do not touch each other.

Provisions should be made to replace the spare filament in the receptacle inside the case, so that in the event another filament burns out while the instrument is being used in the field, a spare will be available.

BALLAST LAMP

The MSA Explosimeter uses a special electrical bridge circuit of "controlled stability." It is this feature that makes it practical to adjust the circuit balance and detector operating temperature with a single operating control. The function of the ballast lamp is to regulate the circuit stability.

This lamp is especially manufactured for the MINE SAFETY APPLIANCES COMPANY. It is selected according to rigid standards and is not replaceable by any commercially made lamp.

The filament of the ballast lamp of a properly operating instrument may glow dimly, but is never

brightly illuminated. The lamp should always be kept firmly screwed into its socket and never removed from it. It may be expected to last throughout the life of the instrument.

Replacement is required only in the case of breakage or after it has been subjected to severe mechanical shock.

FLASHBACK ARRESTERS

The flashback arresters are located in the inlet and outlet of the detector filament chamber. The inlet arrester is reached by removing the detector filament and the baffle plate at the bottom of the detector chamber. The outlet flashback arrester is reached by removing the aspirator bulb coupling.

The arresters are made of cadmium plated copper screen tightly wrapped upon a rod. They may be removed by pulling this rod with a pair of long-nosed pliers. If they are clogged they should be replaced with new ones. The flashback arresters are inexpensive and their function is so important that any attempt to clean them is not recommended.

WARNING: ALWAYS BE SURE THAT BOTH ARRESTERS ARE IN THEIR PLACES AND FIT SNUGLY BEFORE THE INSTRUMENT IS REASSEMBLED. THE FLASHBACK ARRESTERS ARE IMPORTANT SINCE THEY PREVENT THE POSSIBILITY OF FLAME PROPAGATION FROM THE COMBUSTION CHAMBERS.

CALIBRATION

A Calibration Test Assembly Model R is available to periodically check the Explosimeter with a known concentration of methane-in-air. The Explosimeter calibration should be checked after replacement of filament, ballast lamp, flashback arresters, after prolonged periods of non-use, or if catalytic "poisons" may be present in the sample. (see page 5).

THE FLOW SYSTEM

The normal rate of sample flow through the instrument is 0.030 to 0.050 cubic feet per minute. The indication of the instrument is practically independent of the rate of sample flow within wide limits. To check for leaks in the flow system, close inlet of the instrument with one finger of the left hand; then depress the aspirator bulb. Immediately seal the aspirator bulb outlet with one finger of the right hand. As long as both fingers are held in place the bulb should remain deflated. If the bulb fills, then there is a leak in the flow system, which includes: the filament, aspirator bulb, or inlet and outlet fitting gaskets. To check the aspirator exhaust valve for leakage, close inlet of the instrument with one finger of the left hand; then depress the aspirator bulb. The bulb should not completely inflate in less than 6 seconds.

To check for flow (after checking for leaks), depress the aspirator bulb without blocking either intake or exhaust. The bulb should fill completely in 1 to 2 seconds, if not, see maintenance sections: Filter Chamber, Flow Regulating Orifice, and Flashback Arrestors and/or replece the aspirator bulb assembly.

THE FLOW REGULATING ORIFICE

An orifice controlling the rate of flow through the Model 2A Explosimeter is located in the aspirator bulb coupling. It may be screwed out after the rubber tubing connection to the bulb is removed. It is made of a special non-corrosive material. If it is clogged, it may be cleaned by pushing a fine wire through its opening.

FILTER CHAMBER

The Model 2A Explosimeter has a filter chamber integrally cast in the case. It is reached by unscrew-

ing the sampling line coupling. A cotton Filter (Part No. 16499) should be inserted to remove dust or liquid from incoming sample. An activated charcoal filter (Part No. 14318) should be used when it is desired to differentiate between illuminating gas and petroleum vapors. The petroleum vapors are absorbed by the activated charcoal.

An inhibitor Filter (Part No. 47740) must be used when the atmosphere contains or is suspected of containing vapors of leaded gasoline

METER

If the mechanical ZERO setting of the meter has been disturbed in transport or by accident and the meter pointer is not on the ZERO line when the current in instrument is "OFF", set pointer to ZERO by slowly turning screw on meter face with a small screw driver.

It is recommended that at the end of a series of tests the instrument be flushed by aspirating in fresh air to eliminate traces of combustible vapors that may have been absorbed.

After periods of idleness or considerable operation in severely corrosive atmospheres, the contacts of the rheostat may become tarnished causing erratic response to the operating control. This may be corrected by removing the batteries and turning the operating control back and forth a number of times.

SPECIAL SAMPLING APPLICATIONS

DILUTION INSERTS

Dilution inserts are available for estimating or comparing concentrations of combustible gases that are in excess of the lower explosive limit (100% LEL instrument meter reading) or when the sampled atmosphere is oxygen-deficient (less than 10% oxygen).

For example, these inserts can be used when testing bar holes in the ground adjacent to a leak in a buried gas pipe or when following the purging of a closed vessel that has contained flammable gases or

vapors. Dilution inserts are available in 1 to 1, 10 to 1, and 20 to 1 ratios. They are designed to provide 1 volume of sample in 2, 10, and 20 volumes of the diluted mixture, respectively.

