EMG Switch

Operation Manual

Introduction

The EMG Switch is designed to convert electromyographic (EMG) signals which are present on the skin near muscle activity into a standard switch closure that can be used to activate assistive technology equipment. The inputs to the EMG switch box connect to Ag/AgCl cloth electrodes. The tiny signals on the surface of the skin are amplified with an internal low noise amplifier. The EMG switch box continuously monitors the amplified signals from the EMG electrodes, and when the signal level exceeds a user adjustable threshold, a relay is energized providing an isolated switch closure output.

Operation

Connect the 5V Power lead to the wall transformer supplied with the switch. It is important to only use the wall transformer supplied with the switch. This transformer has all the safety ratings for proper isolation from the power lines. Connect the green reference electrode lead to the rear panel jack labeled Ref. Connect the grey shielded electrode leads to the jacks labeled + and -. Connect the Switch Out through a standard 3.5mm cable and plug to the assistive technology device to be controlled.

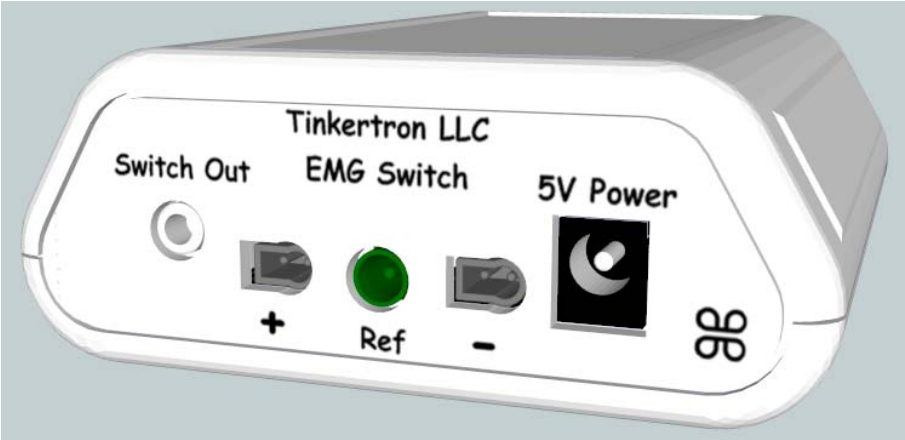

Figure 1 Rear Panel Connections

Snap the cloth electrodes onto the other end of the electrode leads. Place the reference electrode at some convenient location on the body away from the activation site where there is no muscle activity. Place the active electrodes over the muscle site to be monitored. For very weak muscle activity electrode placement is critical. Observe the muscle twitch and place the electrode near the movement site, orienting the two electrodes in line with the muscle movement.

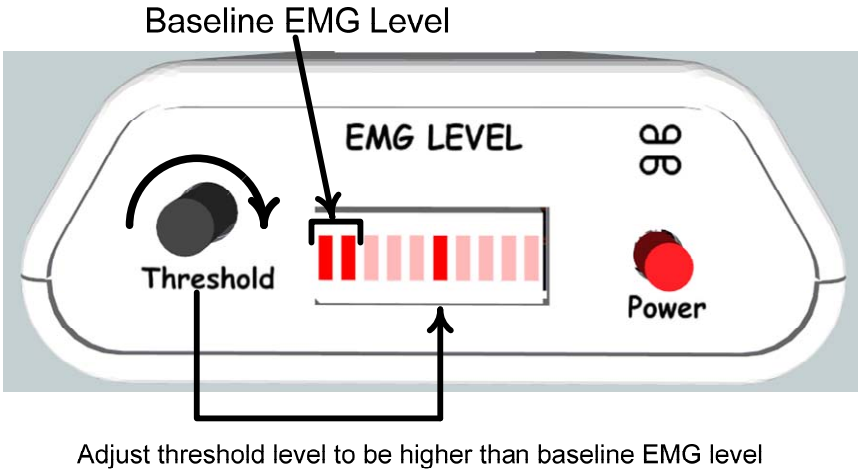

Figure 2 Threshold Adjustment and Typical Baseline Displays

Press the Power switch to turn the power on. EMG activity is indicated on the front panel LEDs. The Threshold setting is also displayed on the EMG Level LEDs. Turn the threshold knob and notice the threshold level moves. Turn the Threshold knob fully counter clockwise and verify that the switch is activated. The state of the switch is indicated by the rightmost LED. Fully counter clockwise corresponds to the lowest threshold setting, and at this setting the switch is activated (i.e the switch is closed) all the time. Turn the Threshold knob fully clockwise. Clockwise rotation corresponds to the highest threshold setting. At a fully clockwise setting it takes a very large muscle contraction to activate the switch. With the muscle site inactive, gradually turn the knob counter clockwise until the threshold is set about two steps above the EMG signal level. Typically the EMG level will illuminate 2 or 3 of the leftmost LEDs.

