Myolab II

Prosthetist Manual

Motion Control
division of
Fillauer®

Myolab II

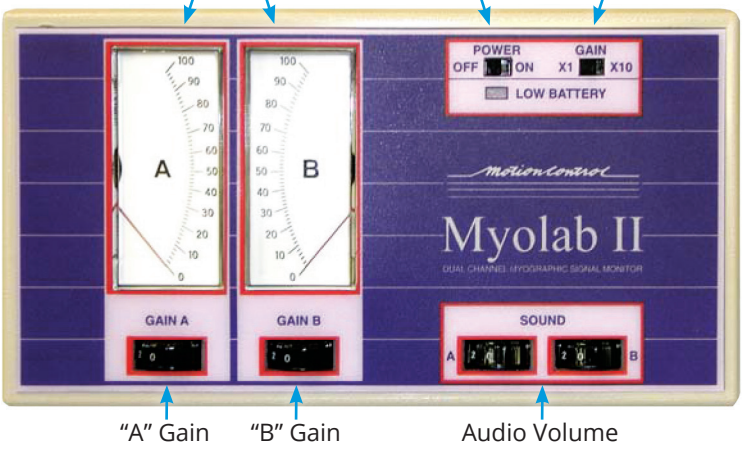
Prosthetist Manual

Introduction

The Motion Control Myolab II™, is a versatile two-channel EMG signal monitor used to display electromyographic activity. The system is an accessory for the fitting of Motion Control's Utah Artificial Arm, and ProControl 2 myoelectric prosthesis for upper limb amputees.

A myoelectric prosthetic device senses EMG signals from intact muscles and translates these signals into usable arm movements. The Myolab II uses this same advanced sensing technology to provide artifact-free EMG signal monitoring in a compact, easy-to-use system.

Myolab II Components



Indications

The Myolab II is intended for the monitoring and display of electromyographic signals for the purpose of fitting the Utah Arm and the ProControl 2 prosthetic devices.

Contrandications

Because the Myolab II is a passive monitoring system, no known contraindications exist for its use.

Special Precautions

⚠ Static electricity can damage the EMG sensors of the Myolab II. Therefore, always pick up the preamplifier by touching the ground (center) electrode first. This will ensure that any static electrical charge present on your body is discharged to the ground electrode, and not to the two sensing electrodes. When not in use, always keep the preamplifiers inside the static protection bag supplied with the preamplifiers.

⚠ Never allow moisture or contaminants to enter the Myolab II or preamplifiers.

⚠ Avoid using the preamplifiers in an extremely moist environment for long periods of time. If the preamplifiers are installed inside the socket of a prosthesis, make sure that the socket provides adequate drainage for perspiration.

System Setup

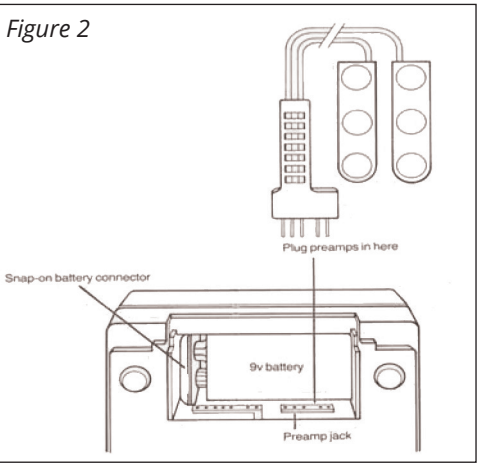
Changing Batteries

Hold the Myolab II upside down with the battery compartment away from you. Place both thumbs on the battery door and push down and away from you. The compartment door will slide out. Connect the battery to the appropriate terminals. (Note: The use of a Duracell 9 volt alkaline battery or equivalent is recommended.) Be sure to change batteries whenever the low battery indicator lights.

