SYSTEM 3 AND 4 UPPER EXTREMITY HEMIPARETIC ATTACHMENT SET

OPERATION MANUAL

830-540
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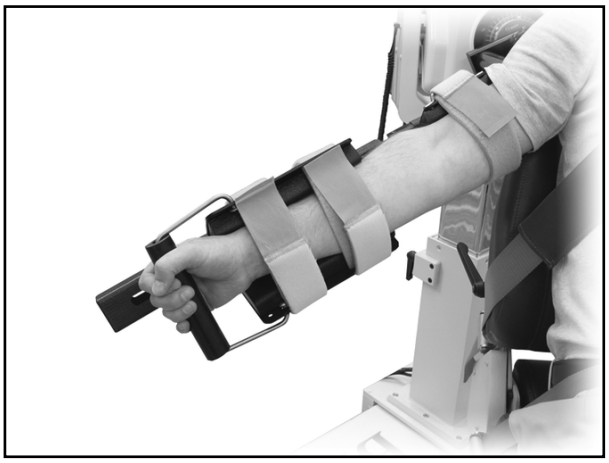
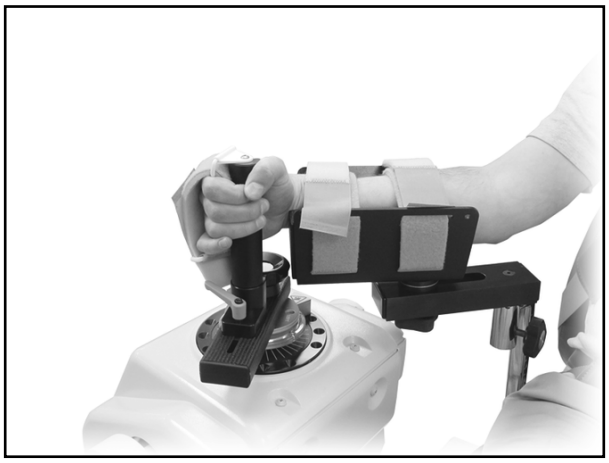
830-544





BIODEX
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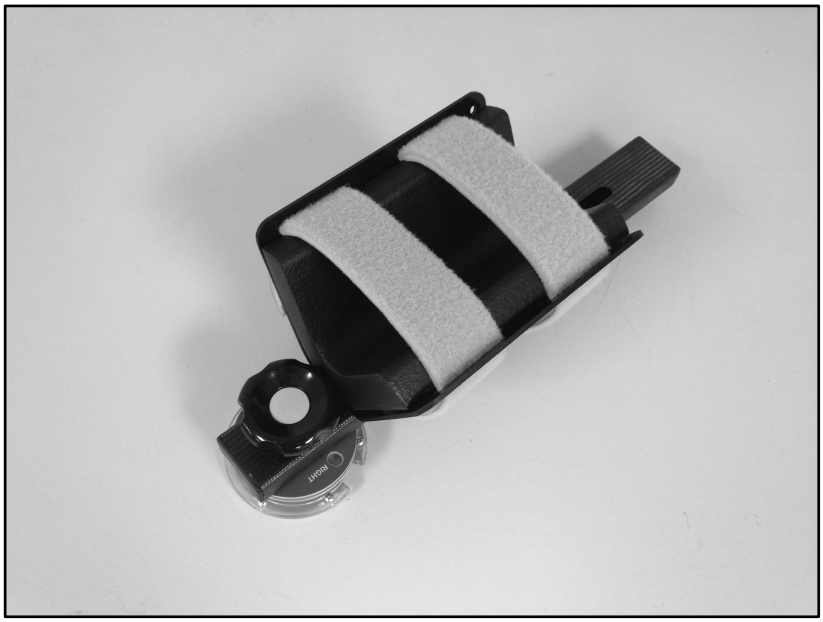
System 3 and 4 Upper Extremity Hemiparetic Attachment Set



This manual covers installation and operation procedures for the following products:

830-540 Upper Extremity Hemiparetic Attachment Set
830-541 Neuro Shoulder AB/AD Attachment
830 542 Neuro Wrist Ex/Flex Attachment
830-543 Neuro Elbow/Shoulder Attachment
830-544 Neuro Wrist Stabilizer Attachment

NOTE: *All or some of the following symbols, cautions, warnings and notes correspond to this operation manual:*

NOTE: *For clinical applications refer to your Biodex Multi-Joint System Pro, Quick-Set, or MVP Operations Manual.*

Symbol	*Meaning*
⚠	*Attention, consult accompanying documents.*
⚠	*Symbol signification: Attention, se référer à la notice.*
⚠	*Warning: Injuries to health may result from incorrect or excessive training.*
⚠	*Attention, Incorrect ou extrême entrainement peut aboutir des lesíons au santé.*
✋	*Caution: Placing your hands or fingers between the dynamometer input shaft (or attachment) and the mechanical ROM stops may result in serious injury.*

Table Of Contents

Before Proceeding

Before you get started with any of the setups described in this manual, there are a few preliminary points to consider which will help ensure safe and smooth operation of your Biodex Multi-Joint System while using the Upper Extremity Hemiparetic Attachments.

- The Biodex Multi-Joint System and attachments should be operated only by qualified personnel.
- Ensure that all system wiring and cables are routed away from any area where they might be stepped on or rolled over by wheeled equipment.
- For testing and exercise patterns in which the positioning chair will be used, we suggest the chair be set to its minimum height before allowing a subject to mount or dismount. It may also help to have a fixed location from which all subjects approach and leave the chair.
- Be aware that use of Biodex technology requires professional expertise for discerning appropriate treatment techniques. Each subject's unique situation should be taken into account before beginning any type of testing or rehabilitation program. Be sure you fully comprehend the operating instructions, as well as the considerations, both physical and clinical, discussed throughout the manual before attempting to set up a subject for testing or exercise. Practice setups and positioning with a healthy subject before attempting to set up an injured patient.
- Instructions for each of the patient setups provided later in this manual assume that the clinician is starting with the system in its neutral position, as illustrated in Figure 1.
- To assist our users and stimulate interest in developing protocols, this manual contains a "Clinical Applications" section where appropriate. These comments come from the clinical experience of our users as well as from published journals.
- The setups presented in this manual are intended to cover most patient protocols. However, because the Biodex Multi-Joint System is so versatile and adaptable, you may find additional setups possible. It is suggested that the clinician try the setups presented herein before attempting any setup improvisations (especially for testing applications). If you do use a pattern that deviates from the manual, be sure to fully document it in your "Patient File" notes.

CAUTION: *Placing your hands or fingers between the dynamometer input shaft (or attachment) and the mechanical ROM stops may result in serious injury.*

⚠ AVANT TOUTE APPLICATION

Avant de mettre en oeuvre les paramétrages décrits dans ce mode d'emploi, les quelques règles préliminaires suivantes vous permettront de veiller à l'utilisation sûre et au bon fonctionnement de votre système multi-articulaire Biodex.

· Ce système doit être exclusivement utilisé par du personnel qualifié.

· Vérifiez que le trajet de tous les fils électriques et câbles du système évite les zones de passage du personnel ou de circulation des équipements à roulettes.

· Lors des tests et exercices faisant appel au fauteuil de traitement, réglez ce dernier en position la plus basse avant de faire monter ou descendre le patient. Dans certains cas, il peut être utile de prévoir une zone fixe pour l'accès au fauteuil.

· L'utilisation de la technologie Biodex doit s'appuyer sur une expertise professionnelle garantissant la sélection judicieuse des techniques de traitement. Il convient d'évaluer la situation de chaque patient avant d'entreprendre tout type de test ou de programme de rééducation. Veillez à bien comprendre les consignes d'utilisation ainsi que les instructions à respecter sur le plan physique et clinique qui figurent dans ce mode d'emploi, avant de préparer un patient en vue d'un test ou d'un exercice. Entraînez-vous à effectuer les gestes de positionnement et les paramétrages avec une personne en bonne santé avant de prendre en charge un patient.

