

## *Boston Digital Arm™ System*



*Boston Digital Arm-Plus System*

- **High-torque prosthetic elbow**
- **State-of-the-art digital technology**
- **Compatible with all hands, grippers and wrist rotators including iLimb & bebionic**
- **Clutch automatically locks/unlocks**
- **Dozens of control options**
- **Operates with inputs from Myoelectrodes, Touch Pads™, servo controls, and switches**
- **TMR version for Targeted Muscle Reinnervation patients**
- **Operates with new pattern-recognition technology**
- **“Plus” upgrade - new Lithium-polymer high-capacity battery**

The **Boston Digital™ Arm System** is a platform for upper-limb prosthetic control. Typically the elbow's microprocessor controls the elbow as well as other devices of the prosthetic system such as; terminal device(s), wrist rotator and possibly a shoulder joint electric lock for shoulder-level prosthesis. Based on the control strategy planned for the patient, suitable input devices should be selected. These can be a mix of myoelectrodes, Touch Pads™, Linear Transducers and even switches. The Boston Digital Arm System (BE300) comes complete with the Drive Unit (BE301), Main Circuit Board and Frame (BE305/309), Forearm (BE309), two Batteries (BE360), Battery Charger (BE366), Lamination Collar Assembly (BE306), Input Connector Board (BE304), Cross-Elbow Cable Set (BE390). The “Plus” version of the Boston Digital Arm System is a recent upgrade that includes the new high-capacity lithium-polymer battery. This 2000 mAhr, 11V battery generally provides adequate capacity to operate the prosthetic system all day without recharging. The battery also has an on-board voltage regulator designed specifically to accommodate the new multi-articulating prosthetic hands; Bebionic and iLimb Ultra.

### *Boston Digital Arm Systems:*



#### **BE300L** Boston Digital™ Arm-Plus System with Forearm, Batteries (2) and Lamination Collar

*The Boston Digital Arm System comprises the following components: BE301, BE302, BE303, BE304, BE305, BE306, BE309, (2) BE360s, BE366, and BE390.*

*“Plus” system includes upgraded Lithium-polymer high-capacity battery*

# Boston Digital Arm™ System



**BE300TMR** Boston Digital™ Arm-Plus System with Forearm, Batteries (2) and Lamination Collar for use with TMR patients who have more than two myoelectric inputs

*The Boston Digital Arm System comprises the following components: BE301, BE302, BE303, BE304, BE305, BE306, BE309, (2) BE350s, BE255, and BE390.*

*“Plus” system includes upgraded Lithium-polymer high-capacity battery*

## Boston Digital Arm Components:

The following Components are included in a Boston Digital Arm-Plus System (BE300L or BE300TMR). To complete the fabrication of the prosthesis, the prosthetist must determine the preferred control strategy and order the appropriate accessories (i.e. input sensors, terminal device, glove, wrist rotator, etc.).



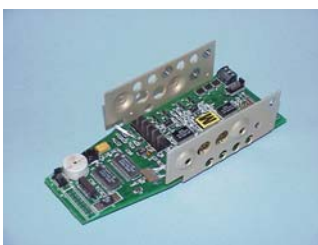
**BE301** Drive Unit, Boston Digital Arm

*Supplied with Boston Digital Arm (BE300) System*



**BE302** Lamination Collar & Clamp (BE306) (shown)

*Supplied with Boston Digital Arm (BE300) System*



**BE305/BE303** Main Circuit Board & Frame for Boston Digital Arm

*Supplied with Boston Digital Arm (BE300) System*

*BE305 Digital Circuit Board mounted in BE303 Forearm Frame. While either of these parts can be replaced, the mounting must be done by LTI.*



**BE304** Input Connector Board, Boston Digital Arm

*Supplied with Boston Digital Arm (BE300) System*

# ***Boston Digital Arm™ System***



**BE309** Prefabricated Forearm, Boston Digital Arm  
*Supplied with Boston Digital Arm (BE300) System*

*When ordering select wrist size and color (tan or black):  
Default wrist diameter: 50mm to match Bock-style lamination ring  
or wrist rotator  
Forearm length: 8½ - 14" (216-355 mm) from center of rotation*



