MOXY
MUSCLE OXYGEN MONITOR

Data Display Options

Purpose:

The purpose of this document is to help you figure out the best way for you to incorporate the data from Moxy into the rest of your training data system.

Background on Moxy Data:

The Moxy microcontroller calculates a new SmO_2 and tHb reading every 2 seconds (or 0.5 seconds in Fast Update Mode). It sends every new data set to two places as shown in the sketch to the right.

1) It gets stored in the memory that is inside the sensor
2) It gets broadcast wirelessly over ANT+

Stored Data:

The stored data is put in a list. Every row on the list contains the date, time, SmO2 Live, SmO2 averaged, tHB, and lap data. Every time a new reading is calculated, it gets put on the bottom of the list. When the list gets full, the row of data at the top of the list gets discarded and the new data is added to the bottom. The list can hold a maximum of 15000 rows. If a no reading is calculated due to the sensor being off tissue or the sensor being turned off, no data is added to the list. The list is always kept in the order that the readings were calculated. It is not sorted by time stamp so if the clock on the sensor is reset to an earlier date or time, the time data may be out of order.

Broadcast over ANT+

Microcontroller SmO2 & tHb

Memory

USB
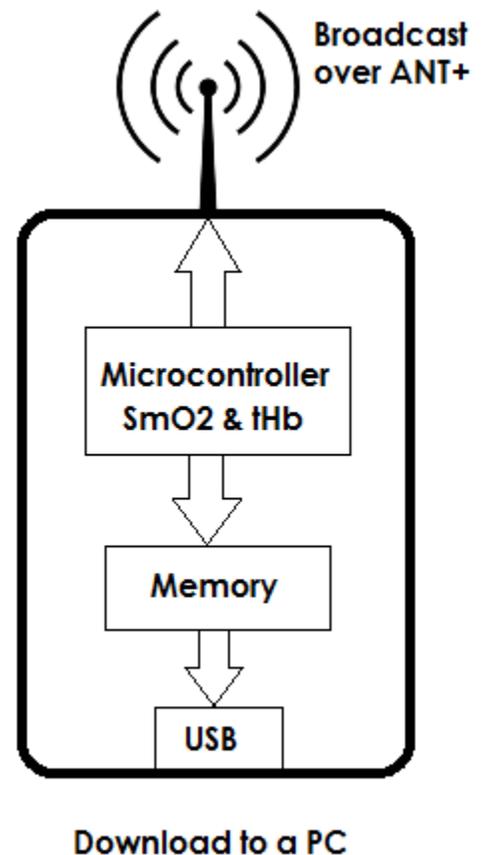
Download to a PC

When the stored data is downloaded to a PC as a .csv file, the file will contain all of the information from the data list in the same order that it is stored on the sensor. The following format is used for the .csv file.

mm-dd, hh:mm:ss, SmO2 Live, SmO2 Averaged, THb, Lap

The only way to download data from the sensor is through the USB port. The Moxy PC App has the capability to download stored data. Note that downloading the data does not clear it. There is a separate clear data button in the Moxy PC App. The following is a screen shot of the Moxy PC App.
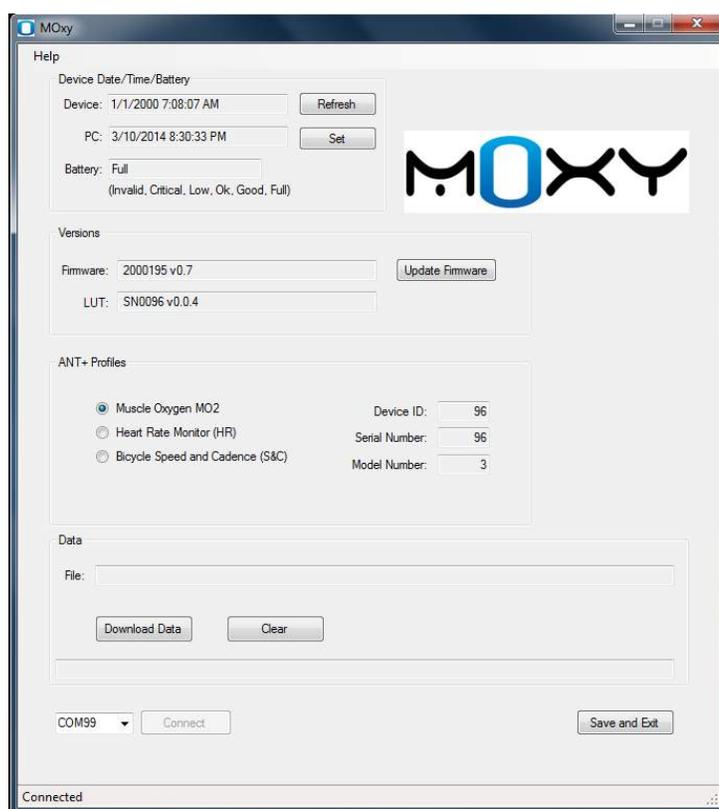
ZeroPace software is a 3rd party application that can download data directly from the Moxy sensor and import .csv files that were downloaded through the Moxy PC App. It creates a graph of the data and allows you to log workouts on a calendar for later review.

