

**BTU MONITOR
MODEL A171**

Instruction Manual



Supplied By:

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BTU Monitor Model A171

I. INTRODUCTION

This hand-held portable gas detection instrument is designed to give a quick indication of BTU value of a propane-air mixture, as a guide to proper adjustment of the mixer. It uses the principle of electrochemical oxygen detection to determine the concentration of oxygen and hence the concentration of air in the mixture. The proportion of air in a propane-air mixture gives an immediate basis for determining the BTU value of the mixture.

II. DESCRIPTION

The Model A171 is assembled into a two-part plastic housing, measuring 3 x 6 x 1 thick, designed to be held in the right hand of the user. A digital meter displays the instantaneous BTU value being tested, from 0-2520, a flexible sample tube brings the test mixture on the left-hand side, a rotameter-type flowmeter on the left front shows flow rate over the sensor, and a thumbwheel-adjustment potentiometer allows quick setting of the circuit to read 000 in the absence of any propane. A miniature SPAN potentiometer is accessible through a hole in the front panel. An internal 9-volt battery supplies power and a toggle switch on the front shuts off the circuit when not needed.

III. OPERATION

The Model A171 requires an adjustable low flow rate of the unknown sample to be fed to the oxygen detecting sensor, through a 3' length of 1/4" OD polyethylene tubing which is furnished with the instrument, complete with Imperioal Polyflo nuts at each end. The sources of sample must include a user-supplied flow-adjustment needle valve with a 1/4" Polyflo outlet.

Included with the Model A171 is a rubber aspirator bulb with an outlet fitting to match the inlet fitting on the left-hand side of the instrument. When this is connected, squeezing the bulb 2 or 3 times will flush out any residual propane, allowing the instrument to be set to 0 in the absence of propane, and with nothing but air at the oxygen sensor.

To Make A Test:

- A. Turn POWER switch on.
- B. Flush out system with air, by connecting and squeezing the rubber aspirator bulb.
- C. Adjust to 999 as nearly as possible by moving the rubber-edged ZERO wheel. Push up, toward the top of the instrument, to increase reading. The far right digit may tend to read up to 5 digits above or below zero, which will not interfere with the use of the instrument.
- D. Connect sample tube to instrument inlet, and to needle valve outlet on gas mixer.
- E. Open needle valve gradually, to bring flow up to SET band of flowmeter, as read while instrument is held in a vertical position.
- F. Watch display and note final reading. It should be achieved within 30 seconds.
- G. Multiply reading by 10 to obtain BTU value of mixture. For example, a reading of 124 should be recorded as 1240 BTU.
- H. Turn off gas flow, and turn off POWER switch. It is preferable to clear the unit of residual gas by use of the rubber bulb before putting it away.

IV. CALIBRATION

The A171 can be calibrated using readily available gas sources.

- A. The "0" setting, which in reality is the condition of 100% air, is checked, and set by the operator if necessary, each time the instrument is turned on. The reading will vary slightly with temperatures, barometric pressure, and atmospheric humidity, so is likely to need readjustment at each use. This is the response of the oxygen cell to variations in oxygen in the atmosphere and should not be regarded as instrument instability.

Calibration should be checked occasionally, for example every month, on 100% propane. The reading should be set to 2520, which represents total absence of oxygen. This reading is quite stable, but can be set if needed, using a screwdriver to turn the SPAN potentiometer next to the POWER switch.

V. MAINTENANCE

- A. The battery should last a year in normal use. It is easily replaced without opening the case by removing the small cover on the lower rear of the instrument. To remove the cover, push the small tab on the cover up toward the top of the instrument, which will release the latch. Unplug the battery and replace it with a standard 9-volt battery.
- B. Oxygen cell will last about 15 months, regardless of hours of use. When the cell is spent, it will become impossible to set to zero within the span of the ZERO potentiometer.

