# MODEL
# $TURBO_2$
# $TURBO_2P$
# PORTABLE TRACE OXYGEN ANALYZER
# INSTRUCTION MANUAL

Sales Order Number: _____

Instrument Serial Number: _____

**DANGER**

HIGHLY TOXIC AND OR FLAMMABLE LIQUIDS OR GASES MAY BE PRESENT IN THIS MONITORING SYSTEM.

PERSONAL PROTECTIVE EQUIPMENT MAY BE REQUIRED WHEN SERVICING THIS SYSTEM.

HAZARDOUS VOLTAGES EXIST ON CERTAIN COMPONENTS INTERNALLY WHICH MAY PERSIST FOR A TIME EVEN AFTER THE POWER IS TURNED OFF AND DISCONNECTED.

ONLY AUTHORIZED PERSONNEL SHOULD CONDUCT MAINTENANCE AND/OR SERVICING. BEFORE CONDUCTING ANY MAINTENANCE OR SERVICING CONSULT WITH AUTHORIZED SUPERVISOR/MANAGER.

P/N M44412
01/11/2012

### Warranty

This equipment is sold subject to the mutual agreement that it is warranted by us free from defects of material and of construction, and that our liability shall be limited to replacing or repairing at our factory (without charge, except for transportation), or at customer plant at our option, any material or construction in which defects become apparent within one year from the date of shipment, except in cases where quotations or acknowledgements provide for a shorter period. The Class S-2 Micro-Fuel Cell is warranted for 6 months from the date of shipment from Teledyne. Components manufactured by others bear the warranty of their manufacturer. This warranty does not cover defects caused by wear, accident, misuse, neglect or repairs other than those performed by Teledyne or an authorized service center. We assume no liability for direct or indirect damages of any kind and the purchaser by the acceptance of the equipment will assume all liability for any damage which may result from its use or misuse.

We reserve the right to employ any suitable material in the manufacture of our apparatus, and to make any alterations in the dimensions, shape or weight of any parts, in so far as such alterations do not adversely affect our warranty.

### Important Notice

This instrument is intended to be used as a tool to gather valuable data. The information provided by the instrument may assist the user in eliminating potential hazards caused by the process that the instrument is intended to monitor; however, **it is essential that all personnel involved in the use of the instrument or its interface with the process being measured be properly trained in the process itself, as well as all instrumentation related to it.**

The safety of personnel is ultimately the responsibility of those who control process conditions. While this instrument may be able to provide early warning of imminent danger, it has no control over process conditions, and can be misused. In particular, any alarm or control system installed must be tested and understood, both as to how they operate and as to how they can be defeated. Any safeguards required such as locks, labels, or redundancy must be provided by the user or specifically requested of Teledyne when the order is placed.

The purchaser must be aware of the hazardous conditions inherent in the process(es) he uses. He is responsible for training his personnel, for providing hazard warning methods and instrumentation per the appropriate standards, and for ensuring that hazard warning devices and instrumentation are maintained and operated properly.

Teledyne Analytical Instruments (TAI), the manufacturer of this instrument, cannot accept responsibility for conditions beyond its knowledge and control. **No statement expressed or implied by this document or any information disseminated by the manufacturer or his agents is to be construed as a warranty of adequate safety control under the user's process conditions.**

# Table of Contents

# Introduction

The Teledyne Analytical Instruments Model TURBO$_2$ is a portable trace oxygen analyzer which does not need an external power source to operate, and can be reliably calibrated without the use of additional calibration gases.

The instrument provides for trace oxygen analysis in measuring ranges of 0-100, 0-1,000 and 0-10,000 PPM (full scale), plus a special calibration range that encompasses the known oxygen concentration of atmospheric air (209,000 PPM).

Sample oxygen is read from an extremely accurate integral meter (0.5% linearity) whose range of measurement is determined by the position of the range selector switch. The 100-division meter scale and the multiplying factor indicated by the position of the range switch determine the full scale oxygen sensitivity of the instrument.

Sample gas is introduced and vented via a pair of quick disconnect fittings that feature integral shutoff valves which automatically close when the mating male fitting is withdrawn. The fittings are an integral part of the measuring cell manifold so that internal sample passage volume is at an absolute minimum. Sample flow control, although not critical (0.1 to 10 liters/min.), is either accomplished with accessory equipment or by the addition of a pump and flowmeter (TURBO$_2$P).