Connecting the Preamplifier Cable

The input preamplifier jack is located within the battery compartment (Figure 2). With the battery compartment door open, connect the preamplifier cable to the five-hole socket provided. (Note that the cable can be connected only one way-you cannot plug it in backwards.) Close the compartment door carefully, insuring that the cable connector is centered in the opening provided in the battery door. If using Triad preamplifiers, plug the Triad to Myolab Adapter (indluded) into the Myolab II, then plug the Triad preamplifiers into the adapter.

Figure 2



Preparing the Preamplifiers

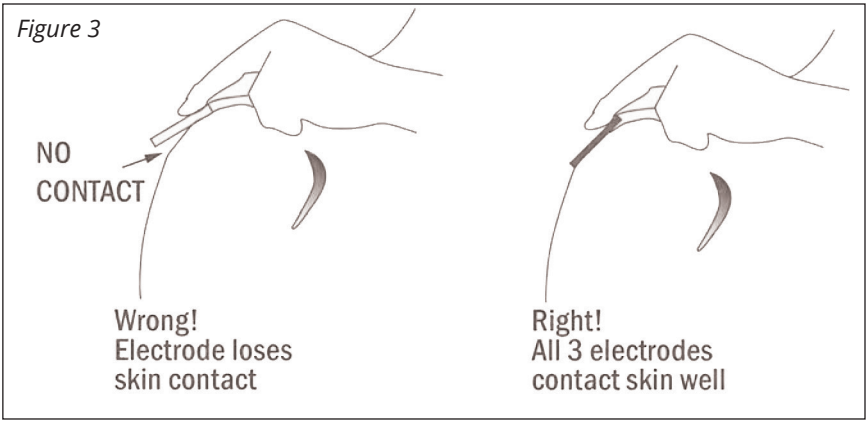
The stainless steel electrodes are screwed directly into the preamplifiers. This direct mounting technique eliminates artifact problems caused by movement of electrode lead wires and electrical interference. However, these electrodes can be removed from the preamplifiers and reconnected to them with lead wires having screw type (4-40 UNC) connectors thereby allowing for remote placement if so desired.

Ensure that the electrodes or any connector wires used are screwed snugly (finger tight only) into the preamplifier. Do not over-tighten.

Using the Myolab II to Monitor EMG Activity

1. To avoid static damage to the preamplifiers, always ensure that the patient is at the same electrical potential as the Myolab. Two good ways of doing this are:
   a) After properly picking up the preamp (ground first), touch the patient with your free hand before placing the preamp on the site being examined.
   b) Have the patient touch the ground (center) electrode before the active (outside) electrode comes in contact with the patient.
2. After guarding the patient, place the preamplifier with its electrodes on the skin directly over the muscle group to be monitored (Figure 3). Be certain that the three electrodes on each preamplifier are all in good contact with the skin. The use of a strip of hypoallergenic medical grade tape to hold the preamplifier in place is recommended.

Figure 3



Note that very dry skin or areas with a great deal of hair will significantly increase skin resistance and can diminish the EMG signal sensed by the preamplifier. Slightly moisten dry skin before applying the electrodes. Occasionally the operator may wish to use a small amount of a conductive salt free gel or lotion before applying the electrodes to extremely hairy areas. Normally, no such preparation is necessary.

3. If you are using only one preamplifier (i.e., monitoring only one muscle group) be sure to protect the remaining preamplifier by securing it in contact with the patient's skin or placing it in the static protection bag. Note: some electrical interference to the EMG signal can occur if both preamplifiers are not in contact with the patient (common ground) during monitoring.
4. Set the gain dials (Gain A and Gain B) to 0.
5. Rotate the sound dials (A and B) to the left until they stop. Sound monitoring is now off.
6. Place the gain switch in the X1 setting.
7. Place the power switch in the ON position.
8. Slowly turn up the gain dial for the channel (A or B) that you are using until you reach the appropriate meter reading for your application. For example, have the patient attempt to contract the appropriate muscle so that under best effort the needle will read between 50 and 70 (above the mid-line) on the meter dial. If the Myolab II is being used to monitor very low amplitude EMG signals, the sensitivity of the system can be increased by placing the gain switch in the X10 setting. This will increase the sensitivity of the system by a factor of 10.