**BE360+** Battery, Lithium-ion 11V, 2000 mAHr for Boston Arm  
*Two batteries supplied with Boston Digital Arm (BE300) System  
Batteries can be charged in or out of the prosthesis using a BE366 Charger  
Fuel Gage - indicator lights report state-of-charge*



**BE366** Fast Charger, Boston Arm Lithium-polymer Battery  
*Supplied with Boston Digital Arm (BE300.)System  
Universal: 110V, 60Hz or 220V, 50Hz.*

*A standard computer cord is provided. An appropriate power cord can  
be obtained for use in any other country.*



**BE390** Cross Elbow Cable Set, Boston Digital Elbow  
*Supplied with Boston Digital Arm (BE300) System*

## ***Boston Arm Accessories:***



**BE3XX** Locking Humeral Rotator for Boston Arm  
*Replaces the BE302 lamination Collar supplied with Boston Digital Arm.  
Can upgrade to this Locking Humeral Rotator at the time of ordering.*



**BE360+** Replacement Battery, Lithium-ion 11V, 2000 mAHr  
with Voltage Regulator Board (BE361)

*Up-grading older (obsolete) Boston Arm Ni-Cad batteries (BE350) to  
Lithium-polymer batteries will also require a new Charger (BE366)*

# *Boston Digital Arm™ System*



**BE360** Replacement Battery, Lithium-ion 11V, 2000 mAhR  
without Voltage Regulator Board (BE361)

*Up-grading older (obsolete) Boston Arm Ni-Cad batteries (BE350) to Lithium-polymer batteries will also require a new Charger (BE366)*



**BE306** Clamp Ring Assembly for Lamination Collar

*Used to clamp BE301 Drive Unit to Lamination Collar (BE302), Elbow Disarticulation Collar (BE308) or Adjustable Check Socket Collar (BE309)*



**BE\_\_\_\_\_** Electric Wrist Rotator for Adult Electric Hands

*Specify color; black or tan*

*Requires MC4050231 Boston Arm 50mm wrist lamination collar*

## *Input Sensors for Boston Arm Systems:*



*Input sensors are required to control the Boston Digital Arm System and its accessories. Depending on the patient's capabilities, many control options are available. One of the most common is positional servo control of the elbow (using a Linear Transducer) and myoelectric control of the terminal device and (if provided) wrist rotator. This gives the user independent control of two devices which can then be operated simultaneously.*

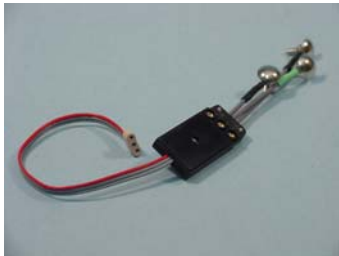
*A brief description of each type of input sensor is provided below – go to the Input Sensor section for complete details.*



**BE235** – Linear Transducer with cable for Boston Arm

*For position servo control of the elbow or quick-slow proportional control of the terminal device*

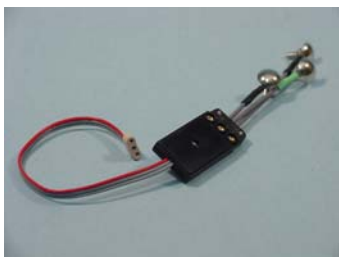
# Boston Digital Arm™ System



## BE328 LTI Remote Electrode System

Supplied with Remote Electrode Cables (your choice of cable length) and Metal Electrodes (your choice of size/shape)

Select Metal Electrodes & Remote Electrode Cables:



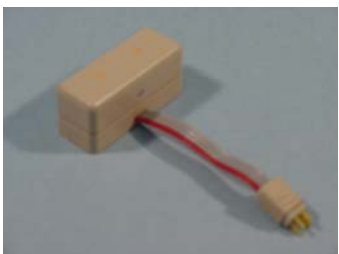
## MSBE328 LTI MagneSnap™ Remote Electrode System