## Method of Analysis

The sample oxygen is measured by a unique electrochemical transducer which functions as a fuel cell; in this instance, the fuel is oxygen. Oxygen diffusing into the cell reacts chemically to produce an electrical current that is proportional to the oxygen concentration in the gas phase immediately adjacent to the transducer's sensing surface. The Micro-fuel Cell is a Class S-2, designed for a quick recovery time from air to low PPM levels of oxygen.

The linear, but minute, signal produced by the transducer from trace oxygen is amplified by a two stage amplifier. The dual stages of amplification provide enough gain to drive the 0-100 microampere meter and thermistor controlled network utilized to compensate for the positive temperature coefficient of the transducer.

## Features

**Micro-Fuel Cell**: The Micro-fuel Cell (U.S. Pat. #s 3,767,552 and 3,668,101) is a sealed electrochemical transducer with no electrolyte to change or electrodes to clean. When the cell reaches the end of its useful life, it is merely thrown away and replaced, as one would replace a worn-out flashlight battery. The life of the cell is warranted by TAI (see Cell Warranty, page 11).

**Reliable Calibration**: The unique qualities of the Micro-fuel Cell allows the user to calibrate the instrument with the most economical, reliable, abundant, standardization gas there is—atmospheric air.

The special CAL range of the instrument features a mark that coincides with the 209,000 PPM oxygen concentration of air. By drawing air through the instrument (see Calibration, page 6) reliable calibration can be achieved.

After the electronics have been properly zeroed (a one-time factory operation), the instrument cannot produce an output indication in the absence of oxygen; therefore, there is no need for a zero standardization gas.

**Integral Power Supply**: For pump option 4, the differential power requirement (+ and – 3.6 VDC) of the instrument amplifier is furnished by two internally mounted 750 milliampere•hour NiCad batteries. Fully charged, these batteries will provide enough power to operate the instrument continuously for a period of about 45 days with the pump option OFF. With the pump option ON, the batteries will provide continuous operation for about 8 hours. With the pump option OFF, an overnight charge of 14–16 hours on a one-month duty cycle should keep the original batteries supplied usable for many years. With the pump option ON, charge 14–16 hours on an 8-hour duty cycle.

An integral charging circuit and a detachable power cord are provided so that the batteries may be recharged from any 50 or 60 cycle, 105 to 125 volt (90 to 110 volt optional), outlet.

The instrument is designed to either sample or have its batteries re-charged. Both operations cannot be carried out simultaneously. TAI has deliberately interlocked the circuitry so that both operations cannot be carried out at the same time.

Only when the selector switch is placed in the OFF position will the neon lamp on the back plate of the Model TURBO$_2$ light up to indicate power to the battery charging circuit.

To determine the state of the rechargeable batteries, turn the Range Selector Switch counterclockwise to the battery test position and hold there (the switch is spring loaded). Watch the meter indicator: if it does not stay within the battery limits, the batteries need to be recharged. Release the Range Selector Switch and it will automatically return to the OFF position.

**Accuracy and Response**: The Model TURBO$_2$ provides monitoring accuracies of ±2% of full scale or ±5 PPM, whichever is greater, at constant temperature. A ±5% of reading accuracy is achievable throughout the operating temperature range of 30 to 125° F.

With a sample flowrate of 150 cc/min., 90% response is achieved in 5–10 seconds in the 0–10, 0–100, 0–1000, and CAL range switch positions.

**Compact Packaging**: The instrument is housed in 10$^1/_{16}$ " W × 7½ " H × 6¾ " D aluminum case that is equipped with a carrying handle and foot pads. When in use, the analyzer should be placed in an upright position on a level surface (off-level positioning will detract from meter accuracy). See Fig.1.

The cell block and amplifier PC board are housed inside the analyzer. The back panel of the analyzer contains the AC power receptacle, the amber charge light, fuse (½A: 110V; ¼A: 220V), and quick-connect fittings for bringing the sample into and out of the sensor assembly. See Figs. 2 and 3.

**Pump**: The TURBO$_2$P has an integral pump used to help draw sample through the analyzer.

## Supporting Equipment and Services

### Sampling Equipment

The customer must provide a means of controlling the pressure and flowrate of the sample gas. For positive pressure applications, TAI suggests a simple throttle valve installed in the sample line between the sample point and the analyzer. The flowrate should be limited to between 0.1 and 10 liters/min.