9. To determine the actual EMG signal strength (within +/- 10%), place the gain switch at the X1 setting and the gain dial in the 10 position. The meter will now display the actual EMG in Microvolts, i.e., 100 (full scale deflection) = 100 microvolts. To measure EMG signals in the 0 to 10 microvolt range, the operator may use the X10 setting with the gain dial control on.
10. The actual microvolt signal strength is the meter reading divided by 10, i.e., a full scale deflection of the needle to the 100 meter reading = 10 microvolts.

To determine actual EMG skin microvolts at gain dial settings other than the 10 position, use the chart in the table below.

Microvolts at Full Scale (Needle at 100)			Microvolts per Division (50 Meter Divisions)	
Gain Dial	**X1 Gain**	**X10 Gain**	**X1 Gain**	**X10 Gain**
12	83	8	1.6	.13
10	100	10	2.0	.20
8	125	13	2.6	.26
6	167	17	3.4	.34
4	250	25	5.0	.50
2	500	50	10	1.0

Set the audio volume at the desired level using the appropriate sound dial. (Note: The pitch of the sound [not the volume] will increase with an increase in EMG signal intensity. In addition, the sound of each channel differentiates the two signals).

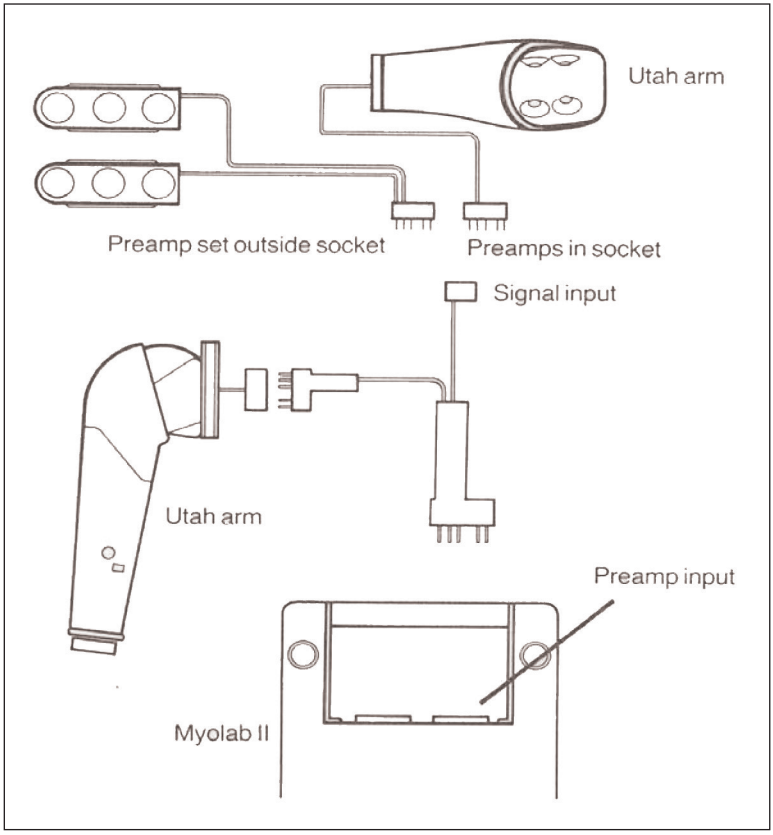
At the conclusion of the training session, remove the preamplifiers from the patient and turn the power switch off. Be sure to store the preamplifiers inside the static protection bag supplied.

Using the Myolab II for EMG Site Selection

1. Before probing for EMG electrode sites, examine the patient for problem areas such as wounds, scar tissue and painful areas. Determine the range of motion and areas of muscle inadequacy.
2. All of the remnant muscles which could be used for control sites should be evaluated before fitting a myoelectric prosthesis. Note: when the biceps or triceps are not present on an amputee, e.g., shoulder disarticulation amputee, other control sites such as the pectoralis and infraspinatus muscles may be successfully used.

