Portable Oxygen Monitors

TELEDYNE
ELECTRONIC DEVICES

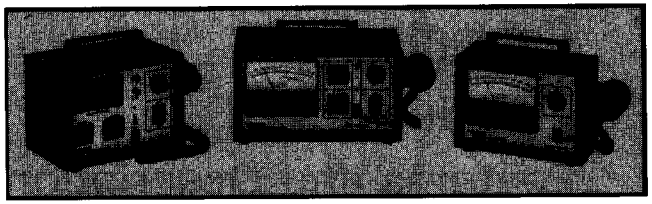
Contents

Introduction

The Models TED 120, TED 140, and TED 160 provide **continuous and specific monitoring of oxygen.** Each model is a fully independant unit designed to monitor oxygen in respirators, incubators and in other medical equipment.

The **TED 120** Oxygen (O_2) Analyzer is a simple, lightweight unit equipped with an easy-to-read analog meter, with 1% O_2, gradations. Its rugged aluminum case is designed to withstand abuse. And, the sensor holder — with 12 foot (3.6 meter) coiled cable — plugs into the TED 120, making the sensor convenient to mount in a variety of applications. Also, since the TED 120 meter display is driven directly from the O_2 sensor, no electronics or batteries are needed.

The **TED 140** includes the same features as the TED 120 plus battery-powered integral alarms. These two adjustable alarms include continuous audible and visual alarm indictors, highly readable white-on-black set point numerals, and a unique push-to-set feature that allows positive control of setpoint adjustments.



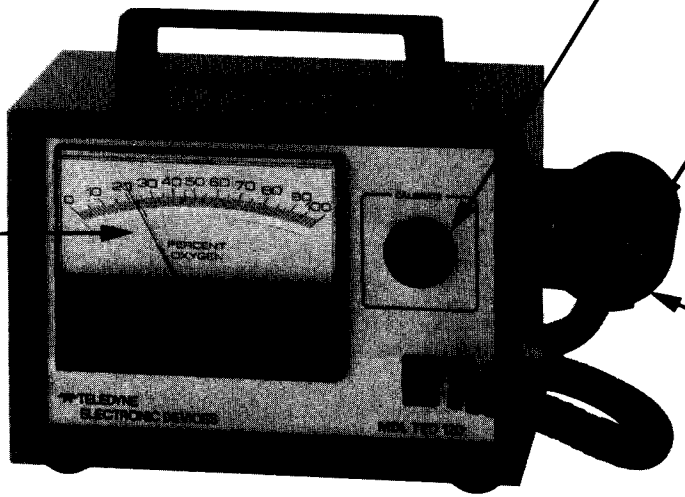
The **TED 160** has all the performance of the TED 140, except in a slightly different more compact package. One feature that distinguishes the TED 160 is its Liquid Crystal Display (LCD), which is readable from distances of 20 feet or more. Also, like the TED 140, the TED 160 has two adjustable alarm setpoints. However, alarm indication is provided by a *flashing* red indicator light and *pulsating* audible alarm. A momentary alarm silence pushbutton is also provided only on the TED 160.

The TED 120/140/160 all utilize the Teledyne patented* **Micro-fuel Cell O_2 sensor** specifically designed for medical applications. The sensor is a maintenance-free device that requires only a simple periodic calibration to assure reliable and accurate performance. At the end of its life, the sensor is easily removed from its holder and disposed of like a common flashlight battery. There are no electrolytes or membranes to change. And, the low-cost sensor has an excellent shelf life that makes it practical to keep spares on hand.

