



Interscan Corporation

Instruction Manual

4000 Series Compact Portable Analyzer

INTERSCAN CORPORATION

4000 SERIES MANUAL

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Equipment Description

1.1 Front Panel

<u>Designation</u>	<u>Function</u>
ALARM LIGHT:	Lamp. Flashes ON/OFF when alarm set point is exceeded.
ALARM SET:	25-Turn potentiometer with a screwdriver adjustment. Sets the alarm trip point at the desired PPM level. A LCD is provided on some models.
AUIDIBLE ALARM:	Horn. Sounds when alarm set point is exceeded.
FUNCTION SWITCH:	Rotary switch as follows:
OFF:	Analyzer power is OFF.
ZERO:	Analyzer power is ON (pump is OFF).
SAMPLE:	Analyzer power and pump are on. In this position the instrument is zeroed, sample measurements are taken and calibration is done.
BAT. TEST A:	Indicates state of charge of the Nickel-Cadmium batteries at the panel meter. These batteries power the pump and the recorder (if provided).
BAT. TEST B:	Indicates state of charge of the "C" size alkaline batteries at the panel meter. These batteries power the circuitry and are NOT re-chargeable.
POWER LIGHT:	Lamp. When illuminated, indicates that unit is turned on (via FUNCTION Switch) to any position other than OFF.
RANGE:	Toggle switch. Allows multiple ranges to be selected. Lo= Low Range, Hi= High Range.
SPAN:	25-Turn potentiometer with a screwdriver adjustment. Sets the meter to correspond to the concentration of the calibration gas used for calibrating the instrument.
ZERO:	10-Turn Potentiometer. Allows the meter to be adjusted to zero by compensating for any background signal.

1.2 Rear Panel

<u>Designation</u>	<u>Function</u>
INLET:	¼" OD compression gas fitting.
OUTLET:	¼" OD compression gas fitting
RECORDER OUTPUT:	¼" phone jack for #4990-B-36 recorder output cable.

WARNING: DO NOT CONNECT TO A RECORDER IF IN A HAZARDOUS ATMOSPHERE.

CHARGER INPUT: 3.5mm phone jack for 9V DC, 100mA charger input.

WARNING: DO NOT CONNECT BATTERY CHARGER IF IN A HAZARDOUS ATMOSPHERE.

General Information

See Section 4.0 for Special Instructions

2.1 Monitor Description

The INTERSCAN 4000 Series Portable Analyzer is a direct-reading, battery-operated unit with integral sample pump. The detection element is an electro-chemical voltametric sensor, designed for long term, reliable performance.

In operation, sample gas is drawn through the sensor. Gas concentration is displayed directly in parts per million. Since the method analysis is not absolute, prior calibration against a Known standard is required. **ALL INTERSCAN MONITORS ARE CALIBRATED AT THE FACTORY PRIOR TO SHIPMENT.** Exhaustive tests have shown the method to be linear, so that calibration at a single concentration is sufficient, independent of the range.

Essential components of the unit are the sensor, batteries and electronic circuitry including: zero compensation, sensor biasing, amplification, alarm elements, sample pump and display.

2.2 The INTERSCAN Sensor

The patented two-electrode configuration of the INTERSCAN sensor has several advantages not found in either 3-electrode sample-draw sensors or in 2 or 3-electrode diffusion-mode sensors. The INTERSCAN sensor electrolyte is immobilized, similar to the electrolyte in flashlight and nickel-cadmium batteries. One need not be concerned therefore, about cell rupture or acid damage to the instrument. The absence of free electrolyte eliminates undesirable sensor noise, particularly when high amplifier gain is required for low concentration measurements. Unlike 3-electrode sensors, the INTERSCAN sensor has a sealed reservoir. Not only does this give a much longer sensor life, but also the possibility of reference electrode contamination is eliminated. Unlike the 3-electrode sensors, which require air to operate, the INTERSCAN sensor may be used in an anaerobic environment if desired.