To replace the cell, open the instrument case, pull the cell out of its cavity and unplug the two wires after noting the color coding and position. Push a new cell into the cavity and connect the wires. The new cell should preferably be checked for calibration, and the ZERO will definitely require re-adjustment.

- C. Flowmeter may be replaced by prying up the spring retainers on the upper and lower stem. Then, pull out the flowmeter assembly and replace with a new one, using new spring retainers.
- D. For any other malfunction, return the instrument to Superior Energy Systems, Ltd. for repair. Please contact us at 440-236-6009 for repair/return instructions.

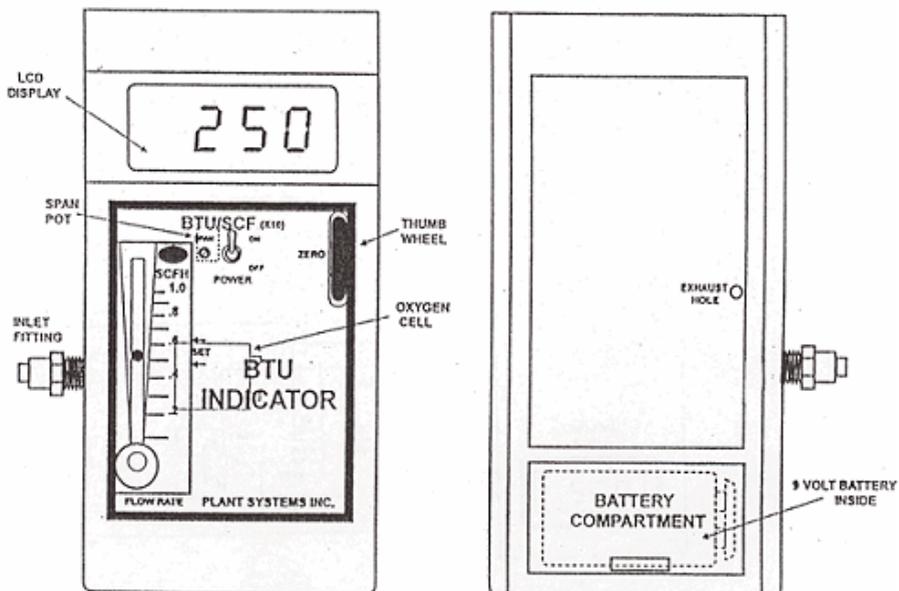
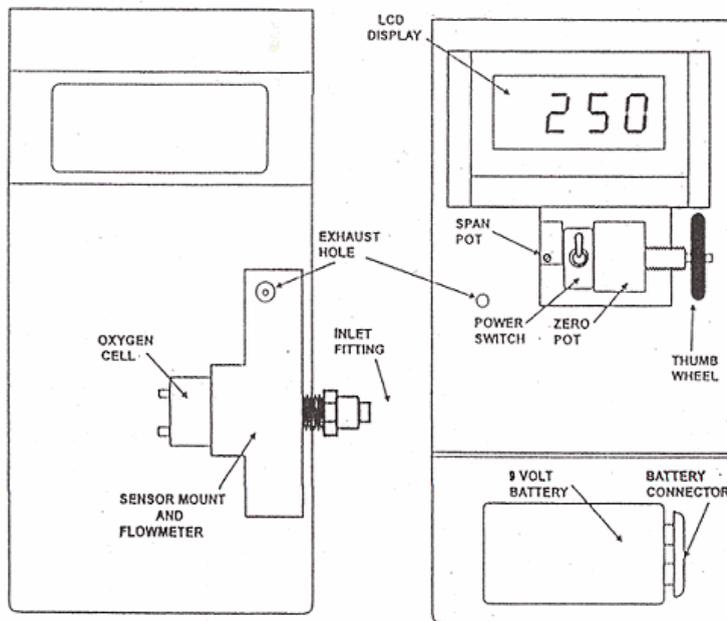
VI. ACCESSORIES