   Begin EMG probing with the most distal of the remnant muscles. While probing, have the subject contract the appropriate muscle being tested.

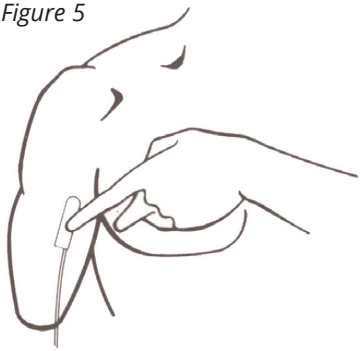
Figure 4 - Use the T-Cable (p/n 5030003) to operate the Utah Arm and Myolab II Simultaneously



Note: unilateral amputees may be aided in learning to contract a particular muscle in their remnant limb by mimicking the same function in the sound arm, e.g., flexing the sound elbow and contracting the biceps simultaneously in both the remnant arm and the sound arm (Figure 5).

For both bilateral and unilateral amputees, the motion of the appropriate joint or the memory of the lost joint motion may be utilized to train the remnant muscle. Remind the subject to relax the muscles proximal to the intended muscle contraction.

Figure 5



For example, relax the shoulder when contracting the biceps.

Also, the EMG signal will usually be more controllable if some resistance is provided to the motion of the remnant limb, either with the clinician's hand or the socket of a prosthesis.

3. Palpate the muscle as the patient contracts it and place the preamplifier over the belly of the muscle. Touching the muscle helps give the subject more sensation of the muscle contraction, which may help in learning to control the muscle (Figure 6).

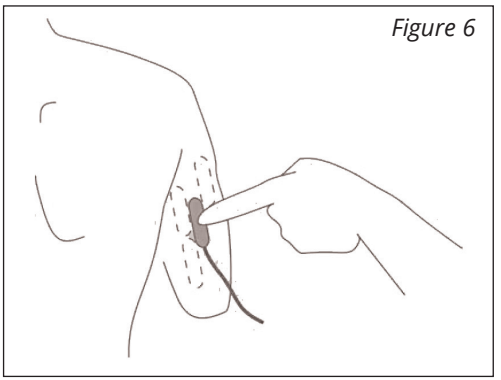


Figure 6

Mark the location of the strongest EMG signal, and the total area in which a strong EMG is found.

4. Instruct the patient to "contract-hold-relax" in about a three second sequence. A smooth and even contraction is desired, without strenuous effort, with relaxation after each contraction. Instruct the patient to try to relax the muscles not being tested.

   Systematically move the preamplifier by one-half inch increments and ask the patient to perform the "contract-hold-relax" sequence with the same strength of contraction for at least two repetitions at each location.

5. When a potential control site is identified, mark the best electrode location on the skin, and also mark the total area in which an adequate EMG signal is obtained (Figure 7). This will be important in locating electrodes in the prosthetic socket. Identify all potential EMG control sites in this manner.

6. When probing EMG control sites for the Utah Artificial Arm, use the "A" channel of the Myolab II to monitor the muscle (the "A" muscle) most appropriate to control flexion of the elbow of the prosthesis (usually an anterior muscle such as the biceps or pectoralis). This muscle is usually recommended for the hand closing site also, although exceptions are common, (e.g., when the elbow extension muscle is more easily controlled by the subject).

7. Find the best agonist-antagonist pair of EMG control sites. Use the “B” channel of the Myolab II to monitor the muscle (the “B” muscle) most appropriate to control powered extension of the elbow (and hand opening or closing). In a two-muscle control system such as the Utah Artificial Arm, strength and independence are important to the agonist-antagonist pair of muscle control sites.

