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PULSE OXIMETRY

OXY100E Module (18-321 BPM)
OXY200 Module (for veterinary use only, 18-450 BPM)
TSD124 Series SpO$_2$ Transducers for OXY100E or OXYSSH-SYS
TSD270 Series SpO$_2$ Transducers for OXY200

These modules measure beat-by-beat, blood oxygen saturation (SpO$_2$) level in a noninvasive fashion. The OXY100E outputs four signals simultaneously:

A: SpO$_2$ value (Ch 1, 2, 3, or 4)

B: Pulse Plethysmogram (Ch 5, 6, 7, or 8)

C: Heart pulse rate (Ch 9, 10, 11, or 12)

D: Module Status (Ch 13, 14, 15, or 16)

These signals are directed to switchable blocks of different MP input channels. Up to four OXY modules can be used with a single MP System. The modules have built-in calibration for a simplified setup procedure. Each OXY module requires one of the TSD124 series SpO$_2$ transducers.

The modules operate in accordance to 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 OXY modules are noninvasive instruments that measure blood-oxygen percentage levels. The module probe incorporates light-emitting diodes (LEDs) which face photodiodes through a translucent part of the subject'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 OXY modules output (as a proportional voltage) the percentage of arterial hemoglobin in the oxyhemoglobin state.

Both the OXY100E and OXY200 have an **ON/OFF** switch for each signal output channel. Users can 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 MP200 channel can be used by another input device.

Available Extensions:

- **CBLOXY-EXT** — 2.4 m Pulse Oximeter Extension Cable for use with OXY100E and OXY200 (connects units to TSD124D).

- **OXY100E-200 EXT** — 3 m Pulse Oximeter extension cable (Discontinued Oct. 2021)

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TSD124 SERIES SPO$_2$ TRANSDUCERS FOR OXY100E

*TSD124B Ear Clip*   *TSD124C Flex Wrap*   *TSD124D Finger Clip*

The TSD124 series human oximetry transducers are reliable and simple to use on a wide range of subjects for both short-term and continuous noninvasive monitoring. The TSD124B/C incorporate Nonin's PureLight® sensors and are backed by a six-month warranty. Use with the OXY100E oximetry amplifier or OXYSSH-SYS pulse oximetry system.

Available Types:

TSD124B   Ear Clip SpO$_2$ Transducer
          Subject Range: > 40 kg (88 lbs)
          Length: 1 m

TSD124C   Flex Wrap SpO$_2$ Transducer (Ships with 25 RX124C adhesive wrap guides)
          Length: 1 m

          RX124C   Disposable FlexiWrap® adhesive guides for
                   use with the reusable TSD124C Flex Sensor.
                   Sized for adults (> 20 Kg or 44 lbs)
                   Apply to index, middle or ring finger.
                   Qty 25 per pack

TSD124D   Finger Clip Transducer *Replaced TSD124A April 2021*

          Subject Range: > 30 kg (66 lbs)
          Preferred application: Index, middle or ring fingers
          Length: 1 m
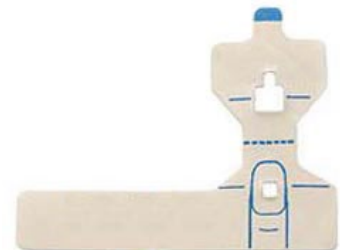
TSD270 Series SpO$_2$ Transducers for OXY200

The TSD270 series veterinary oximetry transducers are reliable and simple to use on a wide range of animals for both short-term and continuous noninvasive monitoring. The transducers incorporate Nonin's PureLight® sensors and are backed by a six-month warranty. Use with the OXY200 Veterinary oximetry amplifier.

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TSD270A Transflectance Transducer

The Transflectance Sensor, the smallest probe, is ideally suited for continuous monitoring from the paw, tail, or other vascularized part of the animal. It can be conveniently placed on the underside, base of the tail or other well-perfused surfaces. It is an excellent option during dental procedures.

