



OHIO WILLOW WOOD

LimbLogic VS FAQ

October 22, 2007

The following are some frequently asked questions on the vacuum system.

Q. When will the product be available?

A. We began accepting orders September 24, 2007 for US based customers. European orders will be accepted in November.

Q. What is the product warranty?

A. It is a two year warranty that is competitive with other electronic vacuum systems. Damage from mis-use is not covered.

Q. Is there a trial period?

A. There is a 30 day trial period.

Q. What is the weight of the unit?

A. The 4-hole controller weighs 190 gm (0.4 lbs).

Q. What is the battery life?

A. The battery life is dependent upon the quality of the seal and the amputee's activity level. Our testing has shown the system can normally last between 1 day and one week on a patient. It is recommended that the unit be charged daily to keep a constant routine. The fob has a user replaceable CR2 camera battery that should last 6 months with normal usage.

Q. Is there anything special with the fabrication of the socket?

A. Yes having an airtight socket is critical to proper operation of the overall system. Ohio Willow Wood provides recommended socket fabrication methodology to achieve airtight sockets with Ohio Willow Wood adapters which are included in the kit instructions and available on our website.

Q. Is there anything special with the sealing?

A. An airtight sealing sleeve is normally required, but there may be other methods to achieve a good vacuum seal.

Q. Does this work for AK amputees?

A. Yes the system is suitable for BK and AK amputees.

Q. What type of maintenance is required for the system?

A. The coarse filter (Poron) in the socket must be kept clear of large debris or lint that would block the airflow. The patient's perspiration will form salt crystals in the vacuum lines, so the system should be flushed with water or isopropyl alcohol on a monthly basis as recommended in the user instructions.

Q. What are the system settings?

A. The vacuum is adjustable from 0 to 20 in-Hg (508 mm-Hg) with most BK patients using a 10 to 16 in-Hg upper set point. The default control range is a span of 6 in-Hg.

Q. What type of liners are needed with the system?

A. Ohio Willow Wood testing has been done with Alpha MAX and Alpha DESIGN Liners. The MAX fabric provided the best compatibility with the vacuum.



Q. What is the difference between the settings of inches of mercury (in-Hg) and millimeters of mercury (mm-Hg)?

A. The LimbLogic system displays vacuum settings in inches of mercury. To convert from inches of mercury to millimeters of mercury simply multiple by 25.4.

Q. What is the difference between suction suspension and vacuum suspension?

A. Both methods use a difference in atmospheric pressure to attach the socket to the residual limb. Suction suspension normally uses a passive expulsion valve to allow air to exit from socket, but only creates a negative pressure differential when the limb begins to move. Vacuum suspension uses an active pump to create a negative pressure differential which doesn't depend upon the limb position.

Q. How does vacuum suspension work?

A. The vertical extraction holding force is determined by the diameter of the socket at the sealing point on the limb. The limb in the socket behaves much like a syringe plunger when the syringe is blocked. The vertical holding force is equal to the cross sectional surface area of the limb at the sealing point multiplied by the pressure differential. A negative air pressure is created between the outside of the fabric coated liner and the airtight socket when the vacuum pump pulls the air from the between the liner gel and socket wall. The negative air pressure pulls the liner towards the wall of the socket. The liner gel creates a similar airtight seal to the limb, so when the liner is pulled towards the socket, the body's internal interstitial outward force in the limb is pushed towards the socket and holds the limb firmly in place. The side force stabilizes the limb in the socket.

$$F \approx \text{Area} * \text{Pressure} \approx \pi * (C/2)^2 * P \approx 0.39 * C * C * P \text{ (assumes a round limb shape at sealing point)}$$

Where

F= approximate vertical extraction force (lbs); C= circumference of limb at sealing point (in); P= negative pressure in socket (in-Hg) [Note: 0.4912 psi/in-Hg]

Q. What L-codes are reimbursed for the LimbLogic VS system?

A. L-5781 = Vacuum pump, L-5782 = heavy duty Vacuum pump, L-7368 = Lithium ion battery charger.

Q. What is the torque required to attach the LimbLogic VS pump to the prosthesis?

A. The M6 flathead screws provided should be tighten to 9 ft-lbs or 12 N-m of torque.

Q. What is the difference between the System Maximum setting and the Upper Set Point?

A. The Upper Set Point (USP) and the System Maximum (SM) settings are related, but they are not the same. The Upper Set Point is easily amputee adjustable by the up/down fob buttons and USP is the highest vacuum level that the pump will regulate to when in automatic mode. The Upper Set Point can not be greater than the System Maximum setting i.e. $0 \leq USP \leq SM$. The System Maximum is prosthetist adjustable and it sets what a prosthetist determines is the maximum vacuum level that should be applied to a limb. The largest System Maximum value is limited by the capabilities of the pump hardware and it is set equal or less than 20 in-Hg i.e. $0 \leq SM \leq 20$ in-Hg.