



**Interscan Corporation**

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# **Instruction Manual**

4000 Series Compact Portable Analyzer

# **INTERSCAN CORPORATION**

## **Simplified**

# **4000 SERIES MANUAL**

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## 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/CAL adjust is inadvertently changed, there is no need to calibrate the monitor until it has seen considerable usage.

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.

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. If these batteries are replaced prior to field use, **you must allow the unit to stabilize for a period of 24 hours prior to use.** See Section 4 for replacement or the charging of the batteries.

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# Equipment Description

## 1.0 Front Panel

<u>Designation</u>	<u>Function</u>
<b>ALARM LIGHT:</b>	Lamp. Flashes ON/OFF when alarm set point is exceeded.
<b>ALARM SET:</b>	25-Turn potentiometer with a screwdriver adjustment. Sets the alarm trip point at the desired PPM level. A LCD is provided on some models.
<b>AUIDIBLE ALARM:</b>	Horn. Sounds when alarm set point is exceeded.
<b>FUNCTION SWITCH:</b>	Rotary switch as follows:
<b>OFF:</b>	Analyzer power is OFF.
<b>ZERO:</b>	Analyzer power is ON (pump is OFF).
<b>SAMPLE:</b>	Analyzer power and pump are on. In this position the instrument is zeroed, sample measurements are taken and calibration is done.
<b>BAT. TEST A:</b>	Indicates state of charge of the Nickel-Cadmium batteries at the panel meter. These batteries power the pump, alarm, and the recorder (if provided).
<b>BAT. TEST B:</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.

<b>POWER LIGHT:</b>	Lamp. When illuminated, indicates that function switch is set to any position other than OFF.
<b>RANGE:</b>	Toggle switch. Allows multiple ranges to be selected. Lo= Low Range, Hi= High Range.
<b>SPAN/CAL:</b>	25-Turn potentiometer with a screwdriver adjustment. Sets the meter to correspond to the concentration of the calibration gas used for calibrating the instrument.
<b>ZERO:</b>	10-Turn Potentiometer. Allows the meter to be adjusted to zero by compensating for any background signal.

## 1.1 Rear Panel

<u>Designation</u>	<u>Function</u>
<b>INLET:</b>	1/4" OD compression gas fitting.
<b>OUTLET:</b>	1/4" OD compression gas fitting
<b>RECORDER OUTPUT:</b>	1/4" 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.**

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# Operating Instructions

## 2.0 Setting the Alarm

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. The alarm will not function properly if set point is less than or equal to 5% of full scale.

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.

## 2.1 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.

## 2.2 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,  $\pm$  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.

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# Calibration

## 3.0 Introduction

There is no easy answer as to when a monitor should be calibrated. This is strictly a function of the application. 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. H<sub>2</sub>S sensors show an additional decrease in sensitivity due to internal sulfur formation, the rate of which depends on the gas concentration.

## 3.1 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, details zero and span/cal 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.

## **3.2 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, which are reactive with, or chemisorbed by the bag itself (e.g. Chlorine, Hydrazine). Teflon or "tedlar" bags are suitable for H<sub>2</sub>S, SO<sub>2</sub>, NO and NO<sub>2</sub>. 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.

## **3.3 Calibration Procedure**

1. Select the range (optional) suitable for the concentration of the calibration gas. (Calibration in one range sets 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/CAL control, set the meter to indicate the calibration gas concentration being used.
6. Check the ZERO and SPAN/CAL 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.

NOTE: If you require additional information on Calibration procedures, please contact the Service Department.

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# General Maintenance

## 4.0 Battery Life

Because of high current requirement of the amplifiers, "C" Size Alkaline battery life is limited to 46 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 dependent upon how well the charge level is maintained.

## 4.1 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.

## **4.2 Chemical Scrubbers**

### **4.2.1 Charcoal Scrubbers (if provided)**

Certain analyzers are equipped with charcoal scrubbers (provided as cartridges or other in-line housings). Charcoal removes many gases (including SO<sub>2</sub>, H<sub>2</sub>S and NO<sub>2</sub>), 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.

### **4.2.2 #158 Scrubbers**

The CO units are equipped with #158 scrubbers, which remove acid gases such as SO<sub>2</sub>, H<sub>2</sub>S, NO and NO<sub>2</sub>. 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.

### **4.2.3 #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.

## **4.3 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.

## **4.4 Post Storage Start-up**

### **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 2.0. Instrument is ready to use or calibrate.

## 5.0 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"> <li>• Ensure the FUNCTION switch is not in the OFF position.</li> <li>• Are Ni-Cad batteries charged? (See Section 4.1)</li> </ul>
Pump won't run.	<ul style="list-style-type: none"> <li>• Ensure the FUNCTION switch is not in the OFF, or ZERO position.</li> <li>• Are Ni-Cad batteries charged? (See Section 4.1)</li> <li>• Are INLET/OUTLET fittings plugged? Is any tubing kinked?</li> </ul>
Cannot zero.	<ul style="list-style-type: none"> <li>• Are alkaline batteries low? (See Section 4.1)</li> <li>• Were alkaline batteries just replaced? (See Section 4.1)</li> <li>• Are alkaline batteries installed correctly? (Proper polarity)</li> </ul>
No response to gas	<ul style="list-style-type: none"> <li>• Ensure the FUNCTION switch is not in the OFF, or ZERO position.</li> <li>• Are Ni-Cad batteries charged? (See Section 4.1)</li> <li>• Are INLET/OUTLET fittings plugged? Is any tubing kinked?</li> <li>• Are alkaline batteries low? (See Section 4.1)</li> <li>• Were alkaline batteries just replaced? (See Section 4.1)</li> <li>• Are alkaline batteries installed correctly? (Proper polarity)</li> <li>• Is the SPAN/CAL turned all the way down (CCW)?</li> <li>• Is electrical lead(s) connected to sensor?</li> <li>• Is sensor secure in sensor clamp?</li> </ul>
Ni-Cads won't charge	<ul style="list-style-type: none"> <li>• Are any batteries dead? (Remove from unit and check with a voltmeter)</li> </ul>

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# Warranty

## **6.0 INTERSCAN's Warranty Policy**

INTERSCAN CORPORATION warrants portable analyzers 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.

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## **Return Authorization**

### **7.0 INTERSCAN's Return Authorization Policy**

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.

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](mailto:service@gasdetection.com)**