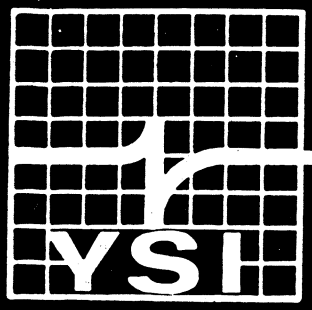


YELLOW SPRINGS
INSTRUMENT CO., INC.

YELLOW SPRINGS, OHIO

INSTRUCTIONS
FOR
YSI
MODEL 52
OXYGEN
METER

TABLE OF CONTENTS

THE MODEL 52 OPERATES THIS EASILY

1. Set switch to ZERO.
2. ZERO meter with ZERO control.
3. Set switch to READ.
4. Expose sample hose to fresh air.
5. Squeeze rubber bulb at least six times.
6. *Set meter to 21% with CAL control.
7. Place sample hose in gas to be measured.
8. Squeeze rubber bulb at least six times.
9. Read % oxygen directly on meter.

*For oxygen pressure measurements see "Calibration Procedure for Oxygen Pressure Measurements" for meter set point.

MODEL 52 OXYGEN METER

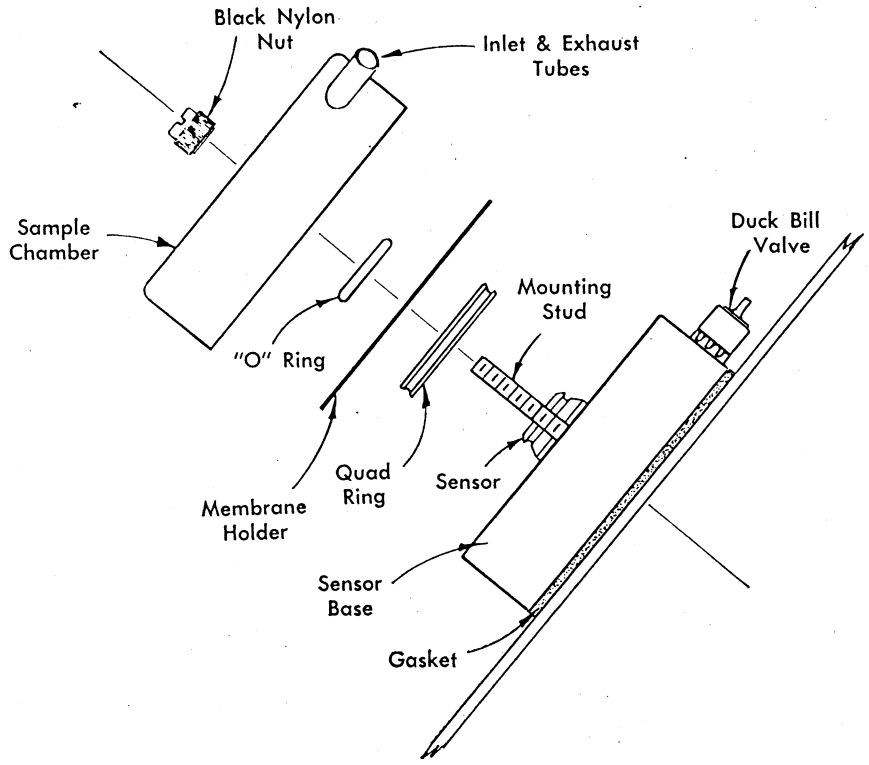
GENERAL DESCRIPTION

The Model 52 Oxygen Meter consists of an instrument readout with integral sensor unit, a sample collecting system (hoses, squeeze bulb, and gas drier tube) and a maintenance kit.

The oxygen measuring system consists of a polarographic sensor, a transistorized differential D.C. amplifier and a meter readout. Mercury batteries are used to polarize the sensor and power the amplifier. The sensor signal is directly proportional to oxygen pressure; this signal is amplified and presented on the meter. The meter reads directly in % oxygen and mm of oxygen pressure. Calibration of the instrument is achieved by using fresh air as reference (21% oxygen).

SPECIFICATIONS

Range:	0 - 50% oxygen 0 - 380 mm Hg oxygen pressure
Temperature Range:	Automatic compensation for use in the temperature range 5°C - 40°C (41°F - 105°F)
Resolution:	0.2% oxygen 1 mm Hg oxygen pressure
Accuracy:	Under normal conditions — ½% oxygen 3 mm Hg oxygen pressure
Battery Life:	In excess of 500 hours



PREPARING THE MODEL 52 FOR OPERATION

To put the Model 52 into operation the sensor and the drying tube must be prepared.

Preparing the Sensor for Operation

1. Add **distilled** water to the KC1 crystals and dissolve completely.
2. Transfer a part of the KC1 solution to the eyedropper bottle.
3. Remove the sample chamber from the sensor. This is done in the following manner:
   a. Remove the black nylon nuts from the mounting studs.

b. Lift the sample chamber, complete with rubber tubing, up and away from the sensor base.

