

Product Manual

NorSwitch User Manual



© 2008, Noraxon U.S.A. Inc.

No part of this document may be copied, photographed, reproduced, translated, or reduced to any electronic medium or machine readable form without the prior written consent of Noraxon U.S.A. Inc.

Noraxon is a registered trademark of Noraxon U.S.A. Inc. All rights reserved. All other company and product names contained herein may be trademarks or registered trademarks of their respective companies and are sole property of their respected owners.

Noraxon U.S.A. Inc.
13430 N. Scottsdale Road, Suite 104
Scottsdale, Arizona 85254
Tel: (480) 443-3413
Fax: (480) 443-4327
E-mail: info@noraxon.com
Support E-mail: support@noraxon.com
Web Site: www.noraxon.com

NorSwitch Bilateral Footswitch System

NorSwitch provides the capability to measure footstrike patterns during human walking or running.

Real-time foot strike data is provided by the NorSwitch system, which includes four footswitches per foot. The system is comprised of a belt-worn amplifier and cables with pluggable sensors for eight locations. Also supplied is a tether cable twenty feet in length to attach to any data acquisition hardware. During measurement, each individual sensor outputs a different voltage, which allows the user to identify which part of the foot touched the surface.

NorSwitch connects easily to all Noraxon's artifact-free EMG systems. The MyoSystem provides a fixed-cable solution for limited range measurement of the EMG/footswitch data. The Noraxon Telemetry system combined with the NorSwitch takes gait analysis to a new level.

The NorSwitch system is lightweight and portable. It is easy to use in most environments or settings with very little setup. The footswitch sensors, which are provided with the system, fit easily inside a sock and are taped to the bottom of the foot. Internal adjustments may be made by the user to vary the sensitivity of each switch.

Table of Contents

Noraxon NorSwitch Checklist	4
<i>Step #1 – Unpack All Items and Check Inventory</i>	4
NorSwitch Components	5
Controls and Displays	6
Noraxon NorSwitch Hardware Setup	6
<i>Step #2 – Setting Up the NorSwitch I or II</i>	6
Connecting the NorSwitch to Noraxon’s EMG Systems.....	8
Noraxon NorSwitch Software Setup.....	13
<i>Step #3 – Setting Up MyoResearch</i>	13
NorSwitch Operation	14
<i>Sensor Detection Modes</i>	14
Sensor Placement	15
Signal Output	15
Removal of Primary Batteries.....	16
Maintenance and Cleaning.....	16
Technical Specifications	16
<i>System</i>	16
<i>Amplifier Detection Modes</i>	16
<i>NorSwitch Voltages</i>	16
<i>Physical</i>	16

Noraxon NorSwitch Checklist

The NorSwitch connects easily to all of Noraxon's artifact-free EMG systems and is easy to setup.

Step #1 – Unpack All Items and Check Inventory

The following items should be included with the Noraxon NorSwitch.
(See figures on page 3)

1. NorSwitch (Part # 080)
2. NorSwitch Sensor Cable :
 NorSwitch I (Part # 080B) , NorSwitch II (Part #080C)
3. C1 Right Sensor Assembly (Part # 080J)
 C2 Left Sensor Assembly (for NorSwitch II only) (Part # 080K)
 - Includes 4 FSR's (Force Sensitive Resistors) on each Sensor Assembly
4. NorSwitch Output Cable (Lemo to 3.5mmM) (Part #080F)
5. NorSwitch Nylon Belt Pouch
6. One or more of the following output cables depending on the EMG system being used.

TeleMyo 2400T/2400R: (page 6)

 NorSwitch I: Single Active Lead Adapter Cable (Part# CBL5)

 NorSwitch II: Dual Active Lead Adapter Cable (Part # CBL6)

MyoSystem 1400A: (pages 7-8)

Option 1: No additional cables are necessary

Option 2:

 NorSwitch I: Single Active Lead Adapter Cable (Part# CBL5)

 NorSwitch II: Dual Active Lead Adapter Cable (Part # CBL6)

Noraxon NorBNC (MyoSystem 1200 or 2000 & TeleMyo 900): (page 9)

 NorSwitch I: Single NS1 to BNC 20' Output Extension Cable (Part# CBL3)

 NorSwitch II: Dual NS/NA to BNC 20' Output Extension Cable (Part # CBL4)