The INTERSCAN sample-draw sensor is a high sensitivity detector with sensitivity 50 to 200 times greater than a diffusion-mode sensor, depending on the gas type. A much lower minimum detectability is possible... an important requirement for measuring gas that has a low TLV.

2.3 Principle of Operation

The INTERSCAN voltametric sensor (U. S. Patent Number 4,017,373) is an electrochemical gas detector operating under diffusion-controlled conditions.

Gas molecules from the sample are adsorbed on an electro catalytic-sensing electrode, after passing through a diffusion medium, and are 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 or recorder readout:

The diffusion limited current; i_{lim} is directly proportional to the gas concentration according to the simplified equation:

$$i_{lim} = \frac{nFADC}{\delta}$$

Where i_{lim} is the limiting diffusion current in amps, **F** is the Faraday constant (96,500 coulombs), **A** is the reaction interfacial area in cm^2 , **n** is the number of electrons per mole reactant, δ is the diffusion path length, **C** is the gas concentration moles/ cm^3 , and **D** is the gas diffusion constant, representing the product of the permeability and solubility coefficients of the gas in the diffusion medium.

An external voltage bias maintains a constant potential on the sensing electrode, relative to a nonpolarizable reference counter electrode in the 2-electrode INTERSCAN sensor. "Nonpolarizable" means that the counter electrode can sustain a current flow without suffering a change in potential. Thus, the counter electrode acts also as a reference electrode, thereby voiding the need for a third electrode and a feedback circuit, as would be required for sensors using a polarizable air counter-electrode.

Operating Instructions

See Section 4.0 for Special Instructions

Your INTERSCAN monitor has been calibrated at the Factory and is ready for use.

3.0 Inspection

Open the box (es) and inspect for damage immediately upon receipt. Examine the Contents list and ensure all items that were shipped have been received. Contact INTERSCAN and report any damaged or missing items immediately. Items discovered “missing” more than 30 days after shipping, will not be replaced at no charge.

3.1 Checking the Batteries

Battery condition is indicated by the analyzer panel meter. Prior to field use, the battery condition must be checked. Turn the **FUNCTION** switch to BAT. TEST “A”. This position tests the condition of the re-chargeable pump batteries. If the meter is reading in the lower half of battery check region, the batteries either need to be charged or replaced. (see Section 6.2)

Turn the **FUNCTION** switch to BAT. TEST “B”. This position tests the analyzer amplifier batteries. These batteries supply power to the sensor and keep it in a state of readiness whether the analyzer is on or not. To be safe, it is good practice to replace these batteries before the indicator reaches the “REPLACE” line.

3.2 Setting the Alarm (if applicable)

Normally, the alarm is set at the Factory at 50% of full scale. The alarm can be reset to any desired level by following the procedure below.

Set **FUNCTION** switch to **ZERO**. Select low range on multi-range units. Using the **ZERO** control, advance the meter to the desired alarm set point. Single high range units may require high ppm gas to set alarm. Adjust the **ALARM SET** control until the alarm sounds. Adjust the **ZERO** control slightly counterclockwise until the alarm is silent. Slowly adjust the **ZERO** control clockwise until the alarm sounds. Re-adjust the **ALARM SET** control if necessary. Adjust the **ZERO** control for a reading of "0" on the meter.

NOTE: The alarm set point is attenuated via the **RANGE** switch to the same meter position (% of full scale), rather than the same numerical value.

e.g. In a 0-100/0-500 ppm dual range unit, a 50 ppm set point on the low range would become a 250 ppm set point when switched to the high range.

3.3 Zeroing the Instrument

The unit should always be adjusted to read "0" on the meter just prior to gas sampling. If the analyzer is Formaldehyde, Hydrazine, Ethylene Oxide, or if the analyzer full scale measuring range is 2 ppm or less, zero adjustments must be made in the **SAMPLE** mode, i.e. with the pump on, in free air of interfering gases. If necessary, use zero air or a filter type C-12 to zero in the sampling area. When using C-12 zero filter, connect externally to gas inlet. Allow approximately 20 minutes or until the meter needle is stable before adjusting **ZERO** control to zero meter. Remove the C-12 filter.