· Les instructions de préparation du patient fournies ultérieurement dans ce mode d'emploi partent du principe que le système se trouve en position neutre, comme l'illustre la figure 1.

· Pour aider les utilisateurs et favoriser la mise au point de protocoles, ce mode d'emploi propose dans certains cas une section « Applications cliniques ». Ces observations reposent sur l'expérience clinique de nos clients et sur diverses publications.

· Les paramétrages présentés dans ce mode d'emploi couvrent la plupart des protocoles. Toutefois, le système multi-articulaire Biodex offre de nombreuses autres possibilités et s'adapte à vos besoins. Il est recommandé d'essayer les paramétrages illustrés avant de réaliser toute improvisation (surtout lorsqu'il s'agit d'applications de test). Si vous utilisez un paramétrage différent, veillez à consigner tous les détails dans votre dossier patient.

MISE EN GARDE: ne placez pas vos mains ou vos doigts entre les accessoires de l'arbre d'entrée du dynamomètre et les butées de l'ADM au risque d'être victime de graves blessures.

Figure 1. *The Biodex Multi-Joint System positioning—Pro configuration.*

1. Introduction

The Biodex Upper Extremity (UE) Hemiparetic Attachments are designed to be on the cutting edge of new technology and methodology for treating subjects with upper extremity hemiparesis. Featuring lightweight, carbon fiber construction, they work together with the Biodex Multi-Joint Isokinetic Pro, Quick-Set, and MVP systems to provide additional rehabilitation options in the pursuit of more positive patient outcomes.

Upper extremity hemiparesis is a persistent physical disability and significant barrier to independence. It is a well-recognized problem, but there is little evidence demonstrating the most effective rehabilitation plan to restore functional motor recovery. Prominent manifestations of compromised motor control include impaired inter-segmental coordination, hyper-reflexia, spasticity and weakness.

An individual impaired by weakness may, for example, be unable to reach and grasp a soda can. Completion of the task, then, necessarily involves compensation with other body segments or use of other movement strategies not typically involved in the movement. Current practice uses a traditional repetitive task approach which reinforces these abnormal movements and the acquired motor skill is not one that is desired.

The need for strength has typically been overlooked in treatment of upper extremity hemiparesis. However, current research by Carolynn Patten, PhD, PT, and others (see Bibliography) is showing that a therapeutic intervention that directly addresses weakness can effectively restore UE hemiparetic motor control. With these new specialized attachments clinicians can build on this research and initiate power training on the Biodex Multi-Joint systems even with patients demonstrating impaired grasp due to hemiparesis.

