

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 can be obtained by using an extension cable

Specification

On/off centre biased switch which switches the output from 10.5mV to 50.2mV on demand

Size is not important.

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 10.5mV and 50.2mV which simulates the output of an oxygen sensor in Air and in 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 (circa 1985) which was used as an J4 simulator Fig 1.

When the J4 was replaced by the T7 the output 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) 5 v regulator
- 3) Potential dividers

Battery Test

This consists of two resistor zener diode chains.

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

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Voltage below 2.7v + LED allows the LED to show Red
Voltages between 2.7v & 3.9v will allow a combination of red + green to be seen.
The unit becomes inaccurate when the red LED is on

5v Stabilised supply

The 5v stabilised supply is generated with a resistor and a reference voltage source.
The capacitor is used to smooth out any spikes caused by switch bounce

Potential divider

The potential divider is in two parts
A coarse voltage is set by VR1 and VR3 to 15mV and 55mV.
These pots are required to counteract any tolerances generated in the 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.
The 15mV and 55mV are set to the required voltages of 10.5mV and 50.2mV by adjusting pots VR2 & VR4.

A single two pole center off biased toggle switch is used to switch on the battery and choos 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 5.0v on TP1
Set TP2 to 15mV
Set TP3 to 50.2mV
Set TP4 to 10.5mV
Set TP5 to 50.2mV

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

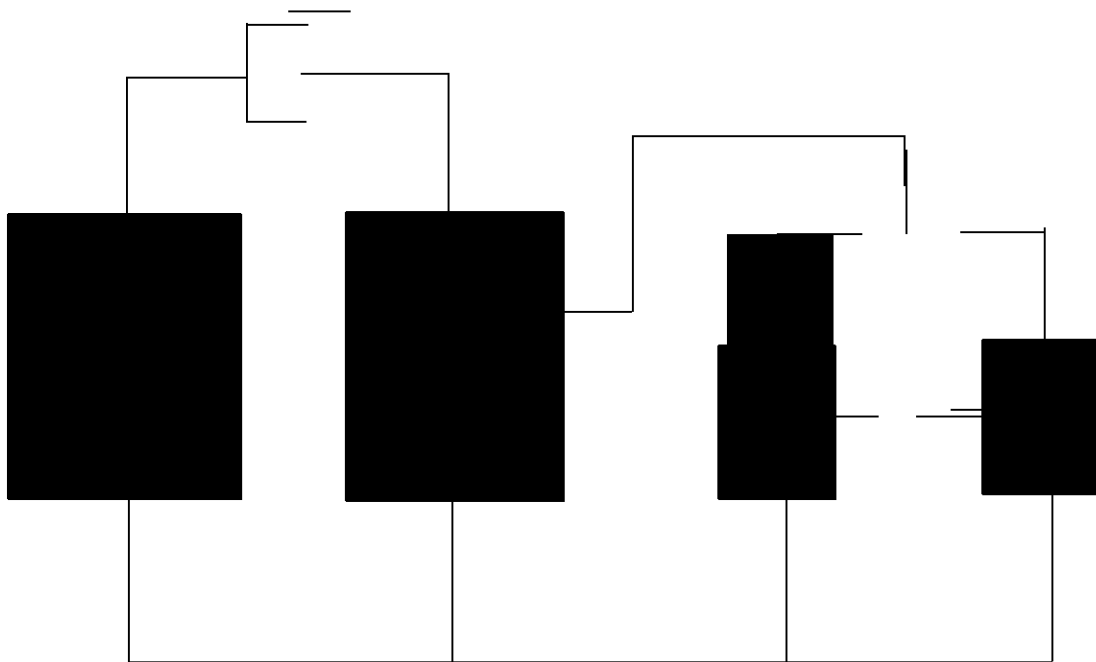
Set 21% Analyser should be caluibrated to 21%
Set 100% Analyser should read 100%

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 diffent output levels to match new sensors appearing on the market.

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Oxycal Block Diagram



OxyCal calculation

Battery check has been proven by being in use since 1985

5v Regulator has been proven by being in use since 1985

Output R17/R22 10.5mV nominal +/- 30% in Air

50.2mV nominal +/- 30% in 100% Oxygen

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

% v has a tolerance of 5% and 10K ohm potentiometers and resistors have a tolerance upto 5%.

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The 10Kohmm pot is then arranged to be set at approximately 8Kohms.

Sett TP'' to 15mV then TP4 can be acctrately set to 10.5mV

Set TP3 to 55mV then TP5 can be accurately set to 50.2mV.

Analysers can then be checked at 12% and 100%