   While viewing both Myolab II meters simultaneously, probe for the two muscle sites with the greatest difference of EMG amplitude (Figure 7). When the subject contracts the “A” muscle, note the amplitude of co-contraction on the “B” channel. Then test the reverse situation as the patient contracts the “B” muscle while the “A” meter is monitored. Raise the gain for the weaker muscle using the Gain Control Dial on the Myolab II so that contraction of either “A” or “B” muscles results in about the same difference between the two meter readings.
8. To train patients in using the unlock feature of the Utah Artificial Arm, instruct the patient to contract both the flexor and extensor muscles simultaneously, in a quick but low strength co-contraction, followed by relaxation (the motion is similar to “snapping” the fingers-very quickly but without straining for a strong contraction). After the muscles have relaxed, the “A” muscle is contracted gradually to move the elbow after unlocking the prosthesis.
9. Using the Myolab II to monitor activity of the appropriate muscles, have the subject perform the following sequence repetitively:

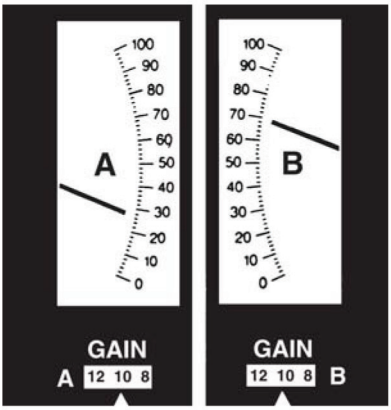
   Step 1- Gradually contract the “A” muscle. Maintain a contraction for one second and then relax.

   Step 2- Gradually contract the “B” muscle. Maintain a contraction for one second and then relax.

   Step 3- Quickly co-contract both the “A” and “B” muscles, then relax both. Return to Step 1 and repeat sequence.

   Once the best control sites are found, the patient may use the Myolab II as a training device, by concentrating efforts on developing the maximum difference between the two Myolab II meters (Figure 7). Some patients may be aided by visualizing movements of the phantom limb while they contract the remnant musculature.

Figure 7 - Differentiation of two muscle groups as visualized on Myolab II meters



Proprioceptive neuromuscular facilitation (PNF) exercise training has been found effective to develop remnant musculature in some amputees. Consult a physical or occupational therapist, or the Utah Artificial Arm Users Manual or Fitting Procedures Manual for more details.

10. Final Site Selection
    Choose the muscle sites only after a reasonable period of training and practice, so that a potentially good muscle site is not rejected prematurely. The minimum criteria are:
    A. To operate the Utah Artificial Arm, when either muscle "A" or muscle "B" is contracted the "A" or "B" EMG signal must exceed the other signal (either "B" or "A") by:
        - 5 microvolts for hand control
        - 12 microvolts for elbow control

To measure the EMG signal magnitude accurately, set the gain dial on 10 and the gain switch on X1.

    B. The muscle EMG signals should be controllable, without spasmodic jumping or quivering.
    C. Contraction of the muscle should not induce pain.
    D. Scar tissue should be avoided, if possible. However, if no other satisfactory sites are available, electrodes can be used over scar tissue if designed properly to avoid breakdown of the scar tissue.

Troubleshooting the Myolab II

1. If you lose the EMG signal to one or both channels, or the signal is erratic:
    - Check the connection to the Myolab II. Be sure the preamplifier cable (and adapter cable if used) is plugged securely into the five pin socket in the battery compartment.
    - Make sure the power switch is in the on position.
    - If you are measuring a very small EMG signal, the signal strength may be too weak for a gain switch setting of X1. Change to X10.
    - Make sure that the gain dial control is at an adequate setting.

Note that a gain dial of "0" effectively shuts off that channel.

- Check the connection of the electrode discs to the preamplifier. Tighten all screw connections securely, but no more than finger tight. Clean any corroded or dirty connections with a cotton swab slightly moistened with alcohol.
- If the skin is extremely dry or densely covered by hair, moisten the area with water or, alternately, use a salt-free electrode gel or lotion.
- If the skin is excessively wet, dry off the skin.
- Check the battery light. If it is on, replace the battery. If it appears that the battery is completely drained (i.e., no indicator light or meter activity) replace the battery.