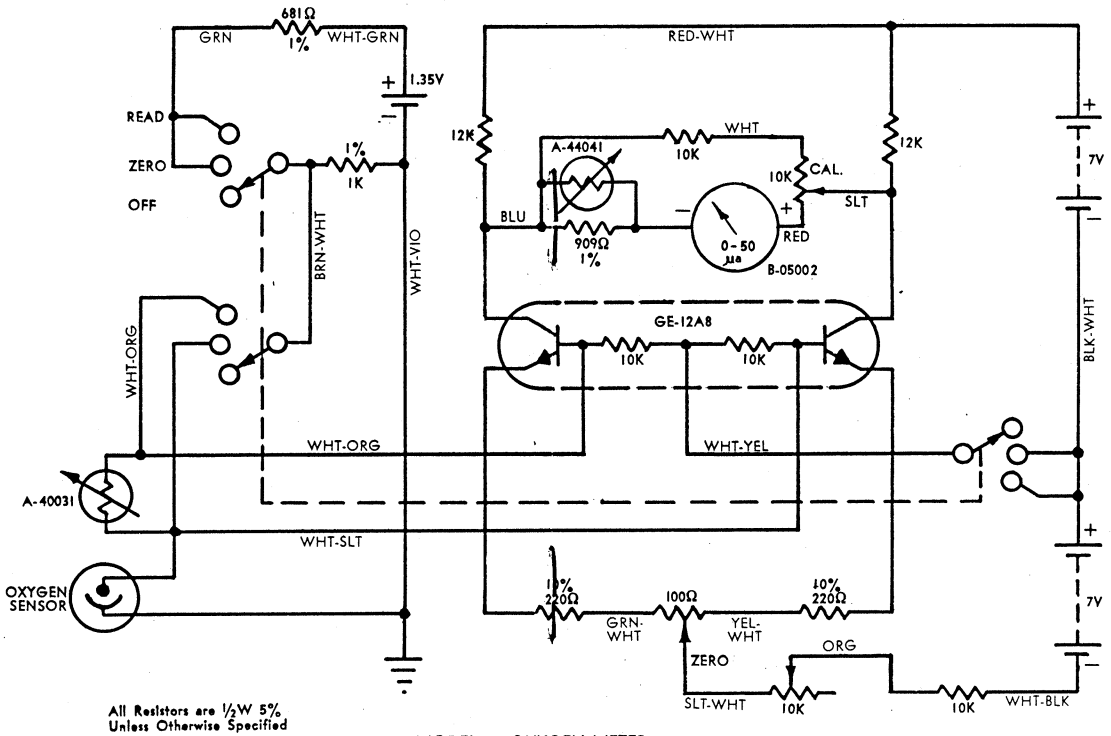
4. Remove the protective membrane and "O" ring by grasping the membrane holder and pulling up until the "O" ring is removed from its groove.
5. Position the instrument so that the sensor is vertical.
6. With the eyedropper, fill the central hole with KC1. Wet the gold electrode and the lucite around it. In doing this the surface tension of the KC1 will form a large drop or meniscus above the electrode. This will ensure complete contact between the membrane and the KC1.
7. Align the notches in the membrane holder with the mounting studs and push the membrane into contact with the sensor surface.
8. Hold the membrane ring in place and stretch an "O" ring over the sensor and seat in the groove provided. Inspect the surface for a wrinkle free intact membrane. A taut smooth membrane surface is required. A lax membrane will result in erratic performance, slow response speed and poor shock performance.
9. Place the instrument in a normal operating position.
10. Remove the rubber duck bill valve from the reservoir opening.
11. Finish filling the reservoir with KC1 solution from the eyedropper if necessary.
12. Remove any excess KC1 solution from the sensor area and reassemble the sample chamber.
13. The oxygen sensor is ready for operation.

Dryer Operational Preparation

1. Pull the dryer from its mounting at the rear of the instrument.
2. Remove the two rubber hoses from the metal tubings.
3. Pull the rubber stopper from one end of the dryer body.
4. Remove the cotton filter.
5. Fill the dryer body with the Drierite® provided in the Maintenance Kit. Allow room for the return of the rubber stopper and cotton fixture.
6. Reassemble the dryer body.
7. Connect the rubber hoses and return the unit to the mounting bracket.
8. The dryer is ready for operation.

MAKING OXYGEN MEASUREMENTS

1. Check the sensor and the dryer to see if they are ready for operation. See "Sensor Care" and "Dryer Upkeep."
2. Turn the selector switch to "ZERO" and set the meter pointer to zero by adjusting the "ZERO" control.
3. Fill the sample chamber with fresh air. Squeeze the rubber bulb completely at least six times.
4. Turn the selector switch to "READ" and set the meter pointer to 21% using the CAL adjustment. When making mm pressure measurements, a similar procedure is used to determine the calibration setting (see Calibration Procedure for Oxygen Pressure Measurements).



