

INTERSCAN CORPORATION

MODEL GF1900 VIKANE ANALYZER

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GF1900 SIMPLIFIED OPERATING INSTRUCTIONS

*****Cautions*****

- 1) Make sure the doors are securely fastened before connecting the GF1900 to a power source. Contact with some of the internal parts **WILL PRODUCE SEVERE BURNS**.
- 2) **DO NOT** attempt to use in areas where gasoline, sulfur compounds, or highly flammable vapors are present. The presence of any of these could produce erroneous readings, **OR WORSE...A VIOLENT EXPLOSION**.
- 3) **DO NOT** use long lengths of sample tubing unless the unit is calibrated with the tubing connected.
- 4) Areas which operate mobile phones, CB's, etc., may cause electronic interference. This is evidenced by random or erratic meter deflection.

OPERATION

- 1) Turn the control knob to the **OFF** position and connect a power supply or battery pack. Screw the connector all the way down.
- 2) Turn the control knob to **ON** or **BAT TEST** and wait for the **READY** indicator to light.
- 3) After the **READY** light is ON, set the meter to **ZERO** with the **ZERO knob**.

NOTE: For best results (to prevent zero drift) the **first** time the monitor is used during the day, set the meter to 20 after the **READY** light is ON. If the meter is moving up or down, wait until it stops. Then adjust the meter to **ZERO**. An alternative is to turn the unit **ON** in the shop, first thing in the morning for 20 or 30 minutes. In this case, no meter adjustment is necessary.

- 4) The unit is now ready to use.
- 5) When using the battery pack, the **LO BAT** indicator will light when there is approximately 10 minutes operating time left. After the light is ON, turn the control knob to **BAT TEST** to see if the meter is ON, or to the left of the **BAT** line. If the meter is to the right of the line, turn back to **ON** for continued gas readings. Check the battery condition every few minutes. When the meter shows **LO BAT**, turn the control knob to **OFF**.
- 6) Recharge batteries overnight.
- 7) Approximately 70 minutes operating time is available with a fully-charged battery pack.
NOTE: Disregard a **LO BAT** indication when using an AC power source.

CALIBRATION:

Should be done every 3 months or more frequent

- 1) Use a sample bag and the same length of tubing to be used in the field.
- 2) Wait 10 minutes after the READY light is ON and set the meter to 20. Make sure the meter is **not** moving. If it is, wait until it has stopped.
- 3) Set the meter to ZERO and connect the sample bag. Wait 3 minutes and then adjust the meter to the gas concentration with the SPAN adjust.
- 4) Remove the bag and see how long it takes the meter to fall below 10% of the calibration value. If this exceeds 5 minutes, wait an additional 10 minutes and re-calibrate.