**IMPORTANT: Use pressure regulators with a metallic diaphragm ONLY.**

Regulators with organic or plastic diaphragms are permeable to oxygen and, if used in the sampling system, will lead to high oxygen readings.

For atmospheric pressure sampling, the TURBO$_2$P has a pump and flow control valve downstream of the analyzer to draw (rather than push) the sample through the instrument.

TAI supplies three (3) male disconnect fittings with the instrument: one for installation of the customer's sample line, one to be used to open the vent fitting of the instrument, and one (equipped with a plastic tube) for drawing air through the unit for calibration purposes.

**Do not place any restriction on the line between the sample point and the analyzer—**as a partial vacuum would then be drawn on the cell. Since the cell is a partial pressure sensitive device, any oxygen readings taken under these conditions would be erroneous. In addition, vacuums in excess of one-third of an atmosphere may damage the cell.

**Power Service**

A source of single phase, 105 to 125 VAC (90 to 110 VAC optional), 50 or 60 Hz power, capable of delivering a maximum of ¼ A of current will be periodically required to recharge the instrument's battery power supply. An 8-foot, UL approved, 3-wire detachable power cord is provided with the instrument and should be stored in a safe place when not in use. The TURBO$_2$ can be optionally furnished with 220 VAC, 50 or 60 Hz charging power or 100 VAC, 50 or 60 Hz charging power.

## Operation

**WARNING: The TURBO$_2$ is NOT intrinsically safe and must not be used in or brought into hazardous areas.**

The TURBO$_2$ is supplied completely assembled and ready for instant use. The Micro-fuel Cell is in place within the manifold, and prior to shipment the manifold was purged with an inert gas to eliminate all but traces of oxygen from the internal sampling system. The integral shut-off valves in the quick disconnect sample fittings, if not disturbed, will maintain this inert atmosphere within the manifold indefinitely. This can be demonstrated by placing the Range Selector Switch in the 0-1000 PPM position.

When the range selector is moved from the OFF position, power to the instrument circuitry is established. The meter will instantly respond to the residual oxygen within the integral sample passages.

It is impossible to achieve a perfect seal of the internal sample system, and what the meter is indicating is the diffusion/consumption balance point of the internal sample system and the Micro-fuel cell.

This balance point, with a properly calibrated instrument, is always within the limits of the 0-100 range. If the reading climbs off the limits of this scale, a leak in the manifold assembly is indicated.

**To extend cell life and minimize the time required to make the next analysis, the instrument should always be purged with sample or an inert gas prior to being taken out of service for standby or storage.**

## Calibration

The inherently constant output of the cell during its useful life precludes a definitive calibration cycle. TAI feels that the interval between calibrations should be dictated by your application. If the instrument is being used to certify the oxygen content of a product for delivery, then, a calibration prior to certification would be in order. If not, a biweekly or monthly calibration is adequate. However, the rapid response of the S-2 cell allows more frequent air calibrations than possible with earlier type instruments.

**NOTE: Do not calibrate the instrument unless there is a trace oxygen gas readily available for purging immediately following calibration.**

To calibrate the instrument:

1) Stand the instrument upright on a level surface, and with the Range Selector Switch in the OFF position, check the alignment of the meter pointer with the zero mark on the scale. Use the mirror to eliminate parallax, and adjust the screw on the face of the meter, if necessary, until the pointer and zero mark are in precise coincidence.

2) Move the Range Selector Switch to the CAL position.

3) Install the plastic tube equipped male disconnect fitting in either of the analyzer's sample ports, and a blank disconnect fitting in the other port (direction of sample flow is of no importance). A pump is recommended on the plastic tube. Pump the tube until the meter reading is stable.

**WARNING: DO NOT ATTEMPT TO DRAW SAMPLE THROUGH THE ANALYZER ORALLY.**
**The sensor electrolyte is caustic. Do not let it come in contact with skin. If it does, immediately flush affected area with water. Consult the Emergency First Aid procedures in the Material Safety Data Sheet at the end of the manual. Do not attempt to open or repair the sensor. Leaking or exhausted sensors should be disposed of in accordance with local regulations. Consult the Material Safety Data Sheet at the end of the manual.**

4) Unlock and adjust the SPAN potentiometer until the meter pointer is in coincidence with the CAL mark on the meter scale. Be sure to relock the control after the adjustment is made.