Set the **FUNCTION** switch to the **ZERO** position. Adjust the meter to "0" with the **ZERO** control knob. If the analyzer has more than one measuring range, always use the lowest range to set the zero.

3.4 Sampling

Set the **FUNCTION** switch to **SAMPLE** to actuate the pump. The analyzer is now in the sampling mode. If the **INLET** or **OUTLET** is blocked, the pump will probably stall. To restart the pump, set the **FUNCTION** switch to **ZERO** momentarily and then switch again to **SAMPLE**.

Nominal sample rate is approximately 1.0 liter per minute, ± 0.2 liter per minute. The Average sample time, starting with fully charged "C" batteries, is 12 hours. If the **BATTERY TEST "A"** indication is down to 25% of the battery test region, the flow rate may have started to decrease. This is usually not a problem unless very precise readings are required. This is the reason for the precautionary statement in paragraph 6.2.

3.5 Sample Pump Flow Control

The sample pump flow rate is controlled by an adjustable voltage regulator circuit. The flow rate is factory set at approximately 1 liter/minute. If necessary, it may be re-adjusted, however, a flowmeter is required to set the new flow rate. **R28**, located at the bottom of the circuit board, controls the adjustment.

NOTE: Any change in flow rate will change the calibration. Analyzer **MUST** be re-calibrated if flow rate has changed.

Section

4

Special Instructions

Not Applicable for this Instrument

Calibration

See Section 4 for Special Instructions

5.1 Introduction

It is not necessary to calibrate the monitor when received from the Factory, or from an INTERSCAN distributor. All INTERSCAN monitors are calibrated at the Factory prior to shipment. Unless the SPAN adjust is inadvertently changed, there is no need to calibrate the monitor until it has seen considerable usage.

There is no easy answer as to when a monitor should be calibrated. This is strictly a function of the application. INTERSCAN monitors can probably go for months without recalibration. Again, it is a function of usage. The need for calibration is to compensate for any possible decrease in sensor sensitivity. The primary cause of sensitivity decrease is excessive loss of water by evaporation. A secondary cause may be by contamination from unknown sources. H₂S sensors show an additional decrease in sensitivity due to internal sulfur formation, the rate of which depends on the gas concentration.

A good recommendation is to calibrate the monitor every 3 months. A record should be kept of the ppm concentration used to calibrate, as well as the ppm concentration displayed by the monitor prior to adjusting the SPAN adjust. If the difference between these two values is unacceptably high (>10% for example), the monitor should be calibrated more frequently. If the difference is well within an acceptable tolerance (<2% for example), calibrations can be performed less frequently.

The instrument is calibrated by introducing a known concentration of gas and adjusting the SPAN control to the proper ppm level. This fact requires that the analyzed ppm of the gas be accurate. The sources of calibration gas standards include commercially available gas mixtures diluted with air or nitrogen in cylinders, permeation devices, and user dilution of concentrated or high ppm cylinder gases.

Unless cylinder gases are available, most users are either not properly equipped to perform acceptable calibrations, or do not want to be bothered with the procedures necessary to attain an accurate calibration. Added to this is the uncertainty of the labeled ppm value of cylinder gases due to instability over a time period. The reliability varies among span gas manufacturers.

For the above reasons, INTERSCAN offers their "Electronic Calibration Service" (ECS), which permits the user to calibrate their monitors without the use of gas.

Calibration is accomplished by quick and simple adjustments of the ZERO and SPAN controls using a digital voltmeter. See the attached information sheet on ECS.

Calibration can be particularly difficult in the case of Chlorine and HCl gases which are easily chemisorbed, even by chemically inert tubing. HCl calibration is more complex because of the high moisture solubility. ECS is especially recommended for Chlorine and HCl monitors for time saving, trouble-free and reliable calibration. ECS is also strongly recommended for Formaldehyde (HCHO) monitors. Formaldehyde permeation tubes (polyoxymethylene) require a calibrator with a controlled temperature of 90° C.