TeleMyo 900: (page 10)

Option 1: Connect NorSwitch directly to transmitter and use EMG channels

 NorSwitch I: 1 Ch NS/NA Adapter Cable (Part# 010L)

 NorSwitch II: 2 Ch NS/NA Adapter Cable (Part # 010M)

Option 2: Use NorBNC – cables described above

7. NorSwitch manual (Part # 080) (this document)
8. One 9 Volt battery (not pictured)

NorSwitch Components



1) NorSwitch (Part # 080)



2a) NorSwitch I Sensor Cable (Part # 080B)



2b) NorSwitch II Sensor Cable (Part # 080C)



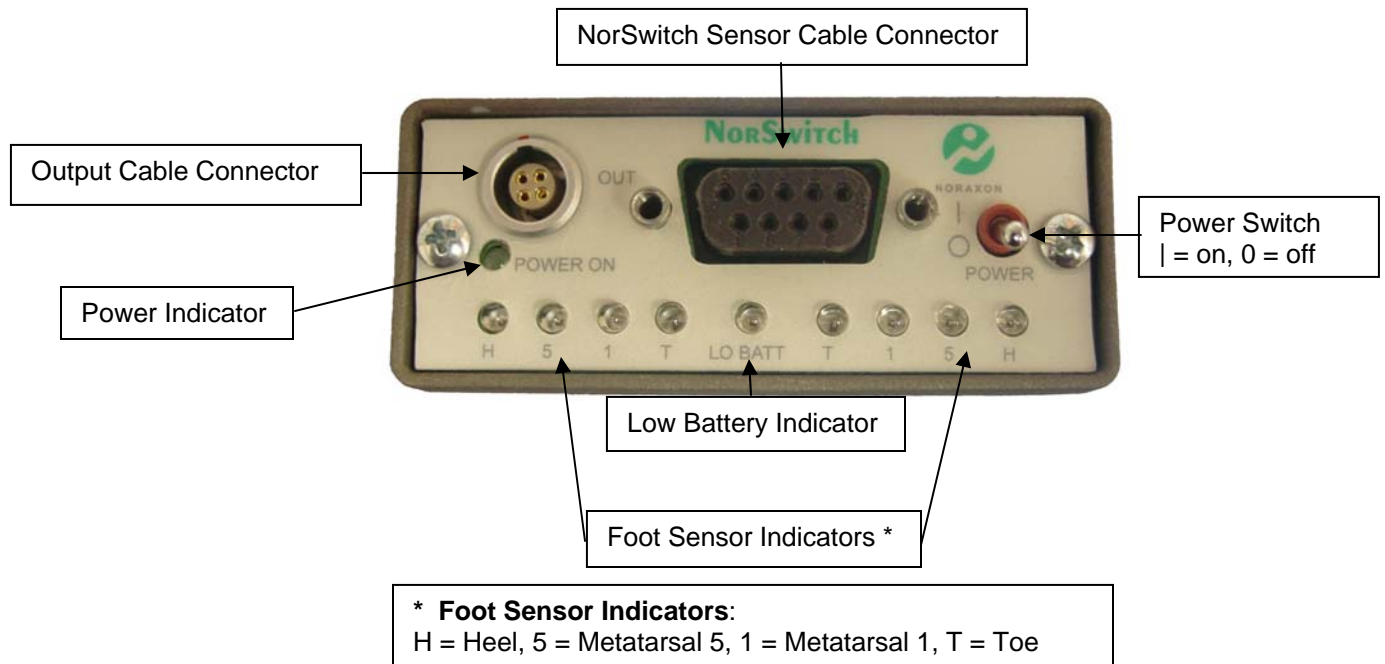
3) C1 Right Sensor Assembly (Part # 080J)
C2 Left Sensor Assembly - for NS II only (Part #080K)



4) NorSwitch Output Cable (Part # 080F)