ZeroPace can be purchased at http://www.zeropace.com/.

Here is a video that shows the capabilities for displaying Moxy Data in ZeroPace.
ZeroPace Video

ANT+ Data Profiles

Moxy has 3 options for sending the data out over ANT+. Each option uses a different ANT+ profile for encoding the data. This allows Moxy to send data to devices that don't yet utilize the Muscle Oxygen Profile. The 3 profile options are

1) Muscle Oxygen Profile
2) Heart Rate Profile
3) Bicycle Speed and Cadence Profile

Muscle Oxygen Profile – This is the preferred profile to use whenever your display device is compatible. It sends the SmO2 and tHb data and it sends other data about the sensor like the battery charge level.

Heart Rate Profile – This sends only the SmO_2 data over the Heart Rate Profile. In this case, 100 is added to all SmO2 values because most display devices have a filter that rejects heart rate values lower than 30 beat per minute. For example, 57% SmO_2 will show up on the watch as 157 beats per minute. The user has to remember to disregard the leading 1. In this mode, you can pair the Moxy to any ANT+ Heart Rate display device. The primary use for this profile would be if you wanted to use a Heart Rate wrist watch display that had upper and lower limit audible alarms. For example, you could set the alarm levels to 180 and 130 to guide strength training to deoxygenate to 30% and reoxygenate to 80% SmO_2.

Bicycle Speed & Cadence Profile – This profile sends the SmO_2 data in the Cadence field and tHb in the Speed field. This is the second best option when the Muscle Oxygen Profile is not available. The SmO_2 and tHb data are encoded as number and timing of revolutions. When the display device decodes this data, SmO_2 shows up as cadence RPM and tHb shows up as speed. It order for the tHb data to show up properly, the wheel size needs to be set on the display device to 2070 mm if speed is in km/hr or 3330 mm if the speed is in mi/hr. The auto wheel size feature on some GPS watches must also be turned off.

PC Display Software

In order to use a PC as a display device, you need to have a USB ANT+ dongle like the one shown below. If you already have a dongle from another ANT+ device like a Garmin watch, you can use that. If not, the dongles are available on the Moxy website or at many places online.

You also need to have software that is capable of reading the data from the dongle and displaying on the screen. The following three software packages are compatible with the Muscle Oxygen Profile. All offer free trials for a short time so you can check them out.
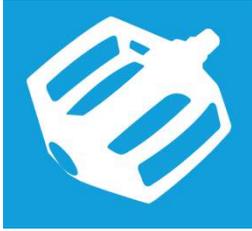
Peripedal is an indoor cycling software that is capable of recording Muscle Oxygen, Heart Rate, Speed & Cadence and Power data over ANT+. It can also estimate power based on the speed values and the model of trainer.

Peripedal has a mode where is only displays Muscle Oxygen and Heart Rate data which make it work well for applications other than cycling.

www.peripedal.com

www.perfprostudio.com

PerfPro is an indoor cycling software that is capable of recording Muscle Oxygen, Heart Rate, Speed & Cadence and Power data over ANT+. It can also estimate power based on the speed values and the model of trainer. PerfPro also has some more advanced features for analyzing cycling data.

TrainingMate is a fitness tracking software that is designed to work with a wide range of fitness devices such as cycling trainers, rowing machines and Nordic ski trainers.
www.training-mate.com

Android Phone Apps

Some Android phones such as the Samsung Galaxy Note3, S4, and S5 and the Sony Xperia series have ANT+ capability built in. For a complete list of such phones, see this link.

Other Android phones can use an ANT+ USB dongle with a USB OTG cable like shown below.

Refer to this Connection Guide for more information on the plugins you need to download.

The IpBike App is designed to use the Muscle Oxygen profile. It can record Muscle Oxygen, Heart Rate, Speed & Cadence, Power, and GPS data and display it on your phone. It's available on the Google Play Store.

IpBike ANT+™ Bike Computer

Other phone apps that don't yet use the muscle oxygen profile can be used if the Moxy is set to use the Cycling Speed and Cadence Profile.

ANT+ to WiFi Bridges

There are 2 available devices that serve as ANT+ to WiFi bridges. WiFi signals can be transmitted hundreds of feet compare to tens of feet for ANT+.