5.2 INTERSCAN'S Electronic Calibration Service

The factory recommended procedure for calibrating all INTERSCAN instruments, involves the use of span gas or a permeation device. Besides being essential for calibration, having a known certified gas standard on hand allows the user to test the instrument at any time to determine that it "really works".

However, there will be times and circumstances in which calibration using span gas or permeation devices is inconvenient. For this reason, INTERSCAN has developed the Electronic Calibration Service (ECS).

A certified spare sensor is kept on hand to be put into the instrument, while the presently used sensor is sent back to the factory for re-certification. The ECS certification, illustrated on the last page of this section, details zero and span adjustments that are to be made on the instrument, to set it up with the specified, newly certified sensor.

As indicated on the certification sheet, the ECS program verifies sensor sensitivity only. It does not certify the instrument as a whole. Most importantly, the ECS program is not a substitute for basic instrument maintenance, nor does it check for malfunction of the instrument components.

5.3 Calibration Gas Standards

Low part-per-million gas mixtures (in air or nitrogen) are available, with few exceptions, in pressurized cylinders. The major concern in using commercially-available, low ppm mixes of such active gases as SO₂, H₂S, NO, NO₂, Cl₂, etc., is their reliability. The analysis shown on the label is applicable only at the time the analysis was performed. Concentration stability with time varies widely as a function of the gas mix, its container and the manufacturer. Moreover, changes in concentration are not slight. The actual concentration of an unstable gas may be one-tenth of its labeled value. Of particular concern is the stability of H₂S and SO₂ mixtures. Some commercially available mixtures

are unstable, in some cases, in less than a month. INTERSCAN should be consulted for recommendations on commercially available gas mixtures.

An alternative source of calibration gas is the use of permeation devices containing the liquefied gas under pressure. Permeation of the gas in nanogram-per-minute rates, permits the generation of a desired concentration in an air or nitrogen carrier. Varying the temperature, flow rate and emission rate characteristics gives a fairly wide range of gas concentrations. Many gases, including H₂S, SO₂, NO₂, Cl₂, HCl, HCN and Hydrazine (INTERSCAN analyzers are available for all these gases), are ideally suitable to the permeation device technique. With the exception of sophisticated laboratory dilution techniques, Cl₂, HCl and Hydrazine (or MMH and UDMH) permeation devices should only be used for these gases.

The Teflon tube O'Keefe type of permeation device for H₂S requires frequent calibration or independent analytical confirmation, due to a changing permeability caused by sulfur deposition in the walls of the tube. These **ARE NOT** recommended.

An excellent source of calibration gas, is the gas syringe dilution of high ppm (several hundred) gas mixtures, or 100% gas. While this is a reliable and accurate method, it is not convenient for most field applications.

5.4 Sample Bag Calibration

Whatever the source of calibration gas, the recommended method is to collect the gas in the proper sample bag, which is then attached to the analyzer. The calibration gas is drawn through the sensor by the sample pump. An exception to the use of a sample bag is for those gases that are reactive with, or chemisorbed by the bag itself (e.g. Chlorine, Hydrazine, see Section 5.8). Teflon or "tedlar" bags are suitable for H₂S, SO₂, NO and NO₂. Several bag materials are suitable for CO. Contact the Factory for recommendations.

The sample bag method is the factory-recommended method. Since an internal pump is used, the same flow rate conditions during the sample and the calibrate modes are assured, eliminating errors due to flow rate differences. For most applications, using a bag is the simplest procedure. A regulated pressurized cylinder fitted with a tee-manifold and unrestricted vent is a good procedure, as long as the flow rate of the gas exceeds that of the sample pump.