Controls and Displays

Front Panel



Noraxon NorSwitch Hardware Setup

Step #2 – Setting Up the NorSwitch I or II

NorSwitch I Setup

1. If you are using the Nylon Belt Pouch, place the NorSwitch unit into the pouch.
2. If the foot sensors (FSR) are not plugged into the C1 Sensor Assembly, firmly hold the FSR near the metal prongs and insert them straight in. If the metal prongs bend, they can be straightened using needle nose pliers.
3. Plug the “C1 Right Sensor Assembly” into the “NorSwitch I Sensor Cable”
4. Verify that the NorSwitch Power Switch is in the “Off” position.
6. Plug the “NorSwitch I Sensor Cable” into the “NorSwitch Sensor Cable Connector”.
7. Tighten the jack screws to secure the NorSwitch I Sensor Cable.
8. Plug the “NorSwitch Output Cable” into the “Output Cable Connector”. (Line up the red dot on the cable with the red dot on the “Output Cable Connector” and insert the cable straight in – do not twist or turn the cable.)
9. Now you are ready to attach the NorSwitch to your EMG system. Refer to the section “Connecting the NorSwitch to Noraxon’s EMG System” for further instructions.

Note: The NorSwitch can also be used as a Stand-Alone device. See the “Signal Output” section of this manual for details regarding the output connector.

NorSwitch II Setup

1. If you are using the Nylon Belt Pouch, place the NorSwitch unit into the pouch.
2. If the foot sensors (FSR) are not plugged into the C1 and C2 Sensor Assembly, firmly hold the FSR near the metal prongs and insert them straight in. If the metal prongs bend, they can be straightened using needle nose pliers.
3. Plug the “C1 Right Sensor Assembly” into the C1 connector on the “NorSwitch II Sensor Cable”
4. Plug the “C2 Left Sensor Assembly” into the C2 connector on the “NorSwitch II Sensor Cable”
5. Verify that the NorSwitch Power Switch is in the “Off” position.
6. Plug the “NorSwitch II Sensor Cable” into the “NorSwitch Sensor Cable Connector”.
7. Tighten the jack screws to secure the NorSwitch II Sensor Cable.
8. Plug the “NorSwitch Output Cable” into the “Output Cable Connector”. (Line up the red dot on the cable with the red dot on the “Output Cable Connector” and insert the cable straight in – do not twist or turn the cable.)
9. Now you are ready to attach the NorSwitch to your EMG system. Refer to the section “Connecting the NorSwitch to Noraxon’s EMG System” for further instructions.

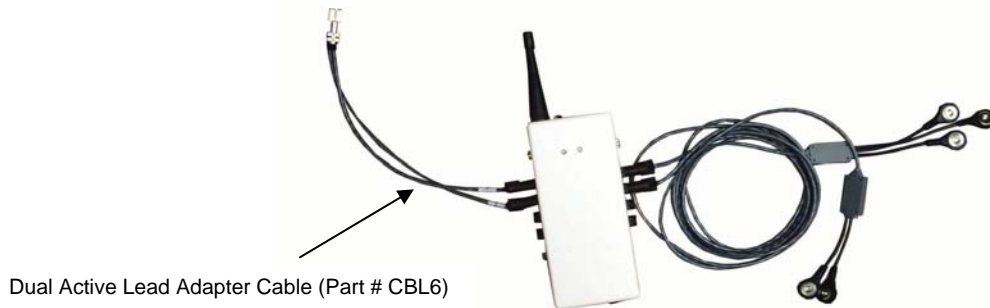
Note: The NorSwitch can also be used as a Stand-Alone device. See the “Signal Output” section of this manual for details regarding the output connector.

Connecting the NorSwitch to Noraxon’s EMG Systems

TeleMyo 2400T / 2400R (G1 -V1/V2 or G2 models)

For a NorSwitch II, use the Dual Active Lead Adapter Cable (CBL6) as shown below. One end has a 3.5 mm stereo jack and the other end has two round 4-pin connectors. You will use the same connector and method whether you are using the TeleMyo 2400T (G1/G2) or 2400R (G1/G2). The 3.5 mm stereo jack is inserted into the stereo plug on the NorSwitch Output Cable (Part # 080F). The two round 4 pin connectors labeled left and right will be inserted into the lead input connector on the TeleMyo 2400T G1/G2. Channels used for the NorSwitch are dependent on which lead input connector the connectors are inserted.

For the NorSwitch I: Use the Single Active Lead Adapter Cable (CBL5) and follow the instructions above; however, you will only have one round 4 pin connector, since you are only using one input channel.



MyoSystem 1400A

This unit has two possible ways to connect to the NorSwitch.