TSD270A

TSD270B Small Animal Wrap Transducer

The flexible wrap sensor can be placed on a small, well-perfused appendage. This sensor is easily secured making it ideal for continuous monitoring during long surgical or other procedures. It is most often used on rodents or other very small animals.
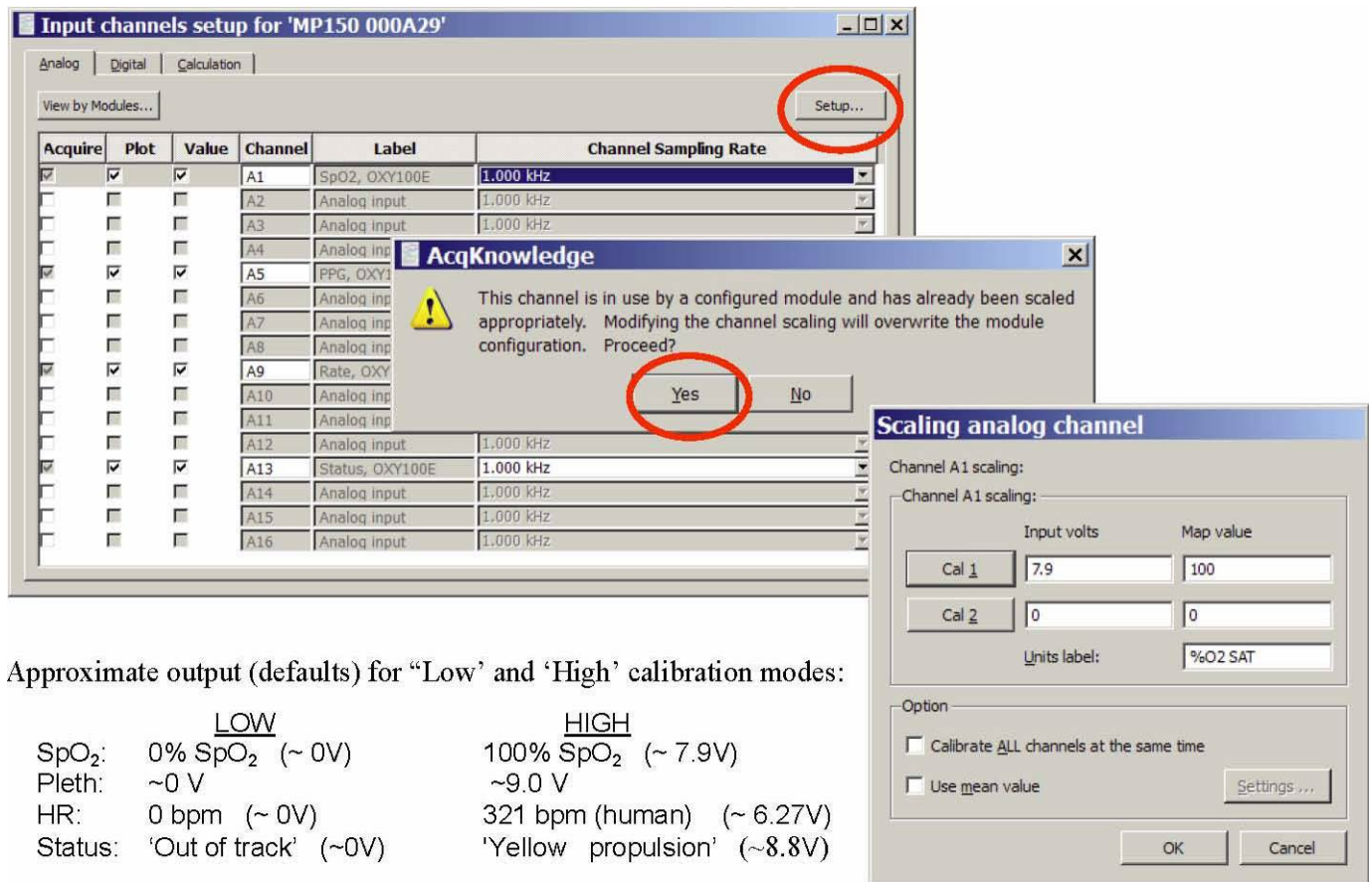

TSD270B

Pulse Oximeter Calibration OXY100E/OXY200

Modules will operate with default values unless an exact calibration is performed using the recessed "Cal" button on the OXY module and Acq*Knowledge* scaling.

To access the "Scaling analog channel" dialog, click MP menu > Set Up Channels and then click "View by Channels," click "Setup…" and click "Yes" when prompted.

Approximate output (defaults) for "Low' and 'High' calibration modes:

	LOW	HIGH
SpO₂:	0% SpO₂ (~ 0V)	100% SpO₂ (~ 7.9V)
Pleth:	~0 V	~9.0 V
HR:	0 bpm (~ 0V)	321 bpm (human) (~ 6.27V)
Status:	'Out of track' (~0V)	'Yellow propulsion' (~8.8V)

On the OXY module, use a paperclip or pen tip to press and hold the recessed "Cal" button. "Press and hold" the "Cal" button for ~1.5 seconds to switch between modes, as indicated by the Status LED states.

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"Normal" Status LEDS = GREEN OFF and YELLOW OFF (YELLOW may occasionally flicker due to background processing)

"Calibration Low" Status LEDs = CONSTANT GREEN ON and YELLOW OFF

"Calibration High" Status LEDs = GREEN OFF and CONSTANT YELLOW ON

Release the "Cal" button as soon as the mode switches—continuously holding the button in the depressed state will *not* lead to another mode change. Modes cycle from normal to low, then to high, then back to normal.

- "Press and hold" the "Cal" button for ~1.5 seconds to switch to "Calibration Low" mode and then click the "Cal2" button in the software for any of the OXY module analog channels that are enabled.