* U.S. Patent Nos. 3,429,796 and 3,767,552

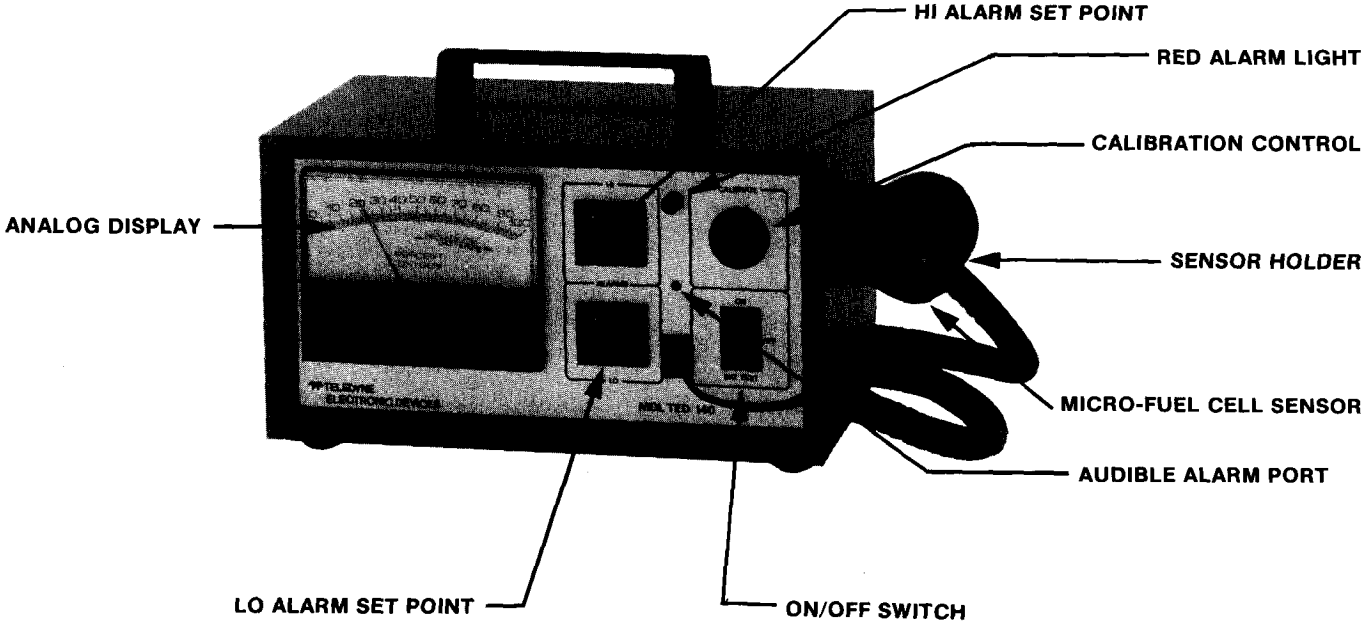
MODEL

TED 120 Oxygen Analyzer



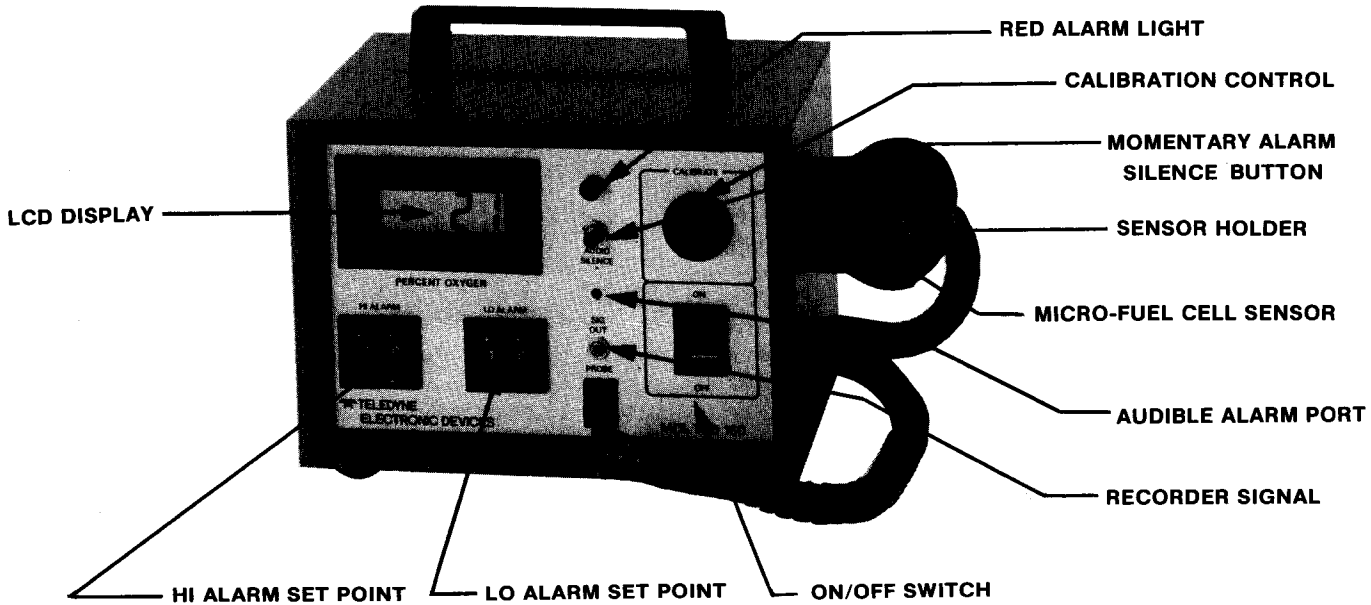
MODEL

TED 140 Oxygen Analyzer and Alarm System



MODEL

TED 160 Digital Oxygen Analyzer and Alarm System



Description

An important feature the **TED 120 Oxygen Analyzer** shares with the TED 140 and TED 160 is that it's so simple to use that a novice can become an expert with just a few minutes experience. An **analog meter display** (see Figure 1) provides a clear, easily readable indication of the percent O_2 content in the gas being monitored. Since the meter is driven directly by the electrical signal generated by the Micro-fuel Cell O_2 sensor, the TED 120 requires **no batteries!** Likewise, no on/off switch is needed.

The TED 120 features a rugged case made of aluminum extrusion and sheet metal constuction, coated with an attractive durable blue enamel paint. The TED 120 also features a corrosion-resistant, sterilizable **sensor holder** which contains the O_2 sensor. The sensor holder is easily plugged into the TED 120 via a coiled cable, allowing convenient mounting of the sensor.