5) Immediately after step 4, disconnect the tubing-equipped calibration fitting, and plug in either the sample or a source of inert gas.

If the instrument is to be used for sampling after the calibration procedure has been completed, follow the decreasing oxygen reading by positioning the Range Selector Switch so that the meter gives the best possible resolution of the oxygen. **Do not attempt to actually take a reading until the meter indication stabilizes.**

If, on the other hand, the instrument is not to be used immediately after calibration, and a low PPM oxygen gas is being employed as a purge, allow the manifold to be purged overnight, and then disconnect both male fittings. **Always disconnect the source fitting first and then the vent fitting immediately after.**

### Positive Pressure Sampling

When connecting the instrument to a positive pressure sample source, always proceed as follows:

1) Before making any connections to the instrument, establish a flowrate in the sample line of from 0.1 to 10 liters/min. Allow the sample to vent to atmosphere long enough to purge the line free of air.

2) Install the vent fitting **first**, and then the sample source fitting. Be prepared to make the connections in rapid order, so that atmospheric diffusion time through the vent fitting is held to a minimum.

When disconnecting the instrument, reverse the procedure: source fitting first, and then vent fitting.

The objective of the connection–disconnection procedure is to obviate the possibility of pressurizing the manifold. If a flowing sample is connected to the manifold without the vent fitting in place, the pressure in the manifold will rise and equal the sample pressure immediately, possibly causing a manifold leak.

### Atmospheric Pressure Sampling

The TURBO$_2$P is equipped with a sample pump and flowmeter to draw sample through the analyzer in the case of sample at atmospheric or slightly less than atmospheric pressure.

The pump power switch is located on the back panel of the analyzer. During calibration and normal operation, set the flowmeter to midrange, and turn the pump on during step 3 of the calibration procedure.

# Maintenance

## Recharging the Battery

TAI suggests that an overnight recharge be performed every 4 weeks of continuous use. To recharge the batteries:

1. Move the Range Selector Switch to OFF and connect the power cord to a convenience outlet. The amber charge lamp (back of case) will light during charging. The integral charging circuit will automatically energize and regulate the battery charging current when the Range Selector Switch is in the OFF position and the AC cord is plugged into the power line.

**CAUTION: Do not turn the Range Selector Switch to either BATT TEST or any of the operating range positions while the unit is connected to AC power. Doing so may cause failure of the integrated circuit.**

2. When recharging is completed, unplug the unit from the AC outlet. Turn the Range Selector Switch to the operating position and then to the BATT TEST position. Meter reads 60%-80% fs.

**NOTE: The BATT TEST position will not give a reliable indication of the battery charge immediately after a charge cycle. Allow the unit to run for a while before testing the batteries.**

If the instrument is stored with the Range Selector Switch in the OFF position (charge cord disconnected), the period of time between charge periods is extended from one month to four months. However, do not leave it longer than this time period.

### Routine Maintenance

Beyond adhering to a battery recharge schedule, no routine maintenance is required, as there are no moving parts in the instrument other than the meter movement. The Micro-fuel Cell is a sealed, modular component that should be replaced only when expired or faulty.

### Cell Replacement

The characteristics of the Micro-fuel Cell are similar to those of a mercury battery in that both provide an almost constant output through their useful life, and then fall off sharply towards zero at the end. If the sample being analyzed has a low oxygen concentration, cell failure will probably be indicated by the inability to properly calibrate the analyzer. You will find that very little adjustment of the SPAN potentiometer will be required to keep the analyzer calibrated properly during the duration of a given cell's useful life. If many turn adjustments clockwise are required to calibrate the instrument, or calibration cannot be achieved within the range of the control, the cell should be replaced.

To offset the possibility of not having a replacement cell available when it is needed, TAI recommends that a spare cell be purchased shortly after the instrument is placed in service, and each time the cell is replaced thereafter.

The spare cell should be carefully stored in an area that is not subject to large variations in ambient temperature (75°F nominal), and in such a way as to obviate any possibility of incurring damage. **Do not open the cell package until the cell is to be actually used**. If the cell package is punctured and air permitted to enter, the cell will immediately start to react to the presence of oxygen.