Battery Warranty

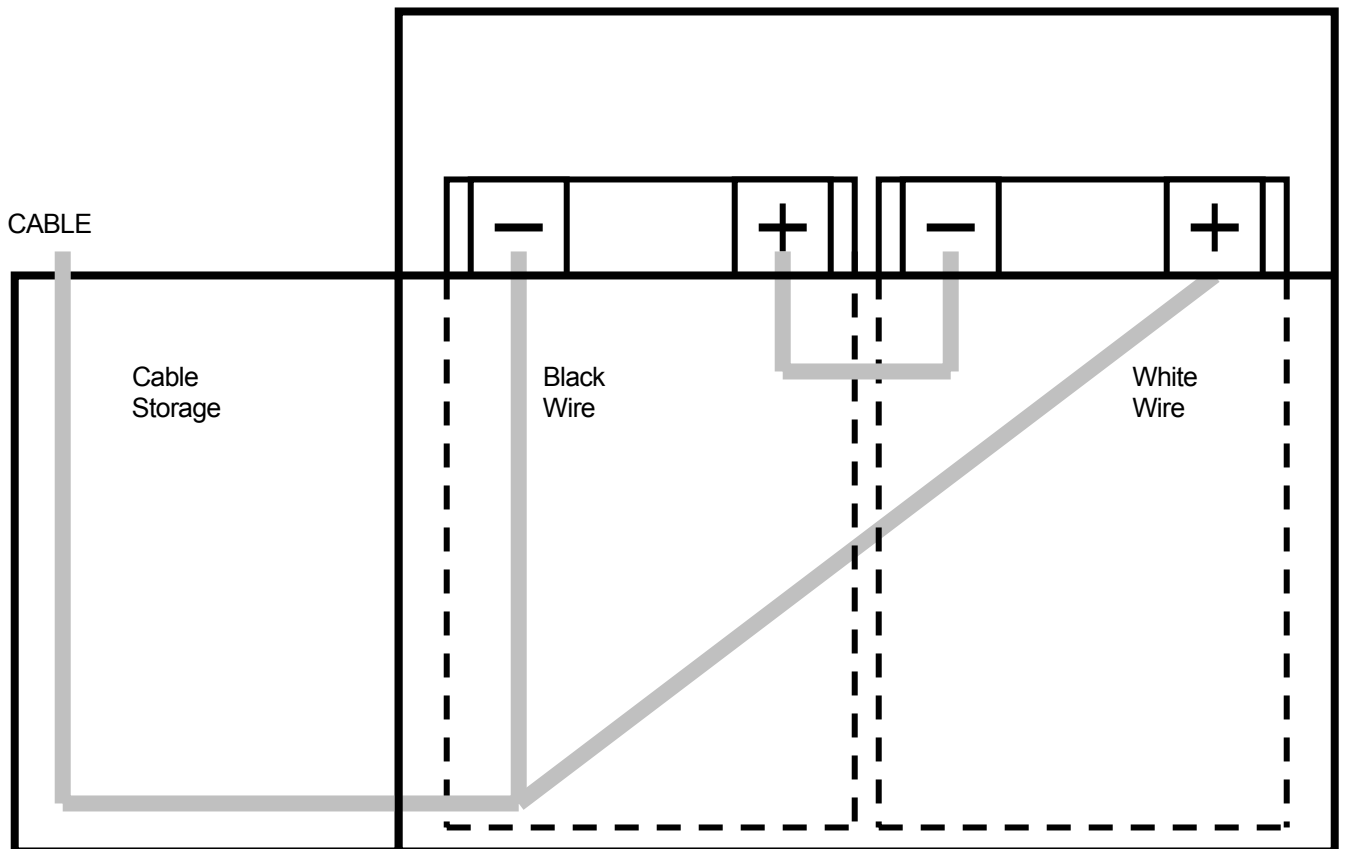
***** I M P O R T A N T *****

THERE IS NO WARRANTY ON BATTERIES.

Discharging the battery pack below the meter indicator can shorten battery life. If the discharge is excessive, permanent damage to the batteries can result. In addition low discharge will blow fuses in battery charger due to excessive current draw.

BATTERY PACK WIRING INSTRUCTIONS & DIAGRAM

- 1) Connect black wire to the negative terminal of battery, which is on the same side as the cable storage.
- 2) Connect a jumper wire between the positive of the first battery and the negative of the second.
- 3) Connect the white wire to the positive terminal of the second battery.
(REFER TO DIAGRAM BELOW)



1.0 EQUIPMENT DESCRIPTION

1.1 Top Panel

<u>DESIGNATION</u>	<u>FUNCTION</u>
READY	When illuminated, indicates that the pyrolyzer has reached operating temperature.
LOW BAT	LED. When illuminated, indicates that the battery pack can provide approximately 10 minutes additional operating time.
SPAN	25-turn potentiometer with screw-driver adjustment. Sets meter to a reading corresponding to the concentration of the span gas used in calibrating the instrument.
ON	When illuminated, indicates the unit is turned on, via rotary switch to any position other than OFF.
OFF/ON/BAT.TEST	Rotary switch, as follows: OFF.....All power is off. ON.....Power is turned on to analyzer and pyrolyzer. BAT.TEST...Indicates state of charge of the Pb/PbO ₂ batteries, at the panel meter.
ZERO	10-turn potentiometer. Zeros meter by nulling out any background signal in sensor.

1.2 Front / Rear

<u>DESIGNATION</u>	<u>FUNCTION</u>
MS CONNECTOR	Input for either A.C. power supply or battery pack.
1/4" O.D. COMPRESSION TYPE TUBE FITTING.....	Sample inlet.

2.0 SYSTEM DESCRIPTION

2.1 Introduction

The Vikane analyzer is a direct-reading, either battery or line-operated unit, with integral sample pump and a pyrolyzer that converts the Vikane to SO_2 . In operation, the SO_2 is drawn through the sensor. Sample concentration is displayed directly in parts-per-million. Since the method of analysis is not absolute, prior calibration against a known standard is required. Exhaustive tests have shown the method to be linear; thus, calibration at a single concentration is sufficient.

Essential components of the unit are the sensor, electronic circuitry including zero compensation, sensor biasing, amplification, and power regulation; sample pump, pyrolyzer, display, and power source.

The pyrolyzer operates at 1000°C . However, even at this temperature, conversion efficiency is quite low, so flow rate and temperature stability are critical. The pump is the dual diaphragm high flow model, regulator controlled. In addition, the intake is open to air to allow full running speed, which further assures smooth, uninterrupted flow.