5.5 Permeation Devices

The use of a permeation device is prescribed as the preferred method for calibrating most instruments, excluding the CO and NO monitors. In addition, it is the simplest

method to use, and probably the most accurate. The ppm concentration varies directly with the permeation rate, and inversely with the flow rate of the carrier gas. The permeation rate is a logarithmic function of temperature in degrees Celsius. (see Section 5.7)

5.5.1 Auxiliary Equipment

Besides the permeation device, an accurate low flow rotameter, cylinder of zero air or nitrogen, and a thermometer are required. A pump may be used, as an alternative to zero air or nitrogen. Incoming air should be scrubbed for possible interferences. In all cases, only Teflon, Bev-A-Line IV or polypropylene tubing should be used downstream of the permeation device, and preferably should be as short as possible. Tygon or rubber tubing should NEVER BE USED.

5.6 Calibrators

Several calibrators utilizing permeation tubes are available on the market. These range in complexity and price, and are found in both fixed location and portable models. Because some of these may be more sophisticated than required for many monitoring applications, the customer should consult the factory.

NOTE: Refer to Section 4.0 for important information relative to calibrators for Hydrazine.

5.7 Permeation Rate And PPM Calculation

Permeation rate information is included with the permeation device by the manufacturer, specified for some temperature. The rate at other temperatures is calculated from:

$$\log P = \log P_m \pm A (\Delta t^{\circ}\text{C})$$

Where **P_m** is the given permeation rate in ng/min. and **A**, a constant, depending on the permeation device. This is either given direct by the permeation device manufacturer, or is calculated as the slope of the above equation, from known permeation rates at two temperatures. Some manufacturers include the **log P**- temperature chart, from which the permeation rate can be read directly.

The gas concentration is calculated from:
$$\text{ppm} = \frac{P \times K}{F}$$

Where **K** is $\frac{24.46}{\text{Mol.Wt.}}$ and **F** is the carrier gas flow rate, in ml/min, through the permeation device.

5.8 Chemisorbable Gases

See Section 4.0 for Special Instructions

Chemisorbable and moisture soluble gases, such as Chlorine, HCl and Hydrazine require that the carrier gas used with the permeation device be totally dry. This requires an efficient drying agent upstream to the U-tube containing the vial.

Even so, under very humid conditions, the drying agent is rapidly saturated, so only dry zero air or nitrogen in cylinders should be used. To emphasize the importance of this, a loss of 73% of Chlorine has been observed under high humidity conditions (by conversion to HCl and HClO). An even greater loss has been observed in the case of Hydrogen chloride. This is aggravated by the restriction to low ppm values, due to the low permeation rates of the available HCl permeation devices. With the user being unaware of these losses, not only is the instrument grossly out of calibration but its over-calibrated condition results in excessive instability.

Such gases require the use of a TEE or manifold procedure of calibration. Dried and scrubbed air or nitrogen carrier gas is passed at a known and constant flow rate through a chamber containing the permeation tube. The chamber effluent is passed into a TEE manifold with unrestricted vent at its opposite end. The side arm of the TEE manifold is connected to the instrument inlet. This connecting tube, and that linking the permeation tube chamber with the TEE manifold, as well as the TEE manifold itself, must be polypropylene or Teflon. The tubing should be as short as possible.

The system is working properly when no gas flows into the analyzer with the sample pump off. After allowing sufficient time for the permeation tube to equilibrate (under temperature and flow conditions), the sample pump is switched on, drawing the calibration gas through the sensor. The flow rate of the carrier gas should exceed that of the sample pump in the analyzer, to avoid dilution from the vent.

Where good temperature control, or elevated bath temperature (in excess of ambient) are required, the flow rate through the permeation tube should be restricted to 100 ml/min, and diluted with room air to give a total flow rate in excess of the sample pump. Gas concentration is calculated using the total combined flow rates.