The **TED 140** incorporates the oxygen monitoring capability of the TED 120 *and* adds an **integral alarm system** that includes one HI alarm and one LO alarm. The setpoints of these two fully adjustable alarms (see Figure 2) are indicated by white-on-black numerals located on the front panel of the TED 140. These setpoints are adjustable in increments of 1% O_2 and are changed by pushbuttons located above (+ adjust) and below (- adjust) each numeral.

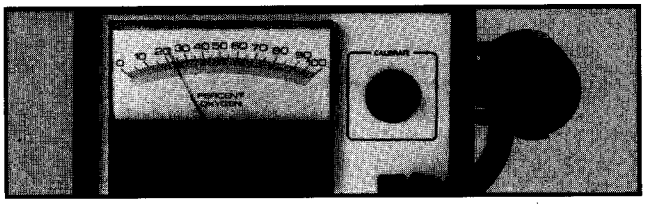


Figure 1. Analog Meter Display

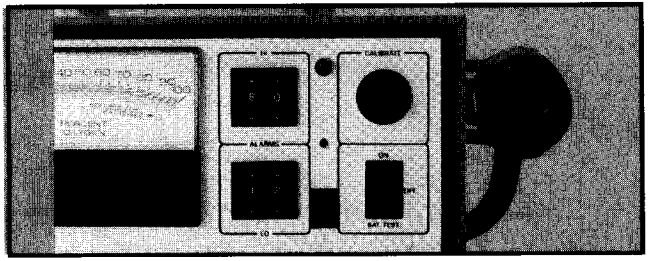


Figure 2. Pushbutton Alarm Setpoints (left)

Integral Audible and Visual alarm indicators are included in the TED 140 alarm system. When activated, the audible alarm utilizes an unmistakable **continuous sound** sufficiently loud to attract attention without being overpowering. The visual alarm indicator is a **red light** located on the front panel of the TED 140.

The following conditions activate the alarm indicators:

- When the oxygen reading is **above** the HI ALARM setpoint
- When the oxygen reading is **below** the LO ALARM setpoint
- **Any time the oxygen reading is below 18%,** regardless of the value of the alarm setpoints

Conveniently located on the front panel are the ON/OFF switch and the CALIBRATE control. A momentary position on the ON/OFF switch allows the meter to indicate when the batteries need replacing. Also, the front panel is **recessed** so that the bezel serves to protect the front panel.