Supplied with MagneSnap Remote Electrode Cables (your choice of cable length) and MagneSnap Metal Electrodes



## TP01 Touch Pad Kit - 3 Pads, 3/4" (diameter), 4 covers

Requires Input Cable (BE340/BE341)



## 9X25 Bock-style Rocker Switch or equal (shown)

9X14 Bock-style Harness Switch

9X18 Bock-style Traction Switch

9X37 Bock-style Dual-action Push Switch

Requires Input Cable (BE230)



## Input Cables for Boston Arm Systems:

Input signals for Boston Digital Arm Systems are generally provided with myoelectrodes and Linear Transducers. The LTI Linear Transducer (BE235) and the LTI Remote Electrodes are supplied with input cables. Touch Pads and switches require a separate input cable.

## Input Cables for Switches:



## BE230 - Cable, Input, Bock Compatible Switches

Accepts Bock 9X14, 9X18, 9X25, and 9X37 and any LTI Bock compatible switch



# Boston Digital Arm™ System



**BE265** - Bump Switch with cable, Bock-Compatible  
*Requires use of BE230 cable above*



**BE364** - Bump Switch with cable for mode selection  
*No additional input cable required  
Must be installed in humeral section.*



## Input Cables for Touch Pads™



**BE340** – Cable, Input, One Touch Pad Plug  
*Requires one Touch Pad from a TP01 Touch Pad Kit*



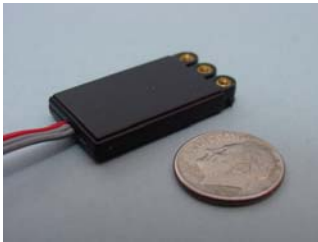
**BE341** – Cable, Input, Two Touch Pad Plugs  
*Requires two Touch Pads from a TP01 Touch Pad Kit*



## Remote Electrodes for Boston Arms:

Remote Electrodes supply myoelectric signals directly to the Boston Digital Arm. They are intended for use with prosthetic sockets comprised of soft inner socket and hard outer socket. The Metal Electrodes are installed through the inner socket and the Remote Electrode Cables are then placed between the inner and outer sockets and the cable eyelets are attached to the studs on the Metal Electrodes. These low-profile electrode-amplifier circuits measure 0.7" (17.3mm) wide x 1.2" (31mm) long x 0.19" (4.7mm) thick which allows them to fit into confined spaces often encountered in prosthetic sockets. And they weigh just 3 grams. They are supplied with Remote Electrode Cables (RECXX) and a Metal Electrode Kit (EL11, EL12 or EL13).

## ***Boston Digital Arm™ System***



**BE328** Remote AC Electrode Amplifier, Boston Arm only!  
Supplied with Remote Electrode Cable (RECXX) and Metal Electrodes (EL1X). Select cable length and electrode style below



## ***Remote Electrode Kits for Boston Arms***



**BE330** Remote AC Electrode Kit for 2 Myoelectrode  
Supplied with Remote Electrode Cables (RECXX) and Metal Electrodes (EL1X). Select cable length and metal electrode style below  
For use with Boston Arm Systems only.



**BE331** Remote AC Electrode Kit for 1 Myoelectrodes  
Supplied with Remote Electrode Cables (RECXX) and Metal Electrodes (EL1X). Select cable length and metal electrode style below  
For use with Boston Arm Systems only.



## ***LTI Remote Electrode Cables:***

These Remote Electrode Cables (REC) are included with Remote Electrode Kits (BE330, BE331). The customer must specify the preferred cable length (3, 6, 12 or 24"). They attach to the Remote Electrode-Amplifiers and to the Metal Electrodes, (EL1X) thus making a complete LTI Remote Electrode System. The three ring terminals are just 0.35" (9mm) wide and 0.1" (2.5mm) thick, thus keeping the profile low.



