



OXY100C PULSE OXIMETER MODULE

Note: Effective August 2010, the OXY100E replaced the OXY100C

The OXY100C Pulse Oximeter Module is primarily used to measure beat-by-beat blood oxygen saturation (SpO₂) in a noninvasive fashion. The OXY100C probe incorporates light-emitting diodes (LEDs) which face photodiodes through a translucent part of the patient's body, usually a fingertip or an earlobe. One LED is red, with wavelength of 660 nm, and the other is infrared (approximately 910 nm). Light absorption at these wavelengths is different between oxyhemoglobin and its deoxygenated form. The oxyhemoglobin/deoxyhemoglobin ratio can be calculated via the ratio of the absorption of the red and infrared light. In particular, the OXY100C outputs (as a proportional voltage) the percentage of arterial hemoglobin in the oxyhemoglobin state. This ratio is expressed as the O₂ Saturation Level and will vary between 0% and 100%.

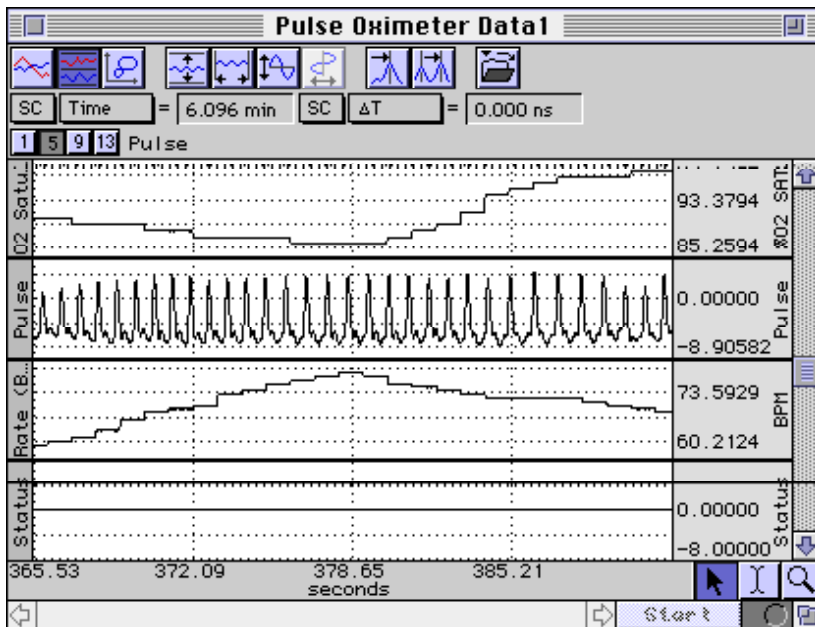
The OXY100C operates in accordance to the principles outlined by the Lambert-Beer law. This is an empirical relationship that relates the absorption of light to the properties of the material through which the light is traveling.

The Pulse Oximeter Module connects directly to the MP150 via the UIM100C. Up to four OXY100C modules can be used with a single MP System. The Pulse Oximeter Transducer (TSD123) connects to the OXY100C via a 3-meter extension cable (included with the OXY100C).

The OXY100C outputs four signals simultaneously. Output signals can be optionally directed to a number of different MP System input channels as determined with the BANK SELECT:

CH SIGNAL	Bank 1	Bank 2	Bank 3	Bank 4	
A	O ₂ Saturation	Channel 1	Channel 2	Channel 3	Channel 4
B	Pulse Waveform	Channel 5	Channel 6	Channel 7	Channel 8
C	Pulse Rate	Channel 9	Channel 10	Channel 11	Channel 12
D	Module Status	Channel 13	Channel 14	Channel 15	Channel 16

There is an ON/OFF switch for each signal output channel on the OXY100C. Set the switch for each signal output channel to sample all, some or none of the signals. When any Signal Channel Enable switch is OFF (bottom position), the corresponding MP150 channel can be used by another input device.



The OXY100C includes Calibration features that permit easy scaling of all these signals when using the OXY100C with the MP System.

The graph on the following page shows sample output.