The **TED 160** provides the same important features as the TED 140 in a slightly different, more compact package. Key difference is the use of a **Liquid Crystal Display (LCD)** (see Figure 3) to provide a readout of the O_2 content of the gas being monitored. The readout is automatically rounded-off to the nearest whole number.

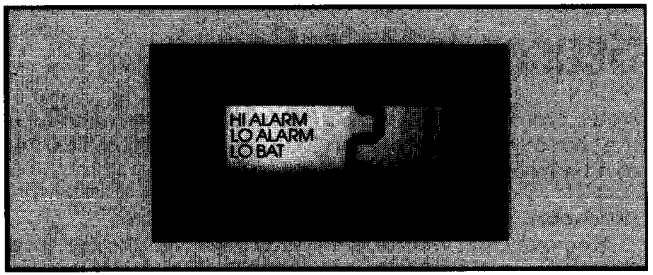


Figure 3. TED 160 LCD Display

Additionally, separate **word** readouts are incorporated into the LCD display to indicate the following conditions:

- HI ALARM
- LO ALARM
- LO BAT (low battery condition)

These readouts make it quick and easy to automatically confirm existing alarm conditions as well as identify when the batteries need replacement (the TED 160 uses two 9V batteries).

Visual and audible alarms on the TED 160 are a *flashing* red light and a *pulsating* audible alarm. Also unique to the TED 160 is a **momentary alarm silence button.** This provides bypassing the audible alarm for about 30 seconds, after which time the audible alarm will again activate if the alarm condition persists.

Sensor Installation

Note: The Micro-fuel Cell O_2 sensor must be installed in the sensor holder **before** the TED 120, TED 140 or TED 160 can be operated.

Procedure

1. Remove the Micro-fuel Cell from its barrier bag. **Carefully and correctly** pull off the shorting clip (see Figure 4). **CAUTION: Do not scratch, puncture or otherwise damage the Micro-fuel Cell membrane. Damage to the membrane may require sensor replacement.**

2. Unscrew the Holder Cap from the sensor holder (see Figure 5).

3. Place the Micro-fuel Cell in the sensor holder, as shown. Make certain that the Cell membrane faces toward the cap.

4. Screw the holder cap back onto the sensor holder.

5. Be sure the sensor holder's coiled cable is plugged into your TED 120/140/160. Proceed with "Operating Instructions."

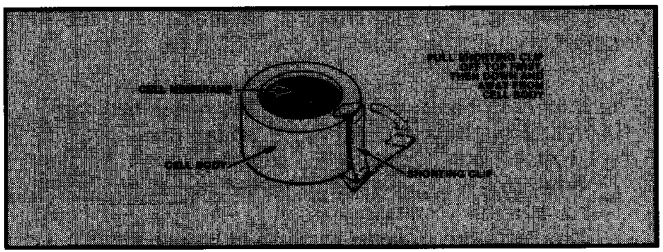


Figure 4. Removal of Shorting Clip

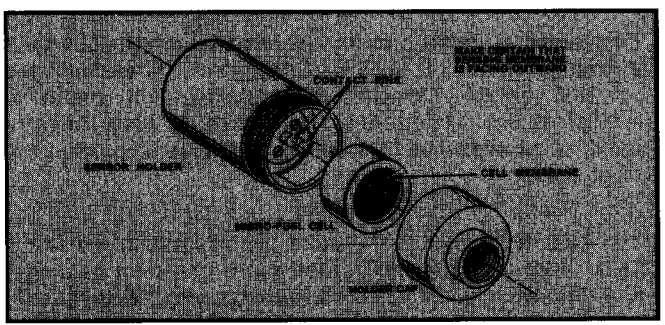


Figure 5. Installing Cell in Holder

Operating Instructions

Model TED 120

1. Be sure that the Micro-fuel Cell sensor is properly installed in your sensor holder.

2. Connect the plug from the sensor holder cable into its receptacle on the front panel of the TED 120.

*3. Expose the sensor holder to air (20.9% O_2). Adjust the CALIBRATE control until the meter needle coincides with the calibration mark.