- "Press and hold" the "Cal" button again for ~1.5 seconds to switch to "Calibration High" mode and then click the "Cal1" button in the software for any of the OXY module analog channels that are enabled.

- "Press and hold" the "Cal" button again for ~1.5 seconds to return to "Normal" mode.

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

OXY100E/200 Series Specifications

Outputs:	SpO_2, Pulse Rate, Pulse Waveform & Module Status
Pulse Rate Range:	OXY100E: 18-321 BPM, OXY200: 18-450 BPM
Pulse Rate Output Options*:	Standard (4 beat average, slew limited)
	Extended (8 beat average, slew limited)
Beat to Beat (un-averaged, non-slew limited, beat-to-beat value)	
	Fast (non-slew limited, 4 beat average)
	Standard (4 beat average, slew limited)
	Extended (8 beat average, slew limited)
SpO_2 Range:	0-100%
SpO_2 Accuracy:	70-100% ±2%
Measurement Wavelengths	Red: 660 nanometers @ 0.8 mW maximum average
and Output Power:	Infrared: 910 nanometers @ 12 mW maximum average
Operating Temperature Range:	0-50 degrees C
Operating Humidity Range:	10-90% (non-condensing)
Compatible Sensors:	BIOPAC TSD124 series
Principle of Operation:	Lambert-Beer law employing dual wavelengths

*for un-averaged, Beat-to-Beat Pulse Rate: use Acq*Knowledge* Rate detector on Pulse Waveform Output. All other settings are established by dip switches shown on page 5.

Note: The Pulse Plethysmogram output is not the raw pulse signal—the waveform is pre-conditioned using proprietary algorithms. The Pulse waveform output of the OXY100E should only be used to calculate heart rate, using the rate detector in Acq*Knowledge*. For a raw Pulse signal, employ the specified PPG Transducer with PPG100D Smart Amp or PPG100C Amplifier for MP160 Systems, or the SS4LA PPG Transducer for MP36R Systems.

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OXY100E and OXY200 Status Output Values

Event	Weight
Out of Track/No sensor	0/16*10 V (~ 0 V)
Artifact	1/16*10 V (~ 0.625 V)
Sensor Alarm	2 /16*10 V (~ 1.25 V)
Green Perfusion	16/16*10 V (~10 V)
Yellow Perfusion	14 /16*10 V (~8.75 V)
Red Perfusion	13 /16*10 V (~8.125 V)

OXY100E and OXY200 Switches

The dip switch bank on the back panel can be used to control output for the SpO_2 and HR channels.
Use 'Calibration' for exact output levels. Output is ~10 V if the sensor is 'out of track.'

Dip Switch			Channel	Output details
1	**2**	**3**	**SpO_2**	Range is 0 V (0%) to ~7.9 V (100%)
OFF	OFF	OFF	0-127 %	4-beat average values updated every pulse beat in standard[1] mode *Factory setting*
OFF	ON	ON	0-127 %	4-beat average values updated every pulse beat in standard[1] mode
ON	ON	ON	0-127 %	4-beat average values updated every pulse beat in standard[1] mode
ON	OFF	OFF	0-127 %	4-beat average displayed values updated every 1.5 seconds in display[2] mode
OFF	OFF	ON	0-127 %	8-beat average values updated every pulse beat in standard[1] mode
ON	OFF	ON	0-127 %	8-beat average displayed values updated every 1.5 seconds in display[2] mode
OFF	ON	OFF	0-127 %	Non-slew limited saturation with 4-beat averaging updated every pulse beat in standard[1] mode
ON	ON	OFF	0-127 %	Non-slew limited, not averaged, beat to beat value updated every pulse beat in standard[1] mode
4		**5**	**HR**	Range is 0 V (0 BPM) to ~6.27 V (321 BPM) for human OXY100E 0 V (0 BPM) to ~8.86 V (450 BPM) for veterinary OXY200
OFF		OFF	0-max[3] BPM	4-beat average values updated every pulse beat in standard[1] mode *Factory setting*
ON		OFF	0-max BPM	4- beat average displayed values updated every 1.5 seconds in display[2] mode
OFF		ON	0-max BPM	8-beat average values updated every pulse beat in standard[1] mode
ON		ON	0-max BPM	8-beat average displayed values updated every 1.5 seconds in display[2] mode

[1] **Standard** SpO_2 and Pulse rate updated on every pulse beat. SpO_2 and Heart Rate values are set to missing data values and out of track indicated.

[2] **Display** SpO_2 and Pulse rate updated every 1.5 seconds. Last in track values transmitted for ten seconds and out of track indicated; after ten seconds, values are set to missing data values.

[3] **511 BPM**   Output of 511 BPM (+10 V) indicates that sensor is not connected or signal is bad (out of track or sensor is not secured on the finger). The module never outputs BPM between range max (321 or 450) and 511.