All Resistors are ½W 5% Unless Otherwise Specified

MODEL 52 OXYGEN METER
SCHEMATIC

B-05051-E

5. Without making any changes in the instrument settings change the gas in the sample chamber, requires at least six complete squeezes of the rubber bulb, and read % oxygen in the unknown from the meter.

CALIBRATION PROCEDURE FOR OXYGEN PRESSURE MEASUREMENTS

The sensor in this instrument is a device which measures oxygen pressure and is therefore sensitive to changes in altitude and barometric pressure. If absolute pressure measurements are desired calibration may be achieved as follows. Knowing the altitude of your location (within ± 200 feet) by means of the following table determine the pressure of oxygen in fresh air.

Altitude	Atmospheric Pressure	Calibrating Gas 21 Percent Oxygen
Sea Level	760 mm	159.6 mm
1000 ft.	733 mm	153 9 mm
2000 ft.	707 mm	148.5 mm
3000 ft.	681 mm	143.0 mm
4000 ft.	656 mm	137.8 mm
5000 ft.	632 mm	132.7 mm

This is the pressure of oxygen in fresh air for a barometric pressure of 30.00 inches as reported by the Weather Bureau. Normal variations in barometric pressure (29.00 to 31.00 inches) will produce errors of less than 5.0 mm and for most purposes can be dismissed as unimportant. If required the correction is proportional to barometric pressure difference from 30.00 inches.

For example: At 2500 feet altitude the table provides a base oxygen pressure of 145.7 mm (at a barometer of 30.00 inches). If the barometer is 29.30 inches the oxygen pressure becomes $\frac{29.30}{30.00} \times 145.7 = 142.6$ mm.

NOTE: The Weather Bureau can provide a current barometer reading.

MAINTENANCE

Normal maintenance on this instrument consists of battery replacement, sensor care and dryer upkeep.

1. **Battery Replacement**
   Since there are three batteries, the first step is to determine which batteries need replacement. For preventive maintenance all batteries should be replaced about every six months if the instrument is used very frequently, or about every one year if use is only occasional. If the batteries are only replaced when failure occurs, the following procedure will determine replacement. If the 1.35-volt battery has failed the instrument readings may become erratic. This battery should be replaced with a Mallory RM1R or equivalent. If normal calibration cannot be attained or if again instrument readings are erratic, both 7-volt batteries should be replaced. These should be Mallory TR165 or equivalent. Replacement is as follows:

   1. Disconnect the rubber hose from the dryer to sample chamber inlet tube.
   2. Remove the entire front panel assembly from the dust cover by removing the two slotted screws in front and the two on top. Lift the panel up slightly and pull forward.

3. Remove the batteries from the holders using a screwdriver to gently pry the batteries. Be careful to restrict the batteries from "popping" out and damaging some other part.

4. Replace the batteries noting the polarity marked on the battery and comparing it with the decal on the terminal board. The + end should always contact the red terminal in the battery holder.*

5. Replace the front panel, screws, sample chamber and rubber hose. Recalibrate the instrument.

***NOTE** — Be certain that the batteries are centered in the holder clips — inspect end contacts to ascertain that good contact is being made.

2. Sensor Care

The Model 52 Oxygen Sensor is a precision device and requires good treatment if optimum performance is to be obtained.

Check the KCl level often and add new solution if required. The special "duck bill" valve retards evaporation.
A membrane should be serviceable for several months. If it suffers mechanical damage or accumulates dirt and dust performance may deteriorate. Evidence of KCl crystals within the sample chamber suggests membrane damage.
When changing the membrane, flush out the sensor cavity with distilled water (or KCl solution) several times. Do not attempt to polish the surface of the gold and plastic. Wipe gently with a moist soft lint-free cloth if required. **WARNING:** Use only YSI recommended membranes and filling solution. Distilled water must be used in making the KCl so-

lution. Tap water contains iron and other salts that result in poor electrode performance and will contaminate the electrodes and result in short life.

YSI Maintenance Kit #05070 is available for this purpose and contains everything necessary except distilled water.

It should be noted that some gases can be reduced at the cathode at the polarizing potential required for oxygen. Included are SO_2 and Halogens. H_2S reacts with the metals and poisons the cell. This poisoning can usually be overcome by periodic wiping of the gold surface gently with a moist clean lint-free cloth.

3. Dryer Upkeep

The dryer is an integral portion of the gas collecting system and is used to remove excess moisture from gaseous samples to be measured. It consists of a plastic chamber filled with indicating Drierite.® In normal operation a check once a month should be adequate. If the Drierite® needs replacement it will be pink in color rather than its original blue.

GUARANTEE

The Model 52 Oxygen Meter is unconditionally guaranteed for one year against defects in components and workmanship. Damage through accident, misuse, or tampering will be repaired at a nominal charge when the instrument is returned to the factory or to a YSI authorized dealer.

SPECIAL NOTICE

If helium is present in the gas mixture, a special calibration procedure may be necessary. If FRESH air is used for calibration, the indicated oxygen values may be in error.

For use in helium atmospheres, calibration should be made using known oxygen helium gas mixtures.