Option 1:

NorSwitch Output Cable (Part # 080F)

This cable has a 3.5 mm stereo plug (phone plug) on one end and a Lemo connector on the other end. Insert the 3.5 mm stereo plug into an AUX input connector located on the MyoSystem 1400A Active Cable set (Part # 210K). The Aux Source Switch on the MyoSystem 1400A must be set to the “cable” position. Channels in MyoResearch or MyoResearch XP will be 17, 18, 19 or 20 when using the AUX inputs.



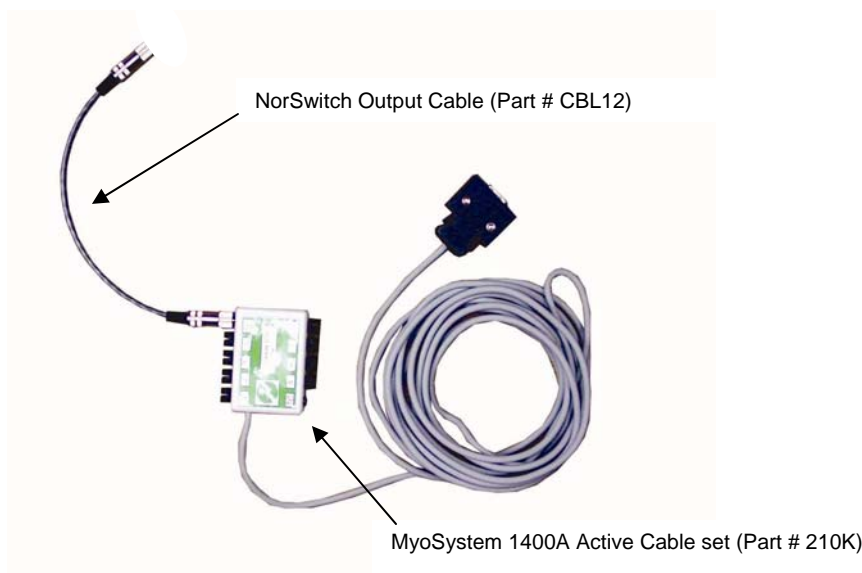
The scaling is 1/2 of normal because the gain is 1/2 for the AUX channels. In MyoResearch XP, this scaling factor has been resolved in the preset settings. You only need to be concerned with this information if you are using MyoResearch.

For MyoResearch only:

NorSwitch Settings if using MyoSystem 1400A Option 1:

(see section Noraxon NorSwitch Software Setup)

Min Volt: 0	Max Volt: 1
Min Value: 0	Max Value: 1690
Amplitude: 2000	Units: on/off



MyoSystem 1400A

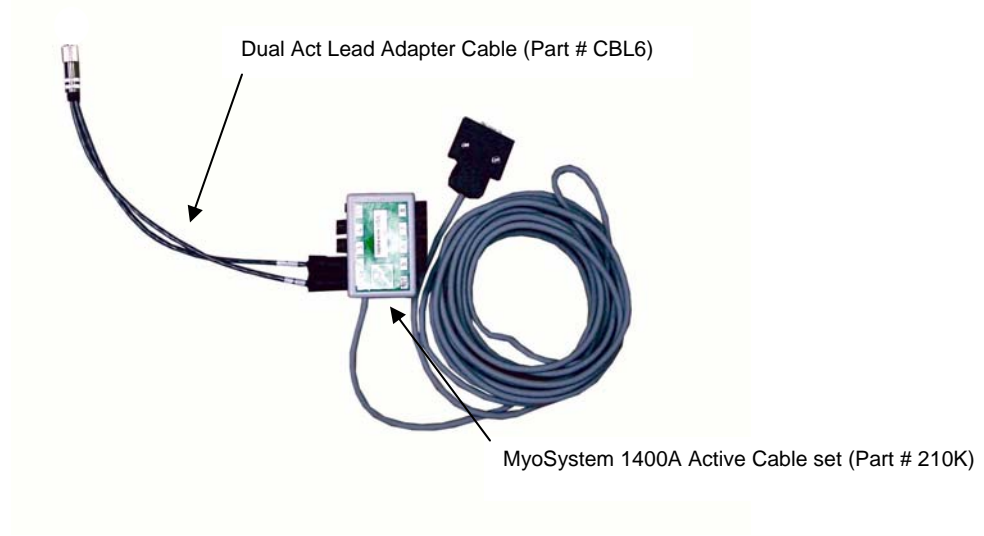
Option 2:

NorSwitch II: Dual Active Lead Adapter Cable (Part # CBL6)

NorSwitch I: Single Active Lead Adapter Cable (Part # CBL5)

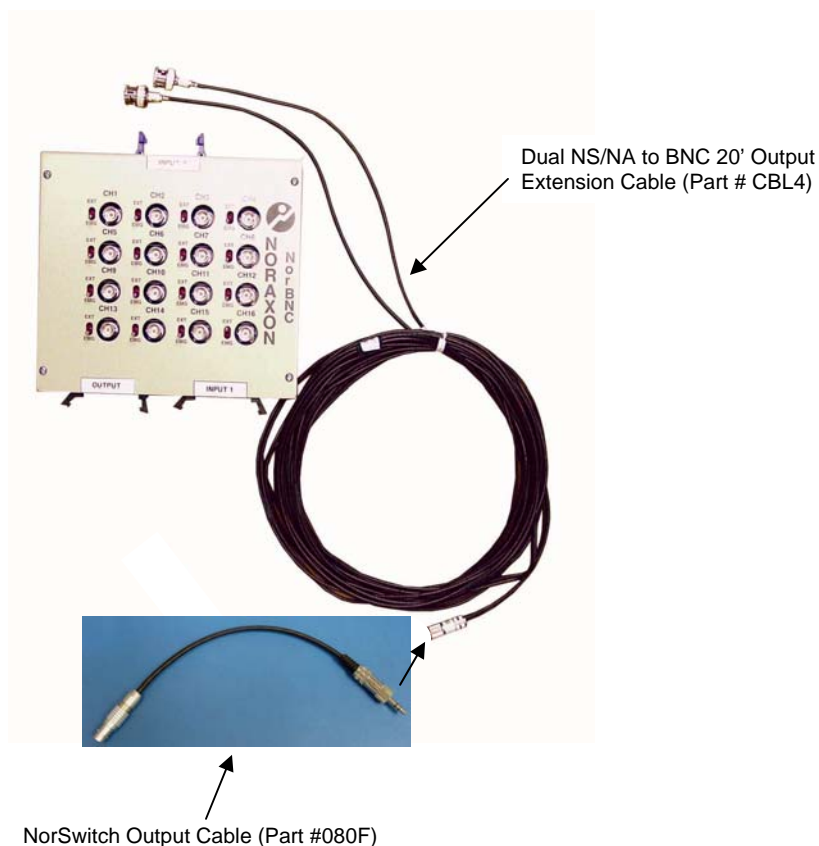
This connection method is similar to that of the 2400T. The 3.5 mm stereo jack is inserted into the NorSwitch Output Cable – Part # 080F. The two round 4-pin connectors labeled left and right are inserted into the lead input connector on the MyoSystem 1400A Active Cable set. Channels used for the NorSwitch are dependent on which lead input connector the connectors are inserted. The scaling is normal.

(The NorSwitch I uses CBL5 which only has one round 4-pin connector and uses only 1 input channel.)