4. The TED 120 is now ready for use.

Model TED 140

1. Hold the ON/OFF switch down in the BAT TEST position.

2. Check the meter for battery condition. Replace batteries if indicated.

3. Be sure the Micro-fuel Cell O_2 sensor is properly installed in your sensor holder.

4. Connect the plug from the sensor holder cable into its receptacle on the front panel of the TED 140. Turn switch ON.

*5. Expose the sensor holder to air (20.9% O_2). Adjust the CALIBRATE control until the meter needle coincides with the calibration mark.

*For optimum accuracy calibrate with 100% O_2. Set meter to read 100%.

6. Check HI ALARM by setting it **below** 21% O_2. The audible and visual alarms should activate. Adjust setting to desired level.

7. Check LO ALARM by setting it **above** 21% O_2. The audible and visual alarms should activate. Adjust setting to desired level.

8. The TED 140 is now ready for use.

Model TED 160

1. Turn switch ON. If LO BAT appears on the LCD Display, replace batteries.

2. Be sure the Micro-fuel Cell sensor is properly installed in your sensor holder.

3. Connect the plug from the sensor holder cable into its receptacle on the front panel of the TED 160.

4. Expose the sensor to pure oxygen (100% O_2). The T-adapter is useful to help accomplish this. Adjust CALIBRATE control until the Display reads 100.

5. Expose the sensor to room air; the Display should read between 20 - 22% O_2.

6. Check HI ALARM by setting it **below** 21% O_2. The audible and visual alarms should activate. Adjust setting to desired level.

7. Check LO ALARM by setting it **above** 21% O_2. The audible and visual alarms should activate. Adjust setting to desired level.

8. The TED 160 is now ready for use.

Precautions

1. Do not press on the sensing membrane of the Micro-Fuel Cell sensor. Scratching, puncturing or other damage to the membrane will require replacement of the sensor.

2. Do no autoclave or gas sterilize any part of the TED 120/140/160. Refer to "Disinfecting and Sterilization" for recommended methods.

3. Nearby operation of equipment such as high frequency, short-wave, or micro-wave apparatus may interfere with the proper functioning of the TED 140/160. The TED 120 is not sensitive to RFI.

4. The TED 140/160 should not be used in the presence of flammable gases or vapors.

5. The T-1 sensor used in the TED 120/140/160 is not recommended for use in gas mixtures containing nitrous oxide (N_2O). Contact your local TED distributor for information describing the correct TED product for N_2O gas mixtures.

Battery Replacement

For TED 140 and TED 160 Only

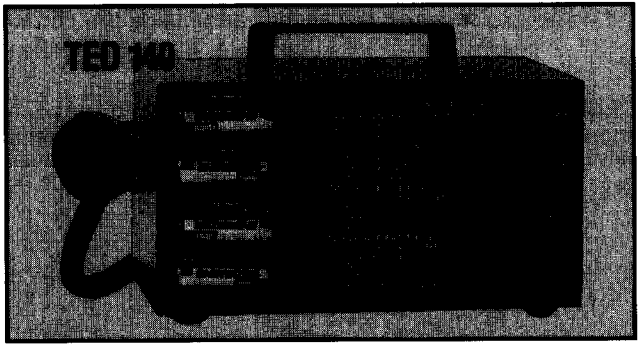
1. Turn switch OFF.

2. Move sliding back panel to the right, exposing the batteries (see Figure 7).

3. Remove old batteries.

4. For TED 140: Install four new "C" size batteries, observing polarity.
   For TED 160: Install two new 9 volt batteries.

5. Return back panel to original closed position.



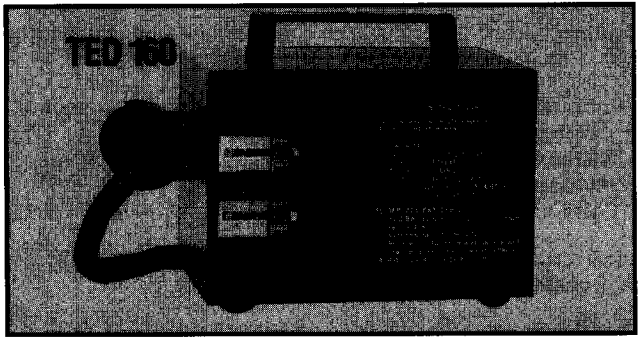


Figure 7. Battery Compartments

Disinfecting and Sterilization of Sensor and Sensor Holder

Caution: Do not autoclave or gas sterilize any part of the TED 120, TED 140, or TED 160

Solutions recommended for disinfecting the sensor, sensor holder and optional adapters are:
— SONACIDE, a potentiated acid glutaral-dehyde made by Ayerst Laboratories, Inc. **OR**
— CIDEX, an activated dialdehyde made by Arbrook, Inc.