O₂ Saturation
(beat-by-beat, CH 1)

Pulse Waveform
(beat-by-beat, CH 5)

Pulse Rate
(continuous, CH 9)

Module Status
(dynamic, CH13)

OXY100C CALIBRATION

Initial setup— OXY100C with an MP System:

1. Snap the OXY100C into the side of the UIM100C.
2. Connect the Analog cables directly from the MP150 to the OXY100C Analog mating connectors.
3. Connect the Digital cables directly from the MP150 to the OXY100C Digital mating connectors.
4. When the cable connections are secure, power up the MP150.
5. On the OXY100C module, place the four-position **Bank Select** switch to the first bank (top position). In this position, the OXY100C output signals will be directed as follows:

O ₂ Saturation	Channel 1	Pulse Rate	Channel 9
Pulse Waveform	Channel 5	Module Status	Channel 13

If using multiple OXY100C modules with a single MP System, be sure to place additional OXY100C modules on unique banks. Furthermore, please check that any OXY100C output does not reside on the same channel used by any other amplifier module.

6. On the OXY100C module, slide the four-position **Calibration** switch to the **OFF** position (bottom).
7. On the OXY100C module, set all the **Signal Channel Enables** to **ON** (top position).
8. Using the **Input Channels Setup** in *AcqKnowledge*, label the OXY100C signal outputs as follows:

<u>Channel</u>	<u>Label</u>
A5	Pulse
A9	Rate (BPM)
A13	Status (status reports a voltage, after calibration the stat

9. It's best to calibrate the OXY100C once, then **Save As > Graph Template** to save the respective scale values.

SCALE SETTING

1. **Determine the highest frequency component** of all the waveforms sampled. To properly sample the signals from the OXY100C, the sample rate of the MP150 (set from *AcqKnowledge*) will need to be double the rate of the highest frequency component resident in the input data.

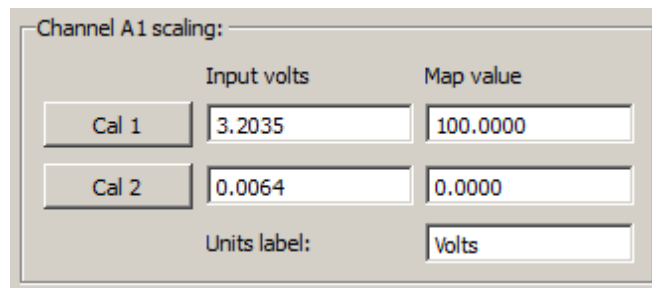
If just the OXY100C is being used, the maximum sampling rate will normally be 50 Hz or less.

If the Pulse Waveform signal is not being sampled, the maximum sampling rate drops to double what the expected pulse rate maximum would be.

The fastest pulse rate detectable by the OXY100C is 250 BPM, so the safe sampling rate minimum would be: $2 \times [250 \text{ BPM}] / [60 \text{ sec/min}]$ or 8.33Hz

2. **Establish the Calibration Scaling for each channel**

O₂ Saturation (Channel 1) scaling



The screenshot shows a dialog box titled "Channel A1 scaling:". It contains two calibration rows, "Cal 1" and "Cal 2", each with an "Input volts" field and a "Map value" field. Below these is a "Units label:" field.

	Input volts	Map value
Cal 1	3.2035	100.0000
Cal 2	0.0064	0.0000
Units label:	Volts	

- Slide the OXY100C Calibration switch to the CAL LO position.
- Click on the Cal2 button in the Channel A1 scaling dialog box.
- Slide the OXY100C Calibration switch to the CAL HI position.
- Click on the Cal1 button in the Channel A1 scaling dialog box.
- Enter the Map values: Cal1 = 100.00, Cal2 = 0.00
- Enter the Units label: %O2 SAT

Ideally, the nominal Cal1/Input volts value should be exactly 3.200. The nominal Cal2/Input volts value should be exactly 0.00. In practice, there will be very slight deviations from these expected values. The minimum O₂ Saturation level detectable by the OXY100C is 0.00%. The maximum O₂ Saturation level detectable is 100%. In the range from 80% to 100% the O₂ Saturation level is $\pm 2\%$ accurate. From 0% to 79%, the O₂ Saturation level is unspecified.