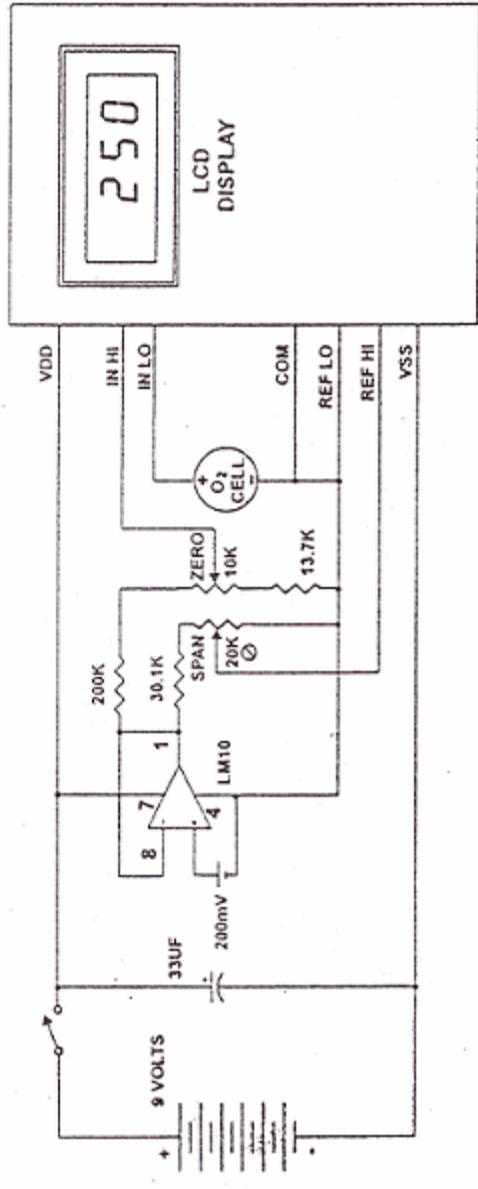
The Model A171 is supplied as a kit in a plastic carrying case, which contains all needed accessories. These include the 3' inlet tube, the rubber bulb, the adjustment screwdriver, a container for a spare oxygen sensor, and the instruction manual.