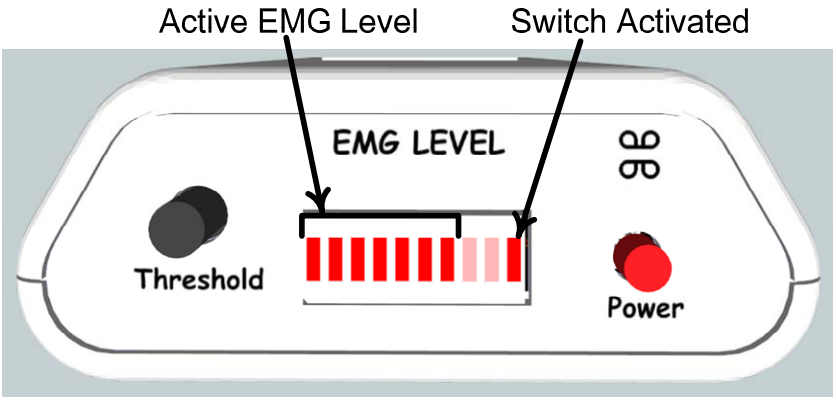

Figure 3 Typical Activation Display

Ask the user to activate the muscle site. The LEDs will illuminate indicating the EMG signal strength. The switch will activate when the EMG signal exceeds the threshold. Switch activation is indicated on the rightmost LED. Verify that the switch turns on when the muscle site is activated and that the light goes out when muscle site is at rest. It

may take some experimentation to optimize the placement of the electrodes, and to optimize the setting of the Threshold knob. The lower the threshold setting the more sensitive the device is to surface signals. A higher threshold takes a stronger signal to activate the switch and also minimizes the false triggers.

Battery Operation

For added safety, to minimize interference, and for increased mobility the unit can be powered with an external “pocket juice” 5V power bank. Instead of connecting the 5V power to the wall adapter connect the 5V “pocket juice” power bank to the 5V power input with the supplied adapter cable. To charge the power bank, connect the bank to a standard USB charger commonly used for cell phones. Always disconnect the power bank from the switch during the charging cycle.

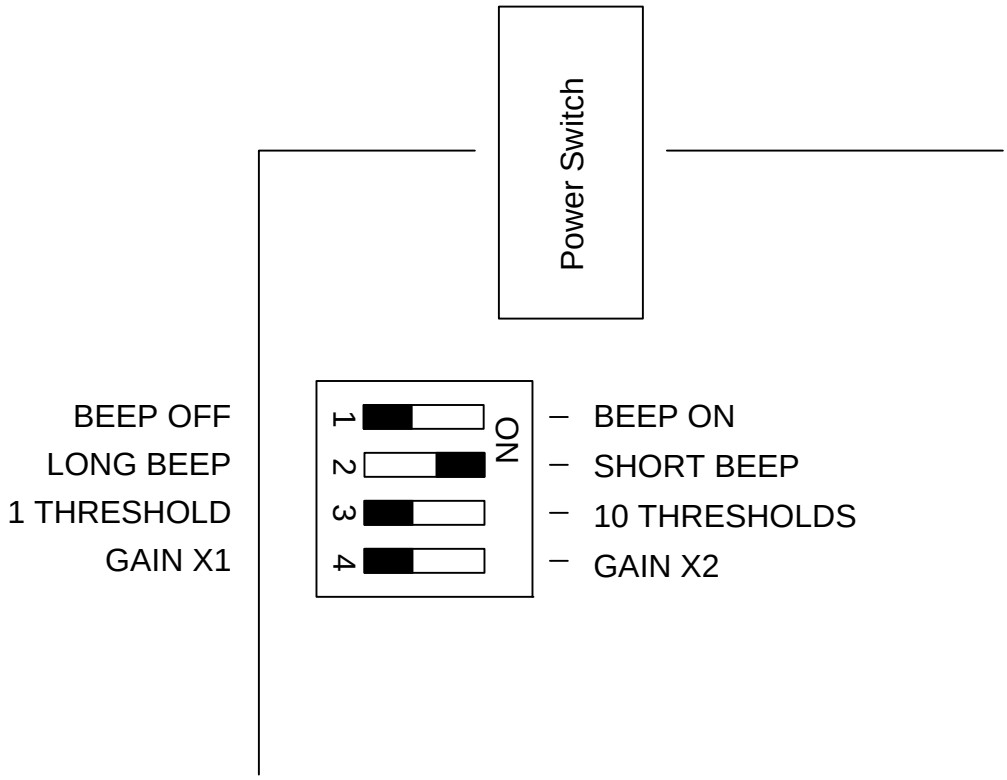

Figure 4 Internal Programming Switches Normal Settings

Supplies

A suggested electrode is the Covidien Biotac 7665 cloth electrode. These have been used with success and are latex free and easy on the skin.

A smaller electrode for placement on the face is the Covidien H69P Cloth Electrode. These are a smaller and also provide good performance.

The Biotac7665 electrodes are available from MVAP Medical Supplies $11.65 for a box of 60. MVAP Phone Number 1-877-735-MVAP (6827). They are also available from Cobalt Medical Supplies http://www.cobaltmed.com/

There are many other electrodes and electrode distributors. Some vendors provide smaller electrodes with less adhesive material, and some vendors provide electrodes with special adhesives to prevent skin irritation. Any electrode with a snap connector is compatible with the unit.

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