To replace the Micro-fuel Cell:

1. Loosen the 2 screws (designated by arrows) on the back panel (see outline dwg. C-45254 or C-57975). See Figure 2.
2. Remove the screw located on each side of the top cover and gently slide the cover up and off.
3. Remove the 3 wing nuts on top of the cell block and remove the cell cap. Carefully remove the old cell from the cell cap and dispose of it in accordance with local regulations (see the Material Safety Data Sheet at the end of the manual). See Figure 3.

4. Remove the new cell from its package, and carefully remove the shorting wire. Do not touch the silver/gold colored sensing surface of the cell as it is covered with a delicate Teflon membrane that can be ruptured in handling.
5. The cell has three pins that fit into the cap one way only. Slide the pins into the cell cap.
6. Replace the cell cap and cover.
7. After the cell has been installed, purge the instrument with an inert gas (or the sample), and then proceed as directed in the calibration procedure.

### Cell Warranty

The Class S-2 cell used in the Model TURBO$_2$ is warranted for 6 months of service from date of shipment.

The Model TURBO$_2$ should not be used in applications where $CO_2$ is a major component in the sample. Concentrations of 1,000 PPM or less will not effect cell performance.

If a cell was working satisfactorily, but ceases to function before the warranty period expires, the customer will receive credit, on a prorated basis, toward the purchase of a new cell.

Customer having warranty claims must return the cell in question to the factory for evaluation. If it is determined that failure is due to faulty workmanship or material, the cell will be replaced at no cost to the customer.

**CAUTION: Evidence of damage due to tampering or mishandling will render the cell warranty null and void.**

### Transduction and Temperature Compensation

The Micro-fuel Cell used in the TURBO$_2$ has an inherent positive temperature coefficient, the effects of which have been minimized through the implementation of a thermistor compensation circuit.

## Pump Removal/Installation (TURBO$_2$P only)

### Removal

1. Loosen the cover plate mounting screws and remove the instrument coverplate.
2. Disconnect the pump motor wires from the circuit terminals.
3. Tag the pump inlet and outlet tubings and then disconnect both from the pump assembly.
4. Loosen and remove the four screws securing the pump assembly to the instrument chassis and remove the pump.

### Installation

1. With the instrument cover plate removed, set the pump assembly in place.
2. Insert and tighten the four screws to secure the pump assembly to the instrument chassis.
3. Connect the tagged pump inlet and outlet tubings to the pump assembly.
4. Connect the pump motor wires to the circuit terminals.
5. Replace the instrument cover plate and then insert and tighten the cover plate mounting screws.

## Specifications

| | |
|---|---|
| **Ranges:** | 0-100 PPM oxygen<br>0-1,000 PPM oxygen<br>0-10,000 PPM oxygen |
| **Sensitivity:** | 0.5% of full scale |
| **Accuracy:** | ±2% of full scale at constant temperature; ±5% of reading or ±1 PPM (whichever is greater) over the operating temperature range. |
| **Response Time:** | 90% of full scale in 5-10 seconds at 68°F (20°C) |
| **Operating Temperature:** | +32°F to +125°F (0°C to +52°C) |
| **Micro-fuel Cell Class:** | S-2 |
| **Micro-fuel Cell Warranty:** | 6 months |
| **Recommended Span Gas:** | Atmospheric air |
| **Operating Power:** | Two rechargeable NiCad batteries |
| **Battery Recharge Circuit:** | 110 VAC, 60 Hz<br>100/220 VAC, 50/60 Hz optional |
| **Wetted Parts:** | Nylon sensor housing and nickel-plated brass quick-disconnect fittings<br>Stainless steel optional |
| **Weight:** | 7 lbs (3 kg) |
| **Dimensions:** | 10 $^1/_{16}$ " W × 7½ " H × 6¾ " D<br>(255.6 mm × 190.5 mm × 171.45 mm) |

## Spare Parts List

| Qty | P/N | Description |
|---|---|---|
| 1 | F51 | Micro Fuse, 1/2A (220V use F39) |
| 1 | C6689-S2 | Micro-fuel Cell, Class S-2 |
| 2 | B76 | Battery |
| 1 | L79 | Lamp |
| 1 | A36289 | Calibration kit |
| 1 | B64442 | Pump Assy. (for Pump Option) |

A minimum charge is applicable to spare parts orders.