Chemisorption by the walls of the connecting tube, and by the filter itself, is a time phenomenon, decreasing gradually over a half-hour period, giving the effect of slow sensor response. True sensor response time requires preconditioning of the connecting tube by allowing the Chlorine or other chemisorbable gases to be drawn through the tubing for some time prior to attachment to the analyzer. This is particularly important for extended life permeation tubes that generate low ppm levels. (For optimum results, such

tubes should not be less than 3 cm of active length. These should last more than 8 months with refrigeration.) This requires bypassing the sensor during the pre-conditioning. Because of degassing, pre-conditioning is not permanent. This chemisorption effect is not serious, because sensor response to changes in gas concentration is always rapid, even during the initial adsorption period.

5.9 Permeation Tube Manufacturers

With the exception of HCHO and Hydrazine gases, most standard permeation devices can be obtained from VICI Metronics (Santa Clara, California), and Kin-Tek (Texas City, Texas). The only recommended permeation device for HCl monitors is VICI Metronics' HCl wafer. For Hydrazine (or MMH and UDMH), & Formaldehyde the factory recommends only the 10 cm Kin-Tek permeation tube.

5.10 Calibration Procedure

See Section 4.0 for Special Instructions

1. Select the range (optional) suitable for the concentration of the calibration gas. (Calibration in one range set the calibration for all ranges).
2. Set the FUNCTION switch to ZERO and zero the analyzer with the ZERO control. If necessary, allow a few moments to achieve a stable setting before making any adjustment.
3. For all gases, except Chlorine or other chemisorbable types, fill the 4 to 5 liter sample bag with calibration gas, and attach it to the external inlet fitting. This is best done by attaching a short length (2 inch/) of 5/16 inch (7.9 mm) O.D. flexible tubing to the sample bag nipple, then attaching the tubing to a 2 inch (51 mm) length of ¼ inch (6.4 mm) O.D. rigid tubing contained within a gas fitting nut securely fastened to the inlet fitting.
4. Set the FUNCTION switch to SAMPLE
5. Allow 2 to 3 minutes for the meter to stabilize, and by using the SPAN control, set the meter to indicate the calibration gas concentration being used.
6. Check the ZERO and SPAN settings, and re-adjust, if required.
7. Remove the sample bag from the analyzer and allow the meter to return to zero.
8. The instrument is now calibrated and set up for operation.

General Maintenance

See Section 4.0 for Special Instructions

6.1 Battery Life

Because of high current requirement of the amplifiers, "C" Size Alkaline battery life is limited to 4-6 weeks, whether the unit is operating or not. Instrument malfunction, as a result of low battery, will show up as either inability to zero the monitor or clipping of the meter at a fixed reading below full scale.

Nickel-cadmium battery life is indeterminate. It is somewhat dependant upon how well the charge level is maintained.

6.2 Battery Charging and Replacement

All models of the 4000 Series analyzers use two "C" size alkaline batteries. These are located on the hinged door, right side. Polarity is marked on the door over the battery holder.

If alkaline batteries are replaced before the Battery Test "B" indicates a low battery condition, a few minutes warm up is needed before using the instrument. If alkaline batteries are low or dead, the instrument should be allowed to sit for 12 to 24 hours after battery replacement. The **FUNCTION** switch should be set to **OFF** during this time. This is to allow the sensor time to stabilize again.

The rechargeable batteries are ½ "C" size nickel-cadmium and are rated at .750-ampere hours. They are mounted on the hinged door, left side. Polarity is marked on the door, over the battery holder. Models that supply power to a DC Rustrak recorder will use four "C" Ni-Cad batteries. All other models use four ½ "C" size Ni-Cad batteries. Condition is shown in the BATTERY TEST "A", **FUNCTION** switch position. The nickel-cadmium battery voltage changes quite rapidly as it approaches the recharge point, which makes

accurate meter indication of this point difficult. It is recommended that the batteries be recharged if the meter is in the lower half of the battery test region.

The charger is an external 9V DC, 100mA transformer and is connected to the rear of the unit prior to charging. The **FUNCTION** switch should be set to **OFF** or **ZERO** when charging. The recommended charge time is 16 hours.