The furnace (pyrolyzer) is primarily controlled by a chromelalumel thermocouple. When a preset (adjustable) thermocouple voltage is reached, an oscillator is turned on. This output is connected to the READY L.E.D., and the furnace pass transistor regulator. The oscillator prevents the furnace from turning off completely, and establishes an average operating current.

Useful battery life terminates at 20V. The low battery L.E.D. is set at approximately 22V. This allows an average 10-minute warning before the meter dips below 80% of scale, as indicated on the panel meter.

2.2 Sensor Description & Operating Principle

The INTERSCAN voltammetric sensor is an electrochemical gas detector operating under diffusion controlled conditions. Gas molecules from the sample are adsorbed on an electrocatalytic sensing electrode, after passing through a diffusion medium, and electrochemically reacted at an appropriate sensing electrode potential. This reaction generates an electric current directly proportional to the gas concentration. This current is converted to a voltage for meter readout.

2.3 Circuit Description (Refer to Drawing #VK-4259).

With the mode switch ON, 24V is applied to Q2, Q4, and to the fan through R10. Q2 provides +5V to the pump and all amplifier circuits. Q4 is adjusted to approximately 17V. U3 is a converter which produces -5V for the sensor amplifiers.

The 1.2V, from reference CR1, is divided by R1, R2, and applied to buffer U1-C. This produces the proper sensor bias. The sensor output is amplified by U1-A and applied to span control R28. The adjustable zero circuit divider provides a small variable current to U1-A for establishing a base line before sample or span gas is introduced. U1-B is a buffer between the control and meter. In TEST position, the meter connects to R9 for battery charge indication.

When power is first supplied, Q4 produces a DC output saturating Q5 and provides maximum current to the furnace. F2 protects the furnace in the event of a CE breakdown. The furnace thermocouple connects across R13 and its output is amplified x100 by U2-A. When U2-A output exceeds the preset voltage of R26 and R27 divider, U2-B switches and begins oscillating at a rate determined by R22 and C8. The oscillating voltage turns on CR2 and is applied to the control terminal of regulator Q4 through Q1. The output oscillation of Q4 is dampened by C7 and prevents Q5 from turning off completely. The Q5 emitter will typically fall only 4V below the base.

2.4 Battery Pack

The batteries supplied are two each: 12V, 7 Ah gel-type, Pb/Pb₂. When fully charged, they will lose approximately 4% of capacity per month of storage. Operating temperature is -60 to +60°C (-76 to 140°F). Charging characteristics are similar to other lead acid type batteries. Do not attempt to charge from a conventional 12V charger. If other than a factory-supplied charger is desired, correct parameters must be established. Any battery with at least 6.5 Ah capacity can be used. Cable connections must be exactly as per the original. (The same applies when replacing gel cells). Polarity reversal of the battery pack will possibly destroy the transistor Q5.

Do not store batteries for periods longer than one month. Pb/Pb₂ must be kept on trickle charge to maintain maximum life.

2.5 Battery Charger

The charger is designed for gel-type batteries. It is current-limited to approximately 1A initial rate. When sufficient charge is developed, a float level maintains the batteries at the proper potential.

Full charge is accomplished in less than 10 hours, and is indicated by the LED above the connector. Two battery packs may be charged simultaneously.

2.6 Power Supply

The supply GFPS-1297 is a purchased item, which is equipped with a handle, line cord (6 inches), and DC cable (11 inches) at the factory. Any 24V supply capable of sustaining 5A can be used. Cable connections to the supply are:

Black.....Positive
Green & White...Negative

Polarity reversal can destroy transistor Q5.

3.0 INITIAL CHECKOUT

3.1 Input Power Test

Connect battery pack and/or A.C. power supply separately to analyzer at the MS Connector. Turn unit on. Note that **ON L.E.D.** illuminates. Wait for **READY** light to illuminate.

3.2 Proper Sensor Operation

With unit turned On, after **READY** light appears, adjustment of the **ZERO** control should give both positive and negative meter deflection. If this does not occur, proceed to Section 7.0.

3.3 Pneumatic and Mechanical Connections

Remove the two cover-retaining screws and open the cover. Inspect the inside of the analyzer for any loose or completely detached pneumatic or mechanical connections. The internal configuration of the unit is such that these faults will usually be readily apparent, and fixing these faults will be relatively simple.

4.0 Optional



5.0 CALIBRATION AND OPERATION

5.1 Calibration

The instrument is calibrated by introducing into it, a known concentration of Vikane gas, and adjusting the SPAN control to correspond to the known analysis of the gas.