**IMPORTANT: Orders for replacement parts should include the part number and the model and serial number of the system for which the parts are intended.**

Send orders to:
**TELEDYNE ANALYTICAL INSTRUMENTS**
16830 Chestnut Street
City of Industry, CA 91748
Telephone: (626) 934-1500
TWX: (910) 584-1887 TDYANYL COID
Fax: (626) 961-2538
Web: www.teledyne-ai.com
or your local representative

## Drawing List

(TURBO$_2$)

| | |
|---|---|
| C-45254 | Outline diagram |
| B-45202 | Schematic |
| C-45204 | Wiring diagram (110V) |
| C-45203 | Wiring diagram (220V) |

(TURBO$_2$P)

| | |
|---|---|
| C-57975 | Outline diagram |
| B-57974 | Schematic |
| A-57977 | Piping diagram |
| C-57973 | Wiring diagram (110V) |

## Material Safety Data Sheet

## Section I – Product Identification

**Product Name:** Micro-Fuel Cells
Mini-Micro-Fuel Cells, all classes
Super Cells, all classes except T–5F
Electrochemical Oxygen Sensors, all classes.

**Manufacturer:** Teledyne Analytical Instruments
**Address:** 16830 Chestnut Street, City of Industry, CA 91749
**Phone:** (626) 961-9221
**Technical Support:** (626) 934-1673
**Environment, Health and Safety:** (626) 934-1592
**Date Prepared :** 08/08/91

## Section II – Physical and Chemical Data

Chemical and Common Names: Potassium Hydoxide (KOH), 15% (w/v)
Lead (Pb), pure
CAS Number: KOH 1310–58–3
Pb 7439–92–1

| | **KOH** (15%) | **Pb** (pure) |
|---|---|---|
| Melting Point/Range: | –10 to 0 °C | 328 °C |
| Boiling Point/Range: | 100 to 115 °C | 1744 °C |
| Specific Gravity: | 1.09 @ 20 °C | 11.34 |
| pH: | >14 | N/A |
| Solubility in Water: | Completely soluble | Insoluble |
| Percent Volatiles by Volume: | None | N/A |
| Appearance and Odor: | Colorless, odorless solution | Grey metal, odorless |

## Section III – Physical Hazards

**Potential for fire and explosion:** The electrolyte in the Micro-Fuel Cells is not flammable. There are no fire or explosion hazards associated with Micro-Fuel Cells.

**Potential for reactivity:** The sensors are stable under normal conditions of use. Avoid contact between the sensor electrolyte and strong acids.

## Section IV – Health Hazard Data

| | |
|---|---|
| **Primary route of entry:** | Ingestion, eye/skin contact |
| **Exposure limits:** OSHA PEL: | .05 mg/cu.m. (Pb) |
| ACGIH TLV: | 2 mg/cu.m. (KOH) |
| **Effects of overexposure** | |
| **Ingestion:** | The electrolyte could be harmful or fatal if swallowed.<br>Oral LD50 (RAT) = 3650 mg/kg |
| **Eye:** | The electrolyte is corrosive; eye contact could result in permanent loss of vision. |
| **Dermal:** | The electrolyte is corrosive; skin contact could result in a chemical burn. |
| **Inhalation:** | Liquid inhalation is unlikely. |
| **Signs/symptoms of exposure:** | Contact with skin or eyes will cause a burning sensation and/or feel soapy or slippery to touch. |
| **Medical conditions aggravated by exposure:** | None |
| **Carcinogenicity:** | NTP Annual Report on Carcinogens: Not listed<br>LARC Monographs: Not listed<br>OSHA: Not listed |
| **Other health hazards:** | Lead is listed as a chemical known to the State of California to cause birth defects or other reproductive harm. |

## Section V – Emergency and First Aid Procedures

**Eye Contact:** Flush eyes with water for at least 15 minutes and get immediate medical attention.

**Skin Contact:** Wash affected area with plenty of water and remove contaminated clothing. If burning persists, seek medical attention.

**Ingestion:** Give plenty of cold water. Do not induce vomiting. Seek medical attention. Do not administer liquids to an unconscious person.