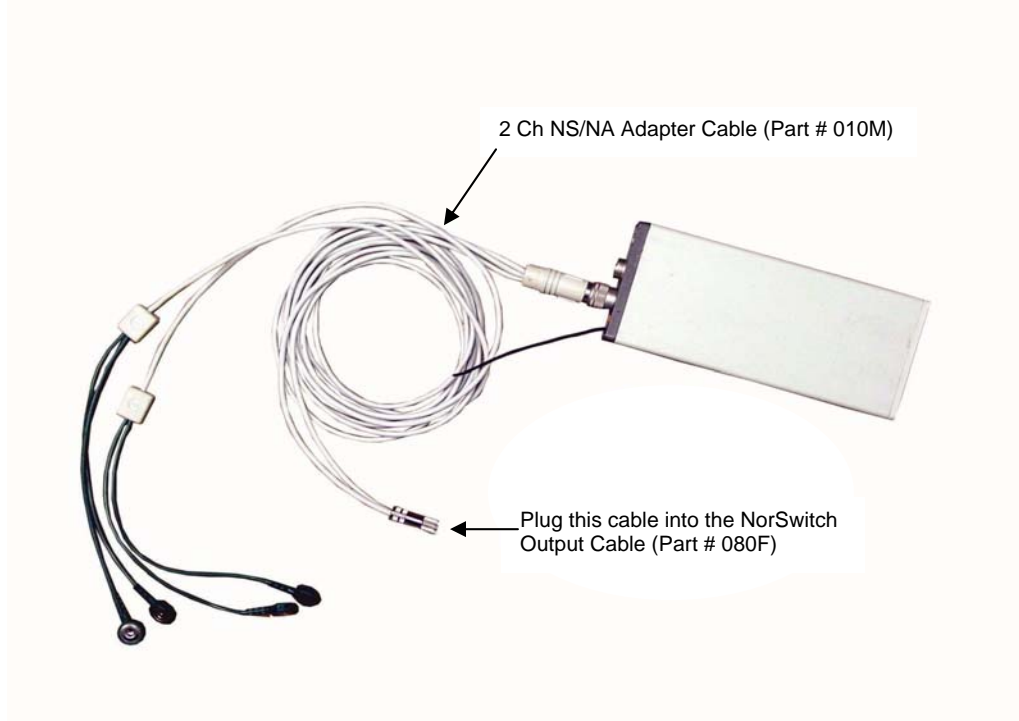
MyoSystem 1200/2000 or TeleMyo 900 / NorBNC

The MyoSystem 1200/2000 requires a Noraxon NorBNC board to function with the NorSwitch. The TeleMyo 900 may also use this method. The Dual NS/NA to BNC 20' Output Extension Cable - Part # CBL4 (NorSwitch II) has two BNC connectors on one end to connect to the NorBNC and on the other end a 3.5 mm stereo plug. (For the NorSwitch I, use the Single NS/NA to BNC 20' Output Extension Cable – Part # CBL3, which has one BNC connector.) Insert the 3.5mm stereo plug on the Single or Dual NS/NA to BNC 20' Output Extension Cable into the NorSwitch Output Cable – Part # 080F. Channels used in MyoResearch or MyoResearch XP will depend on the input channels used on Noraxon's NorBNC.



TeleMyo 900

In order to use the NorSwitch with the TeleMyo 900 system, a 2 Ch NS/NA Adapter Cable - Part # 010M (NorSwitch II) or a 1 Ch NS/NA Adapter Cable - Part # 010L (NorSwitch I) is needed. This cable is attached to the TeleMyo 900 transmitter the same way as the standard TM 900 Cable Set. On the other end of the NS/NA Adapter cable is a 3.5 mm stereo jack that is inserted into the NorSwitch Output Cable (Part # 080F). Jumpers are required to modify the transmitter so that it will process the NorSwitch signals correctly. Refer to the TeleMyo 900 manual for specific details to modify the jumpers. Channels 7 and 8 are usually used for external outputs such as the NorSwitch.



NorSwitch Output Cable (Part # 080F)

Noraxon NorSwitch Software Setup

Step #3 – Setting Up MyoResearch

MyoResearch XP Software: Open the MyoResearch XP software on your computer and click on the measure button. Enter the measurement channels making sure you select the proper channels as indicated above for each system. For the FootSwitch channels, under Type, select “NorSwitch”. If the “NorSwitch” type is not available, you will need to enter the settings in the “Hardware Setup” screen. Press start. Restore the baseline to zero by pressing “zero offset”. When the NorSwitch is on the foot, restore the baseline by pressing “zero offset” while there is no pressure on any sensors. Turn on the NorSwitch, then squeeze the sensors with your fingers and verify that a signal appears in MyoResearch XP.

NorSwitch Settings:

Min Volt: 0 Max Volt: 1.690
 Min Value: 0 Max Value: 1.690
 Amplitude: 2 Units: on/off # Dec: 3 (# of decimal places)

MyoResearch Software: Open the MyoResearch software and click on the measure button. Enter the measurement channels making sure you select the proper channels as indicated above for each system. For the NorSwitch channels, under Type, select “S”. (The first time you use the “foot switch” type, you will need to enter the proper settings in the Channel Setup menu. Use the values listed below unless you are using MyoSystem 1400A Option 1.) Press start. Turn on the NorSwitch, then squeeze the sensors with your fingers and verify a signal appears in MyoResearch. Restore the baseline of the signal by pressing “calibrate”. When the NorSwitch is on the foot, restore the baseline by pressing “calibrate” while there is no pressure on any sensors.