6.3 Chemical Scrubbers

6.3.1 Charcoal Scrubbers (if provided)

Certain analyzers are equipped with charcoal scrubbers (provided as cartridges or other in-line housings). Charcoal removes many gases (including SO₂, H₂S and NO₂), and has a tremendous adsorption capacity. The charcoal is best replaced on a regular time interval, but can be tested by passing various "challenge" gases through the system.

6.3.2 #158 Scrubbers

The CO units are equipped with #158 scrubbers, which remove acid gases such as SO₂, H₂S, NO and NO₂. From its original violet color, the scrubber changes to a light brown then to a darker brown, which later deepens to almost black. Even if all the pellets show the brown-black exterior, the scrubber may still retain high efficiency. Infrequent inspection requires the removal of ten pellets from a thoroughly mixed lot, breaking them open and examining their inner cores. If only two of these retain the violet core, the scrubber is only 75% efficient and should be replaced.

6.3.3 #56 Scrubber (if provided)

The NO units are provided with the #56 scrubber, which removes all acid gases. From its original white color, the scrubber changes to a grayish-blue. The scrubber should be changed when all crystals are gray-blue.

6.3.4 Miscellaneous Chemical Scrubbers (if provided)

Chemical scrubbers are available when needed for certain applications (consult the factory). In general, their effectiveness is best tested, by being "challenged" with the interferent. It is difficult to estimate the longevity of such devices, as it varies with the application.

6.4 Long Term Storage (one month or more)

Turn **FUNCTION** switch to “OFF” position. Disconnect charger from instrument. Detach plug-in connector from circuit board. Remove alkaline batteries and cover instrument to protect from dust.

6.5 Post Storage Startup

24 Hours Before Using:

Uncover the instrument. Install **FRESH** alkaline batteries. Reconnect plug-in connector from circuit board. Connect the charger to the instrument to charge nickel-cadmium batteries.

After 24 Hours:

Follow instructions in Section 3.0. Instrument is ready to use or calibrate.

Section
7

7.1 Troubleshooting

A high percentage of service problems often result from little things that you can find and fix yourself.

Symptom	Corrective Action
No power.	<ul style="list-style-type: none"> • Ensure the FUNCTION switch is not in the OFF position. • Are Ni-Cad batteries charged? (See Section 3.1)
Pump won't run.	<ul style="list-style-type: none"> • Ensure the FUNCTION switch is not in the OFF, or ZERO position. • Are Ni-Cad batteries charged? (See Section 3.1) • Are INLET/OUTLET fittings plugged? Is any tubing kinked?
Cannot zero.	<ul style="list-style-type: none"> • Are alkaline batteries low? (See Section 3.1) • Were alkaline batteries just replaced? (See Section 6.2) • Are alkaline batteries installed correctly? (Proper polarity)
No response to gas	<ul style="list-style-type: none"> • Ensure the FUNCTION switch is not in the OFF, or ZERO position. • Are Ni-Cad batteries charged? (See Section 3.1) • Are INLET/OUTLET fittings plugged? Is any tubing kinked? • Are alkaline batteries low? (See Section 3.1) • Were alkaline batteries just replaced? (See Section 6.2) • Are alkaline batteries installed correctly? (Proper polarity) • Is the CAL turned all the way down (CCW)? • Is electrical lead(s) connected to sensor? • Is sensor secure in sensor clamp?
Ni-Cads won't charge	<ul style="list-style-type: none"> • Are any batteries dead? (Remove from unit and check with a voltmeter)

Warranty

INTERSCAN's Warranty Policy

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 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 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.

Section

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Parts List

Section
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Schematics

Return Authorization

All returns for repairs 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. The reason for this is that a high percentage of service problems are resolved over the telephone, avoiding the need for returning the instrument or part. In other cases, the Service Department may ask for the return of the circuit board only.

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

(800) 458-6153 ext. 121

(818) 882-2331 ext. 121

FAX (818) 341-0642

E-mail: service@gasdetection.com

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