5.2 Calibration Procedure

With the unit turned on and sufficiently warmed up with the **READY** light illuminated, zero the analyzer with the **ZERO** control. Fill a sample bag with Vikane standard, and connect it to the inlet, allowing the gas to flow for at least 3 minutes. **DO NOT ATTEMPT TO INTRODUCE THE VIKANE STANDARD DIRECTLY FROM A PRESSURIZED SOURCE. A SAMPLE BAG MUST BE USED. Do not introduce gases higher than 50 ppm.**

Using the **CAL** control, set the meter to a value corresponding to the span gas concentration. Disconnect the sample bag. Allow to stabilize for 3 minutes. Repeat procedure two additional times. The readings should be within ± 2 divisions of the average of your three readings.

6.0 MAINTENANCE

6.1 Furnace (Pyrolyzer) Replacement (Refer to Drawing V-4260).

Make sure power is disconnected from the analyzer

Remove the thermocouple leads at terminals 3 and 6 of the terminal block. For easy access, loosen the sensor clamp screw and lift the sensor out, placing it on the fan. It should not be necessary to remove any tubing.

Minimize twisting by supporting the end fittings, as shown in the drawing, before loosening the coupling nuts. Before installing the replacement furnace, loosen the screws on the slotted support bracket. Drill and tap (6-32), two new holes $\frac{1}{4}$ inch from old toward door. This allows for newer furnaces which may be longer or shorter than original equipment. **First test fit of new furnace. Move slotted mounting bracket screws to a position that does not distort the furnace fittings. Failure to check this may damage furnace. Do not twist furnace fittings as they are a press fit and can be damaged.**

Position the furnace and hand-tighten the coupling nuts. Secure the bracket and snug-up (**DO NOT USE EXCESSIVE TORQUE**) the coupling nuts, using the wrench support as before. Connect thermocouple wires and replace the sensor. Close the top to position the insulator so it does not lay against the furnace.

7.0 TROUBLESHOOTING □

(Refer to Drawings VK-4259 & VK-4260).

7.1 READY light does not illuminate.

Check that the POWER L.E.D. is on. If it is not:

- 1) Check the main fuse.
- 2) Check that the rear connector is tight.
- 3) Check the power source for a nominal 24V.
- 4) Check that the circuit board connector is tight.

If POWER L.E.D. is on:

- 1) Carefully check that the furnace is cold.
- 2) If furnace is cold, check for an open 4A fuse.
- 3) If fuse is good, disconnect the power source and connect an ohmmeter across the furnace support brackets. The reading should be less than 5 ohms.

If the furnace is good, re-connect the power source and turn the analyzer on.

With a DVM, check the voltage at the Q4 regulator output. It would read between 15.3 and 16.5V.

If regulator output is normal, check for the same voltage at Q5 base and for 24V at the collector. Normal readings here indicate a failed Q5, or discontinuity between the furnace and emitter, or furnace and ground.

To check Q4:

- 1) If Q4 output is close to zero and feels hot, C7 may be shorted.
- 2) If Q4 is cool, check for 24V at the input.
- 3) Check the voltage at the "R" terminal. If it is 1V or less and the output is around 2V, Q1 has failed or is being turned on.

Furnace is hot, READY light is not on.

Thermocouple may be defective. Check across leads for mV reading. Reading should be greater than 20 mV after 5 minutes.

If thermocouple is okay, R27 may be set incorrectly. With the thermocouple reading approximately 30 mV, adjust R27 to get a READY indication.

7.2 No response to Vikane. Furnace hot.

Make sure that the hole in the Sensor inlet fitting is not blocked.

Check that banana plug is in sensor and clamp is tight.

Check for approximately 600 mV on sensor clamp.

Check that meter responds to ZERO control.

Connect rotameter to inlet and open valve completely. Check for approximately 100 cc/min flow.

7.3 Meter off scale. No response to ZERO control.

Remove sensor banana plug and check for ZERO control.

If control restored, check for approximately 600 mV at sensor clamp.

Check output of Q2 for 5V.

Check output of U3 for -5V (pin 5).

Sensor clamp voltage not 550 mV (± 15 mV).

Check reference voltage at CR1. This should read between 1.21 and 1.23 V.



8.0 WARRANTY

INTERSCAN CORPORATION warrants portable analyzers and continuous monitoring systems of its manufacture (sensors, batteries, fuses, lamps, tubing, fittings, filters and scrubbers excepted) to be free from defects in material and workmanship for a period of one (1) year from date of shipment. INTERSCAN CORPORATION warrants sensors of its manufacture to be free from defects in material and workmanship for a period of six (6) months from date of shipment.