NorSwitch Settings:

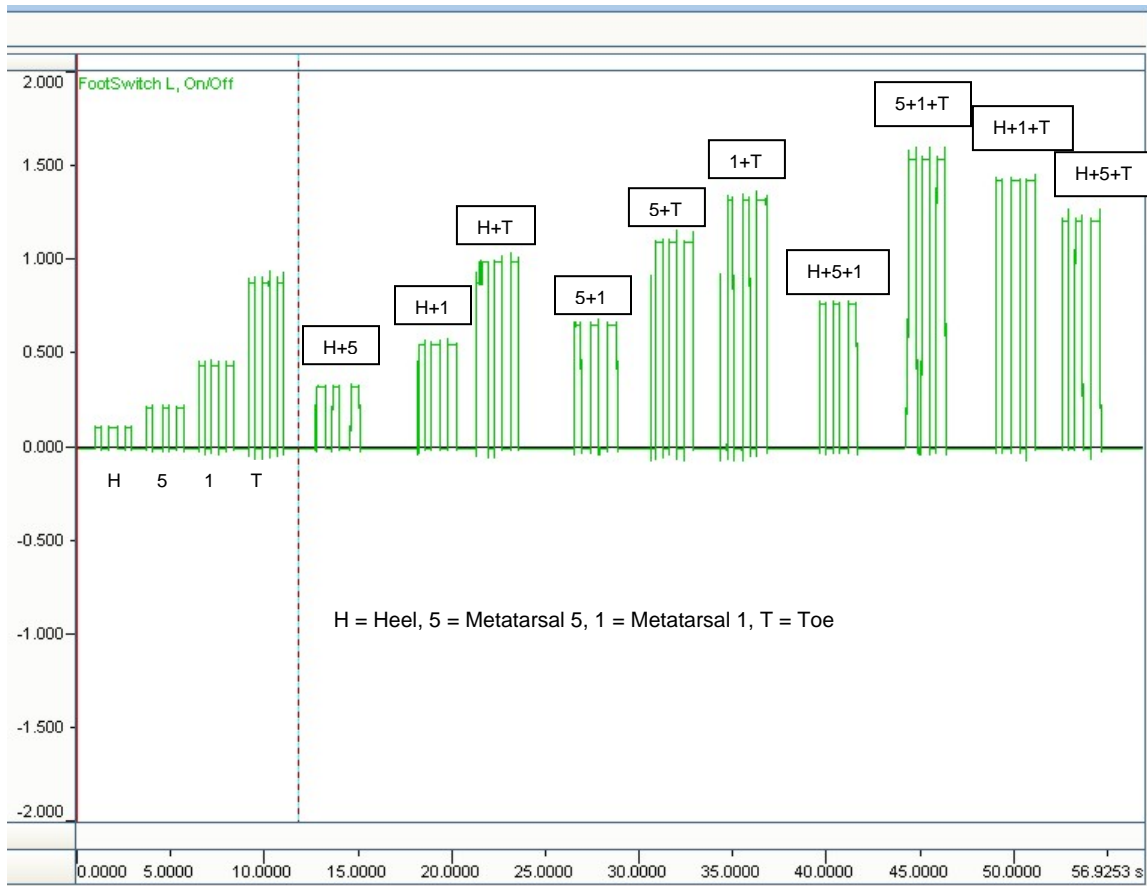
Min Volt: 0 Max Volt: 1690
 Min Value: 0 Max Value: 1690
 Amplitude: 2000 Units: on/off

(Note: Values are calculated using mV because three decimal places are rounded to the nearest whole number in the software.)

NorSwitch Operation

Sensor Detection Modes

The sensors detect which part of the foot is making contact with the surface because each sensor sends a different signal. Each sensor sends a signal to the output device and displays it in the software, e.g. MyoResearch or MyoResearch XP.