**REC03** Remote Electrode Cables, 3 in (76mm) long  
**REC06** Remote Electrode Cables, 6 in (152mm) long  
**REC12** Remote Electrode Cables, 12 in (305mm) long  
**REC24** Remote Electrode Cables, 24 in (609mm) long



The ring terminals on LTI Remote Electrode Cables accept the 4-40 studs on the EL01, EL02 or EL03 Metal Electrodes and attach to the Remote Electrode-Amplifiers above.

# ***Boston Digital Arm™ System***

## ***LTI Metal Electrodes:***

These Cavity-backed™ Metal Electrodes for use with the LTI Remote Electrode System, are attached to the Remote Electrode cables above. They are available in three sizes/shapes to suit all applications. They have a recess on the back allowing the inner socket material to deform into this space, thus reducing the bulge on the socket. When mounted into an inner socket in this way, the Metal Electrodes and their two nuts add less than a tenth of an inch (2.5mm) on the outside. This results in a more cosmetically attractive socket and provides a better seal for perspiration.



**EL01** Remote Metal Electrode, High Dome, Cavity-backed™  
*0.56" (14mm) dia. dome rises 0.19" (4.8mm) with 4-40 threaded stud for attaching to REC ring terminal. Supplied with two small profile 4-40 nuts.*

**EL11** Remote Metal Electrode Kit, High Dome, qty 3  
*Use this kit with the Remote Electrode Cables above*



**EL02** Remote Metal Electrode, Medium Dome, Cavity-backed™  
*0.56" (14mm) dia. dome rises 0.12" (3mm) with 4-40 threaded stud for attaching to REC ring terminal. Supplied with two small profile 4-40 nuts.*

**EL12** Remote Metal Electrode Kit, Medium Dome, qty 3  
*Use this kit with the Remote Electrode Cables above*

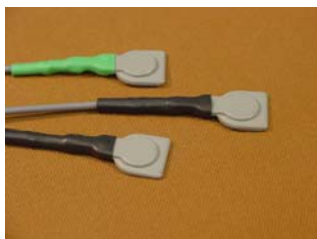


**EL03** Remote Metal Electrode, Small Dome, Cavity-backed™  
*0.37" (9.4mm) dia. dome rises 0.09" (2.2mm) with 4-40 threaded stud for attaching to REC ring terminal. Supplied with two small profile 4-40 nuts.*

**EL13** Remote Metal Electrode Kit, Small Dome, qty 3  
*Use this kit with the Remote Electrode Cables above*

## ***MagneSnap™ Remote Electrodes for Boston Arms:***

The MagneSnap Remote Electrodes are intended for prosthetic applications using a roll-on liner (silicone or gel) rather than an inner and outer socket. They use the same low-profile AC Electrode-Amplifiers as the LTI Remote Electrodes above, but they are supplied with a different cable and metal electrodes. The MagneSnap Remote Electrode Cable (MSRECX) use magnet attraction to attach the cables to the metal electrodes



**MSREC03** MagneSnap Remote Electrode Cable, 3" long  
**MSREC06** MagneSnap Remote Electrode Cable, 6" long  
**MSREC12** MagneSnap Remote Electrode Cable, 12" long  
**MSREC24** MagneSnap Remote Electrode Cable, 24" long  
*Use with MagneSnap Metal Electrodes (MSEL13) below*



# Boston Digital Arm™ System



**MSE113** MagneSnap Metal Electrode Kit, 3/8" dia., quantity 3  
Use with MagneSnap Remote Electrode cables above  
Round nut is magnetically attracted to MagneSnap Remote Electrode Cable

## Output Cables for Hands & Wrists with Boston Arm Systems:

Most prosthetic terminal devices now have on-board microprocessor controllers. Hands like the Bock Sensor-Speed, Bebionic, iLimb Ultra and Pro-Hand have on-board controllers, so they require myoelectric input signals from the Boston Arm.