**Inhalation:** Liquid inhalation is unlikely.

## Section VI – Handling Information

**NOTE: The oxygen sensors are sealed, and under normal circumstances, the contents of the sensors do not present a health hazard. The following information is given as a guide in the event that a cell leaks.**

**Protective clothing:** Rubber gloves, chemical splash goggles.

**Cleanup procedures:** Wipe down the area several times with a wet paper towel. Use a fresh towel each time.

**Protective measures during cell replacement:** Before opening the bag containing the sensor cell, check the sensor cell for leakage. If the sensor cell leaks, do not open the bag. If there is liquid around the cell while in the instrument, put on gloves and eye protection before removing the cell.

**Disposal:** Should be in accordance with all applicable state, local and federal regulations.

**NOTE: The above information is derived from the MSDS provided by the manufacturer. The information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Teledyne Analytical Instruments shall not be held liable for any damage resulting from handling or from contact with the above product.**


Figure 1: Front Panel


Figure 2: Rear Panel

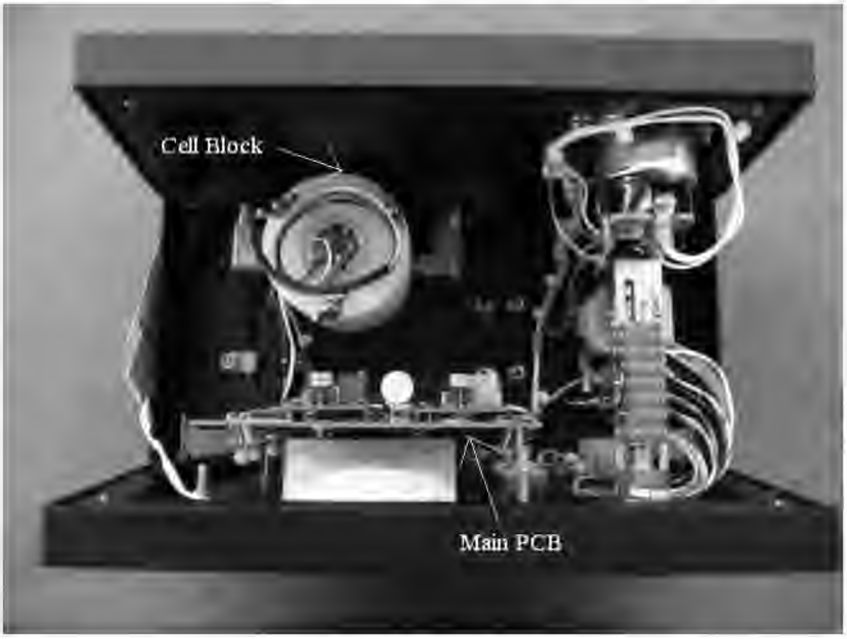


Figure 3: Top View

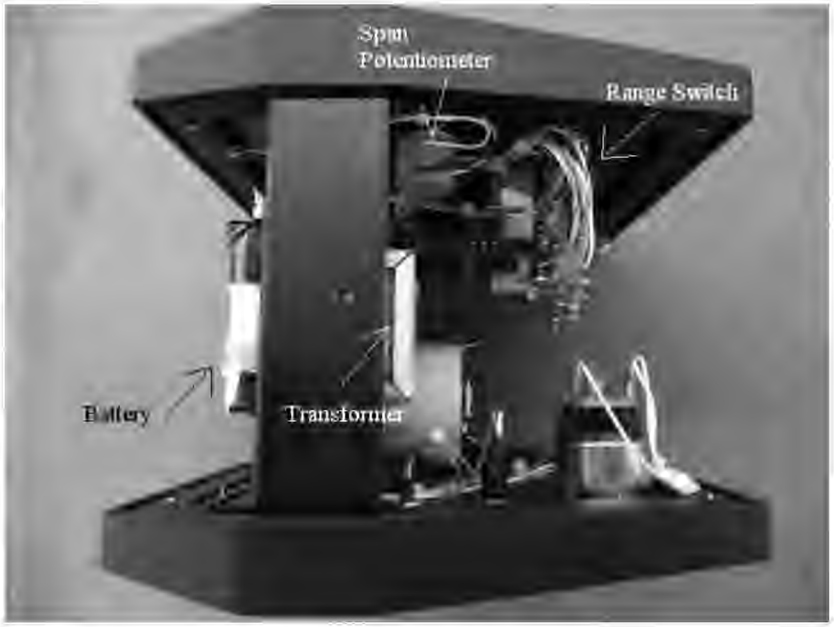


Figure 4: Side View