2. If the meter needle seems to be stuck at the maximum
   - Lower the gain dial setting.
   - Turn the Myolab II power Off. Check all connections and then turn the power On again.
   - Check the gain switch setting.
   - Change the battery.

If the Myolab II continues to malfunction after you have taken the above actions, call the service department at Motion Control for further instructions 801.326.3434 or toll-free at 888.MYO.ARMS (696.2767), or Email: MotionInfo@fillauer.com.

Caring for the Myolab II

The Myolab II is a sensitive medical instrument:

- Always store the preamplifiers in their static protection bag when not in use.
- Always store the Myolab II in its case when not in use.
- Always pick up the preamplifiers by touching the center (ground) electrode first.
- You can clean the preamplifiers by moistening a clean gauze pad with alcohol. Do not use soaps or other solutions as these will tend to leave a film on the electrodes and hinder their performance. Do not immerse the preamplifier in water!
- Clean the Myolab II unit using a damp cloth. Do not allow moisture or contaminants to enter into the case.

Specifications

Size: 19 cm x 10 cm x 3 cm (7.5 in x 4 in x 1.2 in)

Weight: 445 gm (1 lb) with battery

Preamp Gain: 375 Nominal at 300 Hz

Common Mode Rejection Ratio: >100 db @ 60 Hz @ ± 9 Vdc supply voltage

Bias Current: 1 picoamp

Filtering: 1st order, high pass at 10 Hz
1st order, low pass at 10 kHz

Output Impedance: >1 Ohm

Output Current: 6 mA

Output voltage: @ ± 9 V supply voltage – 7.5 V output

T-Cable to Preamps: 2 m (~ 6 ft)