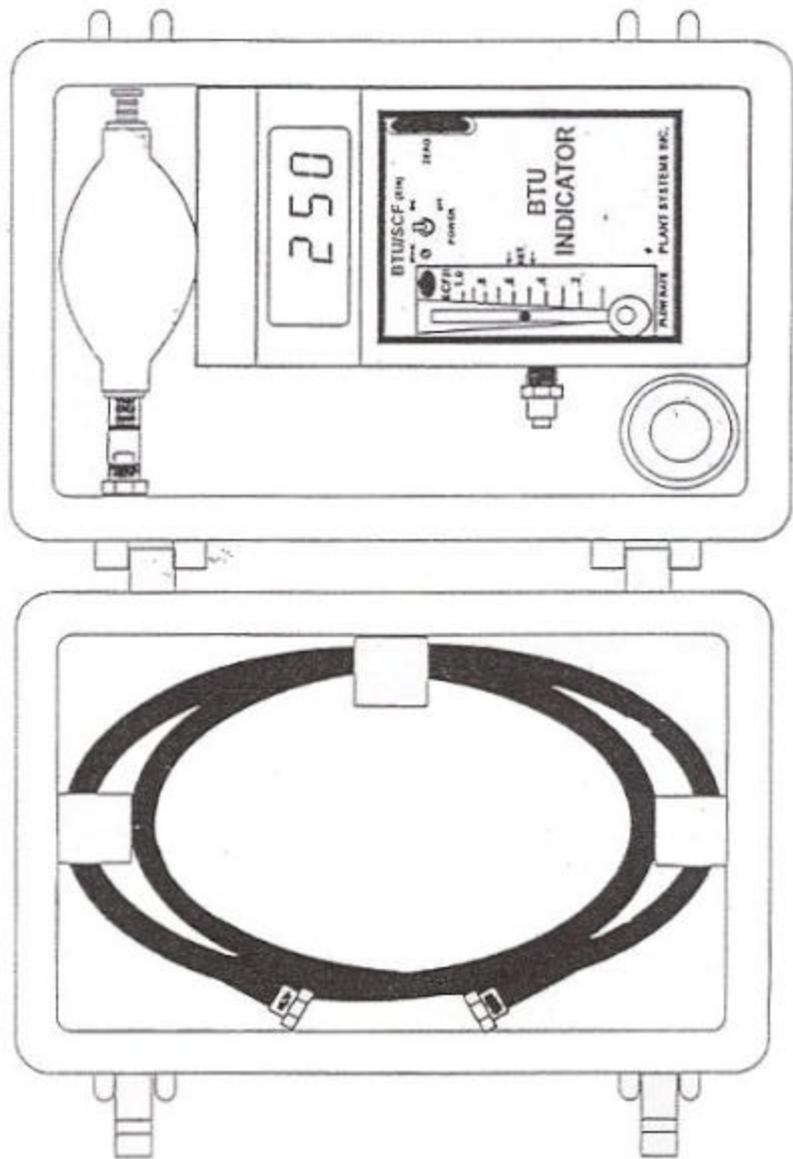
VII. PARTS LIST

Contact Superior Energy Systems, Ltd. at 440-236-6009 for parts including:

Oxygen Cell, Battery, Aspirator Bulb, Flowmeter, and Carrying Case.







| Property | Natural Gas | Propane | Butane |
|------------------------------------------------------|-----------------|-------------------------------|--------------------------------|
| Chemical Formula | CH ₄ | C ₃ H ₈ | C ₄ H ₁₀ |
| Boiling Point of Liquid @ Atmospheric Pressure | -258.7°F | -43.7°F | 31.1°F |
| Vapor Pressure PSIG @ -20°F | Approx 1800 | 10 | - |
| Vapor Pressure PSIG @ 0°F | - | 24 | - |
| Vapor Pressure PSIG @ 20°F | - | 41 | - |
| Vapor Pressure PSIG @ 40°F | - | 63 | 3 |
| Vapor Pressure PSIG @ 70°F | - | 109 | 17 |
| Vapor Pressure PSIG @ 100°F | - | 172 | 40 |
| Calorific Value: BTU/CF @ 60°F | 1012 | 2520 | 3350 |
| Calorific Value: BTU/Gallon @ 60°F | - | 91,500 | 103,000 |
| Latent Heat of Vaporization: BTU/Gallon | 712 | 774 | 808 |
| Liquid Weight: Lbs./Gallon | 2.5 | 4.23 | 4.86 |
| Vapor Specific Gravity | 0.6 | 1.5 | 2.0 |
| C.F. of Vapor Formed from 1 Gallon of Liquid at 60°F | 59 | 36.38 | 31.26 |
| Combustible Limits % of Gas in Air | 5-15 | 2.4-9.5 | 1.9-8.4 |
| C.F. of Air Required to Burn 1 C.F. of Gas | 9.53 | 23.82 | 30.97 |

| BTU Content - Common Fuels | | |
|----------------------------|-----------|------------|
| | Per Pound | Per Gallon |
| Propane | 21,5000 | 91,500 |
| Butane | 21,200 | 102,400 |
| Gasoline | 20,930 | 110,250 |
| Fuel Oil #1 | 16,960 | 135,425 |
| Diesel | 18,500 | 142,800 |

| Informative Data | |
|------------------------|------------------|
| Type | BTU |
| 1 Pound Steam | 970 |
| 1 Boiler HP (Per Hour) | 33,475 |
| 1 Kilowatt Hour | 3,412 |
| 1 Gallon Water | 8.337 Lb. |
| 1 Cubic Foot Water | 7.481 Gal |
| 1 Gallon | 231 Cubic Inches |