

OxyCal R17/R22

Description of the Device

A small hand-held battery powered device that produces voltages equivalent to Oxygen sensors R17 & R22.

The R22 version can be obtained by using an extension cable

Specification

On/off centre biased switch which switches the output from approx 10mV to 50mV on demand

Size is not important. At the same time it switches the battery on

There needs to be a battery indicator so that the output voltages can be guaranteed accurate.

Theory of Operation

Object

To deliver two test voltages approx. 10.0mV and 50mV which simulates the output of an oxygen sensor in Air and in 100% Oxygen.

The device can then be used to test and calibrate Oxygen analysers

Theory of operation

History of device: The device is based on an original Teledyne designed circuit (circ 1985) which was used as an J4 simulator Fig 1.

When the J4 was replaced by the T7 the out this system still worked. But in order to set it up the output being a current had to be fed into a suitable resistor so that a voltage could be easily set.

With the T7 the last resistor 120Kohm was not used as this resistor was replacing a thermistor in the J4 which was not in the T7.

Circuit

The circuit is in three parts

- 1) Battery Test
- 2) 2.5 v regulator
- 3) Potential dividers

Battery Test

This consists of two resistor zener diode chains.

Voltage above 3.9v + LED allows the Green LED to show

Voltage below 2.7v + LED allows the Red LED to show

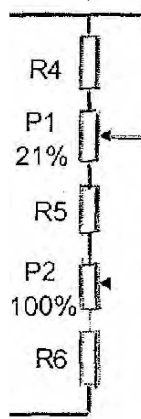
The unit becomes inaccurate when the red LED is on

2.5v Stabilised supply

OxyCal R17/R22

The 2.5v stabilised supply is generated with a resistor R3 and a reference voltage source REF
The capacitor C is used to smooth out any spikes caused by switch bounce

Potential divider



The potential divider is in two parts P1 & P2 (50ohm) in series with R4 (180 ohm R5 (620 ohm) & R6 (51Kohm)
High voltage is set by P1 and the low voltage by P2
These pots are required to counteract any tolerances generated in the 2.5v reference and which would be present if they were fixed resistors.
The combination of two pots and fixed resistors give a greater degree of control on set up.

A single two pole centre off biased toggle switch is used to switch on the battery and choose the voltage required.
The output will be marked 21% and 100%.

The biased toggle is used to prevent the unit being left switched on when not in use and discharging the battery.

Set up Procedure

Check for 2.5v

Set P2 to 47.85mV

Set P1 to 10.00mV

NB (for use with Vandagraph monitors use different procedure VM3COP40.13 to account for different input impedance. Set P2 to 50 mV then using a VN202 mkII set cal to 100. Set P1 so the reading on the VN202 mkII is 20.9)

In use the output 3.5mm Jack socket is connected via the sensor cable to the analyser.

Set 100% Analyser should read 100%

Set 21% Analyser should be calibrated to 21%

Phase II

A third pot could be added in between to check alarm settings.

A variable pot with digital output could be used to set different output levels to match new sensors appearing on the market.

OxyCal calculation

Battery check has been proven by being in use since 1985

Output R17/R22 10.0V nominal +/- 30% in Air

47.85V nominal +/- 30% in 100% Oxygen

The device requires a low impedance output in order to feed accurately in a 10Kohm minimum load.

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Oxycal Block Diagram