Other commercially available solutions similar to these are acceptable for disinfecting.

Directions for sterilization are plainly and simply described on each solution container. These directions should be followed explicitly.

Procedure Notes:

1. Disassemble the sensor holder during sterilization.
2. Whenever possible, overnight sterilization rather than heating is recommended.
3. Rinse the sensor/holder with water after sterilization.
4. After rinsing, use a soft absorbant tissue or swab to dry all wetted surfaces on the sensor and inside the holder.

CAUTION: The sensor, sensor holder and optional adapters are the **only** parts of the TED 120/140/160 that can be sterilized or disinfected.

Installation Tips

— As with all oxygen sensors, **excessive** condensation on the cell membrane will block the diffusion of oxygen to the sensor. (If this should occur, carefully dry the membrane with a cotton swab or absorbant tissue, and continue using the sensor.) **Mount the holder vertically, or no more than 45° from vertical.** This helps prevent condensation build-up.

— A T-adapter is available for installing the sensor holder in breathing circuits. To install the holder on the T-adapter, screw or attach the appropriate optional accessory fitting **into** the holder cap. Then insert the holder, fitting end first, onto the T-adapter (see Figure 8).

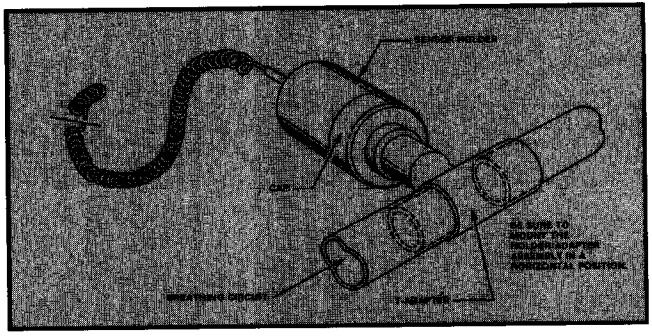


Figure 8. Mounting of Sensor Holder in T-adapter

— A mounting clamp is available that allows easy mounting of the TED 120/140/160 conveniently near the sensor holder, in a number of desirable positions (see Figure 9).

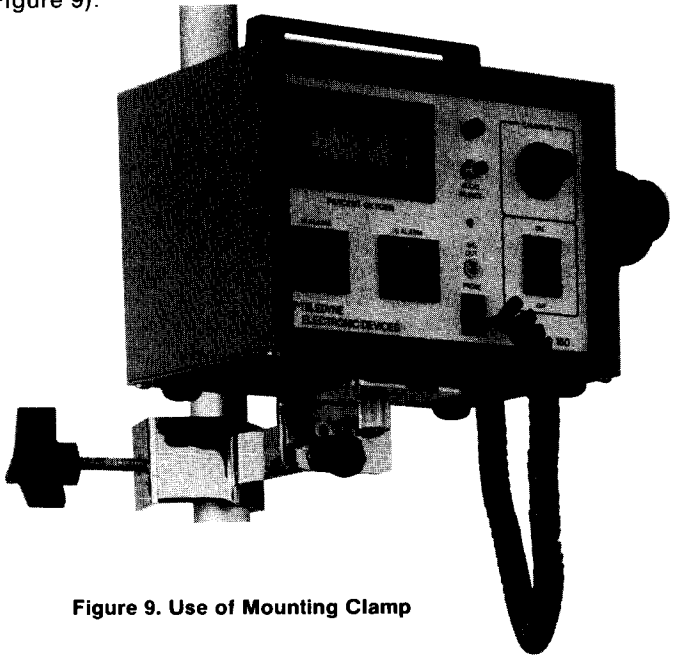


Figure 9. Use of Mounting Clamp

Effects of Pressure and Humidity

The effect of **pressure** is a trait common to virtually all sensors in medical oxygen analyzers. Because sensors measure the partial pressure of oxygen, it is normal for them to respond to changes in total pressure. For example, a positive pressure cycle of 100 cm of water will produce a 10.6% change in the oxygen reading. For a 50% O_2 mixture, that means a positive pressure of 100 cm of water will result in a reading of 55.3% O_2.