**BE343** Cable, Output, Bock QD, use with BE 360+ Battery  
Use for use with Bock Sensor Hand, Bebionic hand, iLimb hand, or other TD with on-board controller



**BE346** Cable, Output, Bock QD, use with BE360 Battery  
Connects to BE361 Voltage regulator on bottom of BE360 Battery.  
Use for use with Bock Sensor Hand, Bebionic hand, iLimb Ultra hand or other TD with on-board controller



## Cables for Hands without on-board controllers:

The digital electronics on the Boston Arm can simulate the myoelectric signal output of the “open” and “close” electrodes when the terminal device chosen does not have an on-board controller. If a wrist rotator will be used with these hands using the BE343 cable below, a separate BE244 cable is required for the wrist rotator. The Boston Digital Arm can accept either type of terminal device, those with on-board controllers or those without on-board controllers, but the terminal devices cannot be mixed (one with and one without an on-board controller).



**BE243** Cable, Output, Bock QD, hand or Greifer only  
Use for PWM control of either an 8E37 Hand or an 8E32 Greifer



# Boston Digital Arm™ System



**BE244** Cable, Output, wrist rotator only  
*Use for PWM control of only a Wrist Rotator*



**BE247** Cable, Output, hand with wrist rotator  
*Use for PWM control of either an electric Hand (8E37) or Greifer and a Wrist Rotator*



# Boston Digital Arm™ System

## Boston Digital Arm™ System Specifications

Factor/measure	Boston Digital Arm
Torque	10 ft-lbs
Weight Lifting Ability (@14")	9 lbs
Clutch (mechanical)	reverse locking
Clutch release under load	yes
Speed: no load	
flexion (against gravity)	1.1 sec
extension (with gravity)	1.0 sec
Speed: with Greifer (1.2 lbs)	
flexion (against gravity)	1.2 sec
extension (with gravity)	1.0 sec
Weight of Elbow (no TD) w/ battery & lamination collar	2 lb 2 oz
Weight of Elbow with OB TD	3 lb 3 oz
Center of Mass (from rear of housing)	3.5 inches
Control Options:	
myo-myo	yes
positional servo & myo	yes (1 or 2)
switches	yes
Touch Pads (FSR) - up to 5	yes
Mode Selection	co-contraction, switches or revert
Battery Capacity (11 volt) – lithium-polymer	1100 mAh
Removable battery	yes
On-board Charging	yes
Fast Charger	yes
Patient adjustable humeral rotation friction	yes
Forearms:	
wrist size, inside diameter	50 mm
number of colors	2 – tan & black
range of lengths	8½ - 14" (216-355 mm)
maximum circumference	9.25"
minimum coupling collar distance - to bottom of elbow	2.80"
minimum distance residual limb - to elbow center	1.75"
Terminal Device Compatibility:	
Bebionic multi-articulating hand	yes
iLimb Ultra & Revolution multi-articulating hand	yes
Otto Bock electric hands (8E38=8, 8E37, 8E, etc.)	yes
Steeper Select electric hands	yes
Otto Bock Greifer	yes
body powered split-hooks	yes
Motion Control Electric Terminal Device (ETD)	yes
Powered Wrist Rotator:	
Motion Control electric wrist rotator	yes
Modular construction (for servicing)	yes
Surface Mount Technology (SMT) circuits	yes
Drive Train	direct drive (wave generator)
Free-swing mode	yes (mechanical)
Warranty	2 year limited
Myoelectrodes/amplifier size	1" x 11/16" x 3/16" thick
Suggested* HCFA L-code considerations (in addition base code):	
Boston Arm - sequential control	L7180
Boston Arm - simultaneous control	L7181
Boston Arm - "Microprocessor control" terminal device	L6882
Boston Arm - Lithium Battery Replacement	L7367
Boston Arm - Lithium Battery Charger	L7368
Boston Arm - Proportional Control (previously L7274)	L7499
Electric Hand, Adult	L7007
Terminal Device Glove for hands, any material	L6890
Electric Hook, Adult	L7009
Electric Hand, Multi-articulating digits, any grasp pattern	L6880
Quick Disconnect Wrist	L6628
Shoulder Joint, Multi-positional Locking, abduction friction	L6646

\* The L-codes provided represent our suggestions and you as a practitioner must decide which codes to use.