The dilution insert should be connected between the sample inlet of the instrument and the sampling line. To determine the approximate concentration of combustible gas in the sampled atmosphere, the meter reading must be multiplied by the following factors:

- 1 to 1 Dilution Insert: Multiply meter reading by 2
- 10 to 1 Dilution Insert: Multiply meter reading by 10
- 20 to 1 Dilution Insert: Multiply meter reading by 20

Dilution inserts should provide sample dilutions within ± 10% accuracy when used with a 15-foot sampling line (MSA Part No. 11912). Shorter or longer sampling lines may be used, but the accuracy of the dilution will be reduced. With 5-foot sampling lines, the readings may be as much as 20% high. With 50-foot the readings may be as much as 20% low.

ORDERING INFORMATION

DILUTION INSERT	PART NO.
1 to 1	85375
10 to 1	45174
20 to 1	11377

PRESSURE TESTING BAR HOLES

In some instances where bar holes are drilled to locate pipe line leaks, a group of holes, all containing pure gas may be found. This condition usually occurs near a large leak. It is expected that the gas pressure will be greatest in the bar hole nearest the leak. The instrument may be used to locate the position of the leak by utilizing this bar hole pressure. This is done by observing the time required for this pressure to force gas through the instrument sampling line. A proble tube equipped with a plug for sealing off the bar hole into which it is inserted is required. The following test procedure should be followed.

Aspirate fresh air through the Model 2A Explosimeter then unscrew the aspirator bulb coupling. This removes the flow regulating orifice from the instrument. Adjust the rheostat until the meter pointer rests on "ZERO."

The probe tube is now inserted in the bar hole and sealed off with the plug. Observe the time at which this is done. Pressure developed in the bar hole will force gas through the sampling line to the instrument. This will be indicated by an upward deflection of the meter pointer as the gas reaches the detector chamber.

Determine the time required for the gas to pass through the proble line. The bar hole showing the shortest time will have the greatest pressure.

When the upward deflection of the meter pointer starts, turn off the instrument, replace the aspirator bulb and flush out the probe line for the next test.

QUESTIONS AND ANSWERS

1. Should the meter pointer go to the upper end of the scale as the Model 2A Explosimeter is turned on and cannot be returned to ZERO by counterclockwise rotation of the rheostat:

(a) The combustion chamber may be filled with an explosive mixture. Flush with air free of combustible gases.

(b) The connection to the detector unit may be loose. (Page 10.)

(c) The detector unit may be burned out. (Page 10.)

2. Should the meter pointer start up the scale when the instrument is turned on and then return to a point below ZERO and cannot be adjusted to ZERO by extreme clockwise rotation of the rheostat:

(a) The dry cells may require replacement. (Page 8.)

(b) There may be a very high concentration of combustible gases in the combustion chamber. Flush with air free of combustible gases.

3. Should the meter pointer go directly to some point below ZERO and cannot be adjusted to ZERO with the Rheostat:

(a) The detector unit terminals may be touching each other. (Page 10.)

(b) The ballast lamp may be loose in its socket or may be damaged and require replacement. (Page 10.)

4. Should the meter pointer move up scale more than one division when the instrument is operated in fresh air, the flashback arresters are clogged. (Page 11.)

5. Should the operation of the instrument be sluggish and require more than the specified number of aspirations for maximum deflection of the meter pointer:

(a) The flashback arresters may be clogged. (Page 11.)

(b) The flow orifice in the aspirator coupling may be plugged. Clean with fine wire.

(c) Cotton filter may be plugged. (Page 13.)

(d) The aspirator bulb may be damaged. Replace with new aspirator bulb.

6. Should the motion of the meter pointer be erratic as the rheostat knob is adjusted, the rheostat contact requires cleaning. (Page 13.)

7. Should service other than that outlined be necessary, instrument should be returned to Mine Safety Appliances Company, Repair & Customer Service Dept., at one of the following addresses:

1000 Cranberry Woods Drive,
Cranberry Twp., PA, U.S.A. 16066

or

Parque Industrial El Marques
Lote 2, Manzana 8
Autopista Mexico-Qeretaro KM. 115.5.
MPO. EL Marques QRO. MEX 76240

REPLACEMENT PARTS AND ACCESSORIES

FOR EXPLOSIMETER® MODEL 2A combustible gas indicator

Combustible Gas Indicator

When ordering replacement parts specify Part Number and give Description.

Pt. No.	Description
89220	MSA EXPLOSIMETER Combustible Gas Indicator Type Model 2A complete with carrying straps, less sampling lines
11354	5 ft. Sampling Line complete with couplings
11955	10 ft. Sampling Line complete with couplings
11912	15 ft. Sampling Line complete with couplings
11913	25 ft. Sampling Line complete with couplings
11957	35 ft. Sampling Line complete with couplings
11958	50 ft. Sampling Line complete with couplings
85375	Dilution Insert, 1:1 ratio
11377	Dilution Insert, 20:1 ratio
45174	Dilution Insert, 10:1 ratio
11960	4 ft. Solid Probe Rod
11961	3 ft. Hollow Brass Probe Tube
11355	Replacement Filament Unit
30052	Dry Cell (6 required)

52148 Ballast Lamp
14318 Cartridges, Charcoal, pkg. of 6
16499 Cotton Filters, pkg. of 6
15264 Flashback Arrester (2 required)
47740 Inhibitor Filters, pkg. of 6
74814 Line Trap Assembly
994198 Instruction Manual
16839 Aspirator Bulb Assembly

CALIBRATION TEST SYSTEM

459948 Flow Control
449401 Adapter-Hose
459945 Calibration Gas Methane 2.0%
459942 Calibration Gas Methane 2.5%

MSA

(L) Rev. 9

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MANUAL NO. 994198