Humidity does not affect the accuracy of the sensor's measurement. However, when a nebulizer or other device is used to increase moisture levels in gas mixtures, the moisture actually dilutes the mixture. This dilution effect decreases oxygen concentration. For example, if an 80% O_2 gas mixture is humidified to saturation, at room temperature the resulting gas mixture will contain only 77.5% O_2. Your TED Oxygen Analyzer accurately measures decreases in oxygen concentration due to the dilution effects of moisture added to gas mixtures.

Optional Accessories

Description	Part No.
T-Adapter (white)	A-181
T-Adapter, conductive (black)	A-182
Mounting Clamp	B-34102

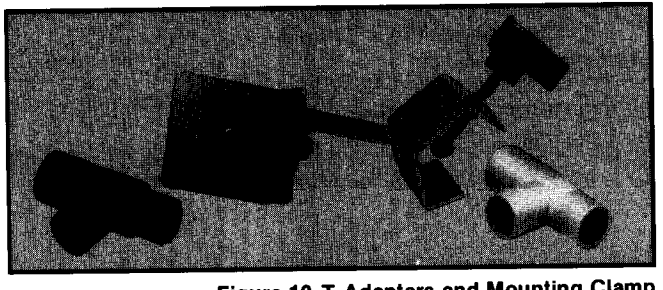


Figure 10. T-Adapters and Mounting Clamp

Spare Parts List

Description	Qty	Part No.
Micro-fuel Cell O_2 Sensor	1	A-37016
9 Volt battery (for TED 160 only)	2	B-326
"C" size battery (for TED 140 only)	4	B-90
Sensor Holder Assembly (includes coiled cable and connector plug)	1	B-36817

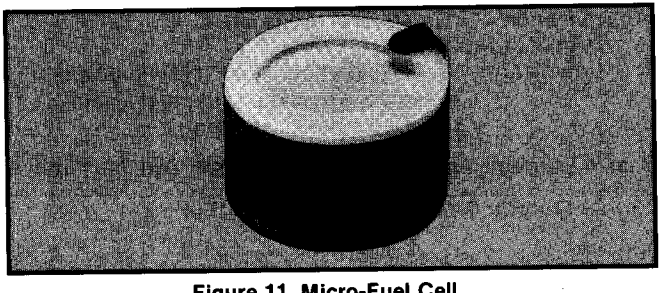


Figure 11. Micro-Fuel Cell

Specifications

Range: 0-100% Oxygen

Accuracy: ±2% of full scale at constant temperature; ±5% of reading (worst case) over the operating temperature range

Operating Temperature Range: 32-104 degrees F (0-40 degrees C)

Storage Temperature Range: 32 to 122 degrees F (0 to 50 degrees C)

Response Time: 90% in less than 30 seconds at 77 degrees F (25 degrees C)

Alarm Range (TED 140 and 160 only):
High Alarm: 00-99% Oxygen
Low Alarm: 18-99% Oxygen. Note: Low alarm is activated when readings drop below 18% regardless of setting.

Alarm Setpoint Accuracy: ±1% (TED 140 and TED 160)

Signal Output: 0-100 millivolts (TED 160)

Power Requirements:
TED 120: None
TED 140: 4 "C" size 1.5 volt batteries
TED 160: Two 9 volt batteries.

Expected Sensor Life: 12 months

Sensor Type: T-1 Micro-fuel Cell (galvanic)

Dimensions:
TED 120: H=5.8" x W=8.6" x D=3.0"
(147mm x 218 mm x 76mm)
TED 140: H=5.8" x W=10.5 " x D=4.5"
(147mm x 267mm x 114mm)
TED 160: H=5.8" x W=8.6" x D=4.5"
(147mm x 218mm x 114mm)

Net Weight:
TED 120: 1.9 lbs. (0.86 kg)
TED 140: 3.3 lbs (1.5 kg)
TED 160: 2.6 lbs. (1.2 kg)