Pulse Waveform (Channel 5) scaling

Channel A5 scaling:		
	Input volts	Map value
Cal 1	4.0604	10.0000
Cal 2	0.0073	-10.0000
Units label:	Pulse	

- Slide the OXY100C Calibration switch on the OXY100C module to the **OFF** position.
- Slide the OXY100C Calibration switch to the CAL LO position.
- Click on the Cal2 button in the Channel A5 scaling dialog box.
- Slide the OXY100C Calibration switch to the CAL HI position.
- Click on the Cal1 button in the Channel A5 scaling dialog box.
- Enter the Map values: Cal1 = 10.00, Cal2 = -10.00.
- Enter the Units label: Pulse

Ideally, the nominal **Cal1/Input** volts value should be exactly 4.064. The nominal **Cal2/Input volts** value should be exactly 0.00. In practice, there will be very slight deviations from these expected values. The Pulse Waveform output from the OXY100C is functionally equivalent to a standard plethysmographic waveform, such as obtained with the PPG100C and TSD200.

Pulse Rate (Channel 9) scaling

Channel A9 scaling:		
	Input volts	Map value
Cal 1	3.9902	250.0000
Cal 2	0.0027	0.0000
Units label:	BPM	

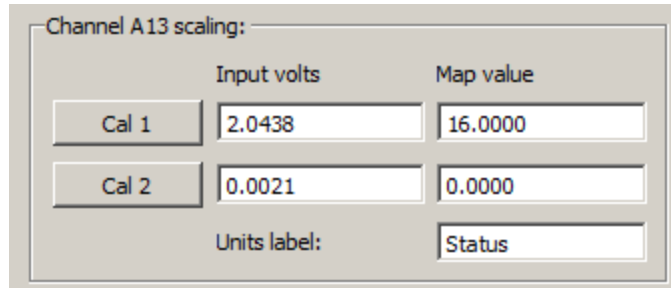
- Slide the OXY100C Calibration switch on the OXY100C module to the **OFF** position.
- Slide the OXY100C Calibration switch to the CAL LO position.
- Click on the Cal2 button in the Channel A9 scaling dialog box.
- Slide the OXY100C Calibration switch to the CAL HI position.
- Click on the Cal1 button in the Channel A9 scaling dialog box.

- f) Enter the Map values: Cal1 = 250.00, Cal2 = 0.00.
- g) Enter the Units label: BPM.

Ideally, the nominal **Cal1/Input volts** value should be exactly 4.00. The nominal **Cal2/Input volts** value should be exactly 0.00. In practice, there will be very slight deviations from these expected values.

The minimum BPM detectable by the OXY100C is 30. The maximum BPM detectable is 250. The BPM accuracy in the range of 30-250 BPM is $\pm 1\%$. The BPM settles to $\pm 1\%$ of the final reading less than 15 seconds after the sensor is properly applied.

Module Status (Channel 13) scaling



The screenshot shows a dialog box titled "Channel A13 scaling:". It contains two columns: "Input volts" and "Map value".

	Input volts	Map value
Cal 1	2.0438	16.0000
Cal 2	0.0021	0.0000
Units label:	Status	

- a) Slide the OXY100C Calibration switch on the OXY100C module to the **OFF** position.
- b) Slide the OXY100C Calibration switch to the CAL LO position.
- c) Click on the Cal2 button in the Channel A13 scaling dialog box.
- d) Slide the OXY100C Calibration switch to the CAL HI position.
- e) Click on the Cal1 button in the Channel A13 scaling dialog box.
- f) Enter the Map values: Cal1 = 16.00, Cal2 = 0.00.
- g) Enter the Units label: Status.

Ideally, the nominal **Cal1/Input volts** value should be exactly 2.048. The nominal **Cal2/Input volts** value should be exactly 0.00. In practice, there will be very slight deviations from these expected values.

MODULE STATUS LEVELS:

- | | |
|---|--|
| 0 – no status errors, all is well | 9 – probe error 2, sensor’s IR led has failed |
| 1 – probe fell off subject, outputs at full scale | 10 – connect probe, probe not connected to OXY100C |
| 2 – unused | 11 – incorrect probe, incompatible probe connected |
| 3 – insufficient light, mean path is too low for valid readings | 12 – front end initializing |
| 4 – light interference, ambient noise detected on front end | 13 – unused |
| 5 – pulse out of range, pulse rate exceeds 250 BPM | 14 – unused |
| 6 – low signal strength, AC signal too low | 15 – unidentified probe, can’t determine if probe is correct |
| 7 – monitor error 1, front end fatal error | 16 – probe failure, general |
| 8 – probe error 1, sensor’s red led has failed | |