INTERSCAN CORPORATION's sole obligation under this warranty is limited to repairing or replacing, at its option, any item covered under this warranty, when such item is returned intact, prepaid to the factory (or designated service center).

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons, or which have been subject to misuse, negligence, or accident, incorrect wiring by others, installation or use not in accordance with instructions furnished by the manufacturer, or which have had the serial numbers altered, effaced, or removed. The sensors are factory sealed and must not be opened or modified in the field for the warranty to remain in effect. This warranty is in lieu of all other warranties, whether expressed or implied.

Additionally, in a custom system, warranty on any component shall not exceed the manufacturer's warranty given to INTERSCAN CORPORATION.

9.0 Parts List

Parts List...Interscan Model GF1900

RESISTORS

R1	6192F	R14	2430F
R2	4992F	R15	1001F
R3	49R9F	R16	20K Ω
R4	2492F	R17	51 Ω
R5	4992F	R18	1003F
R6	2492F	R19	5.1K Ω
R7	27K Ω	R20	1.2K Ω
R8	1001F	R21	1273F
R9	2552F	R22	10M Ω
R10	47 Ω , 1W	R23	7501F
R11	56 Ω	R24	100 Ω
R12	4021F	R25	1.2K Ω
R13	100K Ω	R26	4991F

RESISTORS, VARIABLE

R12	50k Ω , 3262X-1-503/BOURNS
R27	20K Ω , 3262X-1-203/BOURNS
R28	10K Ω , 3250w-1-103/BOURNS
R29	50K Ω , 3590S-2-503/BOURNS

CAPACITORS

C1	47 μ F, TANTALUM, 6VDC
C2, C3, C6	10 μ F, TANTALUM, 25VDC
C4	6.8 μ F, TANATALUM
C8	
C5	1000 μ F, ELECTROLYTIC

INTEGRATED CIRCUITS, SEMICONDUCTORS

U1, U2	QUAD OPERATIONAL AMPLIFIER	LM324N
U3	VOLTAGE CONVERTER	ICL7660CPA
CR1	1.2V REFERENCE DIODE	AD589JH
CR2, CR3, CR4	LED, RED	EBR5704S
CR5	5W, ZENER DIODE	1N5347
Q1	TRANSISTOR	2N4013
Q2	+5VDC VOLTAGE REGULATOR	LM340T5
Q4	VARIABLE VOLTAGE REGULATOR	LM317T

MISCELLANEOUS

BEZEL, LED (3)	816-1
CIRCUIT BOARD	ISSC-2013-2 REV C
F1	AGC5/BUSS, MAIN FUSE
F2	AGC4/BUSS, FURNACE FUSE
FAN	DB131L
FURNACE	GFF1901/INTERSCAN
FITTING, INLET	4BU OR 4BU-316/GYRO
FITTING, SENSOR INLET	TE2023/THOGUS
FITTING, SENSOR OUTLET	40-4-2/JACO
METER, 1mA	2025/hoyt
PUMP	10109/GILIAN
Q5, INSULATOR	4651
Q5, HEAT SINK	5029B-3/AAVID
Q5, TARNISISTOR	2N3055
RESISTOR, AMPLIFIER LEAD	5.1 Ω
ROTARY SWITCH	73-1088/STACKPOLE
SENSOR, ELECTROCHEMICAL	VOLTAMETRIC
	113-P/INTERSCAN

10.0 ELECTRONIC SCHEMATICS



11.0 RETURN AUTHORIZATION

All returns for repair require a □□RETURN AUTHORIZATION NUMBER □□ issued by the INTERSCAN Service Department upon request.

This is done primarily to cause the user to contact the factory directly, as a high percentage of service problems can be resolved over the telephone, avoiding the need for returning the instrument or part. In other cases, the Service Department may ask for return of the circuit board only.

The user is advised to consult the "TROUBLESHOOTING" section (Section 7) of the manual prior to contacting the factory. Instructions are simple, and no electronic repair background is necessary. This will avoid erroneous conclusions by the user as to the problem before contacting the factory.

Should return of the instrument or part be advised by the Service Department, the "RETURN AUTHORIZATION NUMBER" will expedite prompt return of the repaired unit.

For service information please contact:

INTERSCAN CORPORATION
Service Department
1 800 458-6153 (USA & CANADA)
(818) 882-2331
FAX: (818) 341-0642
<http://www.vikanemonitor.com>
<http://www.gasdetection.com>
service@gasdetection.com