More specifications at www.UtahArm.com

Satisfaction Guarantee

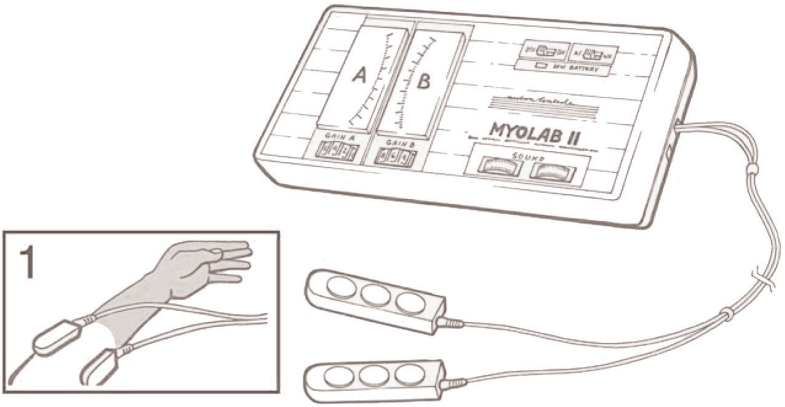
30 days from date of shipment

Warranty

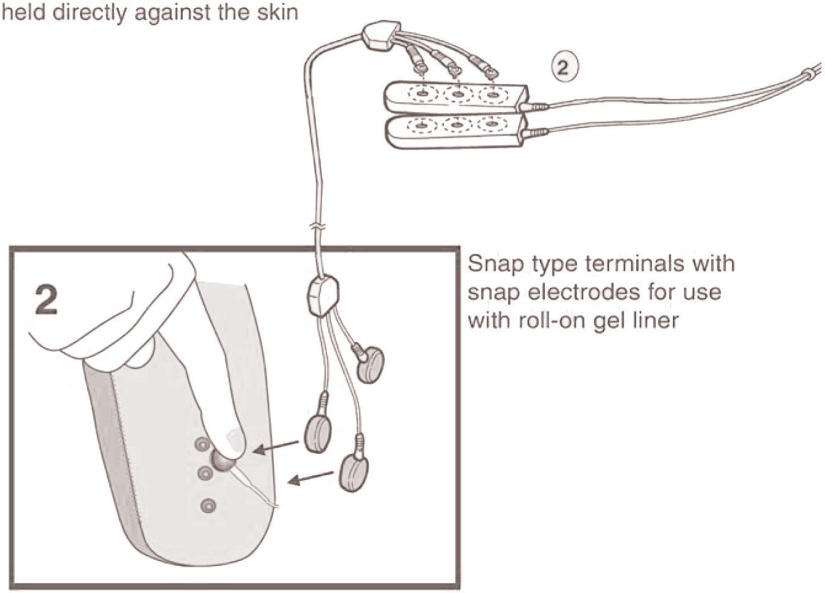
2 year limited warranty

Ordering Information

www.UtahArm.com/Catalog

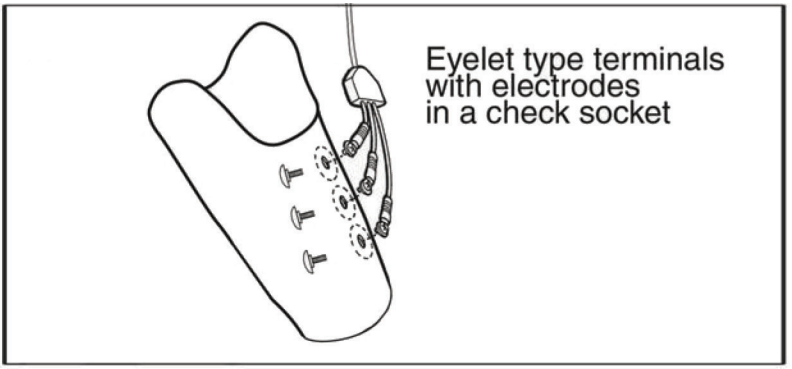


Preamps with flat disc electrodes held directly against the skin

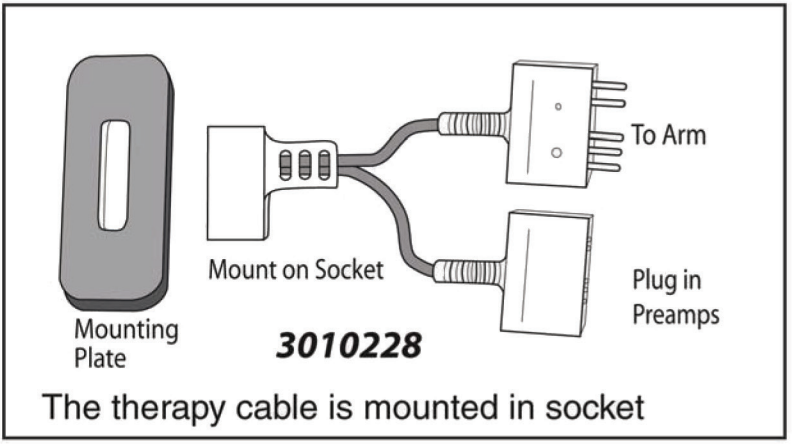


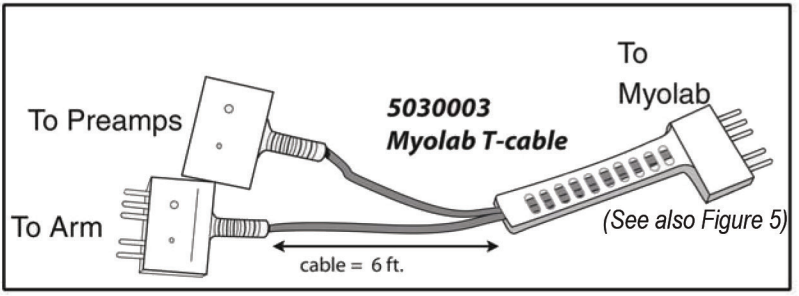
Snap type terminals with snap electrodes for use with roll-on gel liner

Alternate leads for use with Myolab II



After the Utah Arm is fitted, the Myolab can be connected using the Therapy cable or the T-cable





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