Wimu is a device available from Real Track Systems. It collects data from up to 8 ANT+ sensors of various types like Muscle Oxygen, Power Meter, Heart Rate, and Speed and Cadence. It also contains accelerometer, gyro, and GPS motion sensors. All of the data it transmitted to Quiko software via WiFi where it can be recorded and analyzed.

Wasp is a device available from North Pole Engineering. It has several operating modes where it can collect data from multiple ANT+ devices and send the data to an iPad or other iOS device.

iPhones and iPads

iPhones and iPads require an ANT+ iPhone Accessory like one that is available here.

At this point, we are not aware of any iPhone apps that use the muscle oxygen profile so the Moxy would need to be set to use the Cycling Speed and Cadence profile to work directly with iPhones or iPads.

Sport Watches and Bike Computers

At this point, we are not aware of any ANT+ sport watches or bike computers that utilize the Muscle Oxygen profile. The best option is to use the Cycling Speed and Cadence profile with these devices. Refer to the Speed and Cadence section above for information on setup.

Once the Moxy is set to use the Speed and Cadence profile, it can be paired to the watch or bike computer just like it was a speed and cadence sensor. Follow the instructions for your particular display device.

Here is a video that shows the pairing procedure for connecting a Moxy to a Garmin 310XT watch. Other Garmin models have a similar procedure. https://www.youtube.com/watch?v=Ma-aT7O-DbU

The following list of watches and bike computers are compatible with the Cycling Speed and Cadence profile.

Compatible Watch and Bike Computer List

Model	Manufacturer	Type
COUNT 14+ Wireless Counter	B'TWIN	Bike Computers
Dash CC Delux	iBike	Bike Computers, Phone Acc...

DashCC	iBike	Bike Computers, Phone Acc...
Edge 305	Garmin	Bike Computers
Edge 500	Garmin	Bike Computers
Edge 510	Garmin	Bike Computers
Edge 705	Garmin	Bike Computers
Edge 800	Garmin	Bike Computers
Edge 810	Garmin	Bike Computers
Forerunner 50	Garmin	Watches/Wrist Displays
Forerunner 305	Garmin	Watches/Wrist Displays
Forerunner 310XT	Garmin	Watches/Wrist Displays
Forerunner 405	Garmin	Watches/Wrist Displays
Forerunner 405CX	Garmin	Watches/Wrist Displays
Forerunner 410	Garmin	Watches/Wrist Displays
Forerunner 610	Garmin	Watches/Wrist Displays
Forerunner 910XT	Garmin	Watches/Wrist Displays
FR60	Garmin	Watches/Wrist Displays
FR70	Garmin	Watches/Wrist Displays
FunTrek 130 Pro	Holux	Bike Computers, Handheld ...
G3	Xplova	Bike Computers
G5 ST	Xplova	Bike Computers, Handheld ...
G5 TOPO	Xplova	Bike Computers, Handheld ...
GP7	VDO	Bike Computers, Handheld ...
GPSport 260 Pro	Holux	Bike Computers, Handheld ...
Hindsight 35	Cerevellum	Bike Computers
iDash+Power	iBike	Bike Computers, Phone Acc...
Ironman Global Trainer GPS HRM	Timex	Watches/Wrist Displays
Ironman Global Trainer GPS Watch	Timex	Watches/Wrist Displays
Joule 2.0	CycleOps	Bike Computers
Joule 3.0	CycleOps	Bike Computers
macro x	o-synce	Bike Computers
macrohigh x	o-synce	Bike Computers
Mio Cyclo 105	Mio Technology	Bike Computers
Mio Cyclo 305	Mio Technology	Bike Computers, Handheld ...
Mio Cyclo 505	Mio Technology	Bike Computers, Handheld ...
mixpro	o-synce	Watches/Wrist Displays
MOTOACTV	Motorola	Other, Watches/Wrist Disp...
MOTOACTV Golf Edition	Motorola	Other, Watches/Wrist Disp...
Node 1 Digital	Bontrager	Bike Computers
Node 1.1	Bontrager	Bike Computers
Node 2 Digital	Bontrager	Bike Computers

Node 2.1	Bontrager	Bike Computers
Pantera Series	Falk Outdoor	Bike Computers
PotterNavi SGX-CN700-w/-k	Pioneer	Bike Computers
PotterNavi SGX-CN710-w/-k	Pioneer	Bike Computers
PowerControl 7	SRM	Bike Computers
Suunto Ambit	SUUNTO	Watches/Wrist Displays
Suunto Ambit2	SUUNTO	Watches/Wrist Displays
Suunto Ambit2 S	SUUNTO	Watches/Wrist Displays
Switch	Magellan	Watches/Wrist Displays
Switch Up	Magellan	Watches/Wrist Displays
TwoNav Sportiva+	CompeGPS	Bike Computers, Handheld …
TwoNav Ultra	CompeGPS	Bike Computers, Handheld …