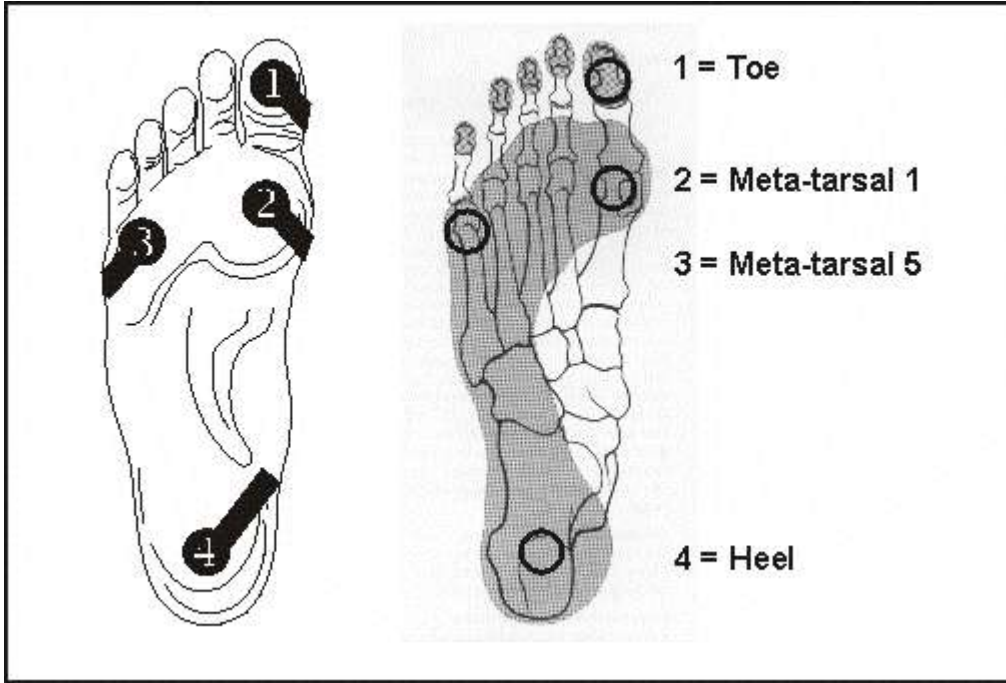
NorSwitch Translation

Individual Values (in Volts)		Normal Step Sequence Values	
H	= 115 mV	H	= 115 mV
5	= 225 mV	H, 5	= 340 mV
1	= 450 mV	H, 5, 1	= 790 mV
T	= 900 mV	H, 5, 1, T	= 1690 mV
		5, 1, T	= 1575 mV
		1, T	= 1350 mV

H = HEEL ; 5 = 5th METATARSAL ; 1 = 1st METATARSAL ; T = TOE

Sensor Placement

Tape the sensors to the foot as shown below. Either side of the sensors may be taped to the foot.



Signal Output

3.5 mm Stereo Output Connector

Pin	Signal
1 (Tip)	Left Foot
2 (Ring)	Right Foot
3 (Sleeve)	Common

Removal of Primary Batteries

The NorSwitch uses one 9 Volt battery. The battery compartment is located on the backside of the unit. The cover over the battery compartment is removed by sliding the cover to the right side. Be careful not to break the small tabs on the cover. The 9 Volt battery is snapped into the battery connector. Be careful not to break the wires that connect to the 9 volt battery connector. If the wire breaks at the battery connector, the wire can be resoldered. A Low Battery indicator illuminates when the battery is running low.



Important: Remove the battery from the NorSwitch if it will not be used for an extended period of time.

Maintenance and Cleaning

The NorSwitch sensors should be wiped off with a damp cloth between uses. The individual sensors are replaceable parts and should be replaced when damaged.

Technical Specifications

System

- Power: one 9 Volt battery
- Battery Life: > 10 hrs cont.
- Accuracy: +/- 2 mV
- Analog Output: 0 to +1.7 Volts

Amplifier Detection Modes

- 16 output levels (uniquely detects each sensor combination)

NorSwitch Voltages

- No Pressure - 0 volts; Heel – 115mV; 5th – 225mV; 1st – 450mV;
Toe – 900mV; All – 1690mV
Note: 5th - Metatarsal 5; 1st - Metatarsal 1

Physical

- Length: 6.5" (16.5 cm)
- Width: 2.75" (7 cm)
- Height: 1" (2.54 cm)
- Weight: 16 oz (0.45 kg)