2. Upper Extremity Hemiparetic Attachments

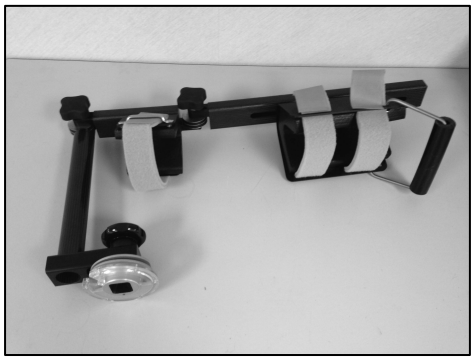


Figure 2. *Neuro Shoulder Attachment*

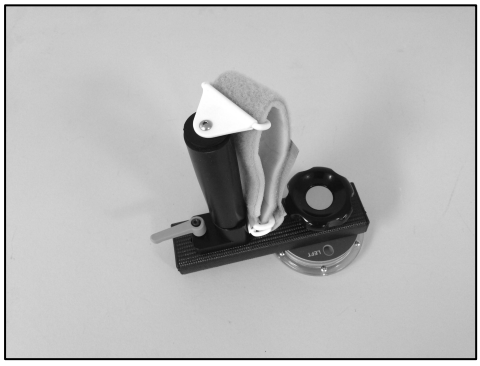


Figure 3. *Neuro Wrist Ex/Flex Attachment*

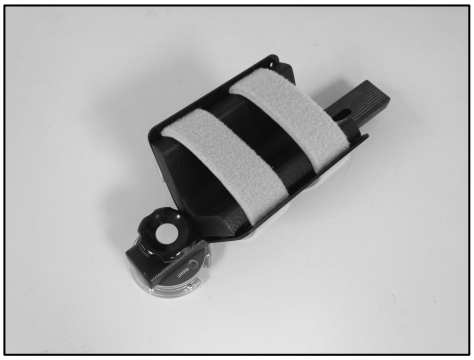


Figure 4. *Neuro Elbow/Shoulder Attachment*

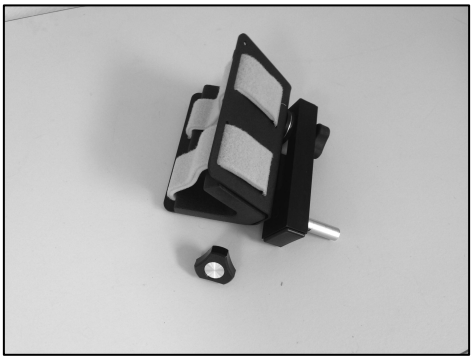


Figure 5. *Neuro Wrist Stabilizer with replacement knob for Limb Support attachment*

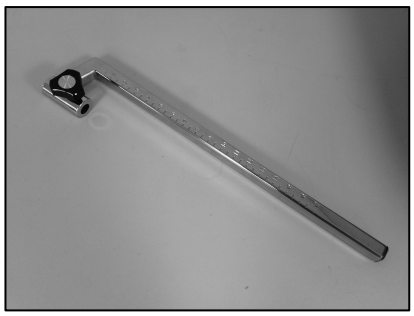


Figure 6. *Limb Support attachment (included with standard S3/S4 attachments package)*

3. Setup and Positioning

The following section details the Biodex Multi-Joint System setup and positioning for each of the exercise patterns used with the Upper Extremity Hemiparetic Attachments. Included is information on both mechanical and anatomical aspects.

NOTE: *For operation of the Biodex Multi-Joint System, including clinical considerations for similar patterns, refer to the Multi-Joint System Operations manual.*

While the following setups are standard, it should be noted that other positioning setups are possible. The Biodex Multi-Joint System is extremely versatile and can accommodate many test and rehabilitation needs. If you find a new setup to be especially useful in your practice, be sure to document it and pass the information along so it can be included in our database.

NOTE: *All attachments have "R" (right) and "L" (left) designations. Proper range of motion is ensured by aligning the dynamometer shaft red dot with the appropriate designation for the side to be tested or exercised.*

NOTE: *Check the dynamometer, gimbal and seat for proper positioning before each exercise, biofeedback or test session.*

CAUTION: Placing your hands or fingers between the dynamometer input shaft (or attachment) and the mechanical ROM stops may result in serious injury.

MISE EN GARDE: ne placez pas vos mains ou vos doigts entre les accessoires de l'arbre d'entrée du dynamomètre et les butées de l'ADM au risque d'être victime de graves blessures.

Shoulder: Flexion/Extension

Figure 7.

Figure 8.

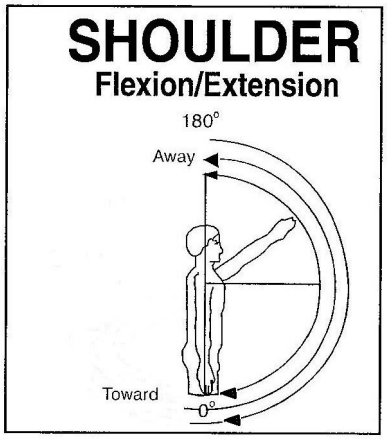


Figure 9.

Quick Reference

Dynamometer Orientation:	0 - 15 ˚
Dynamometer Tilt:	0 - 10 ˚
Seat Orientation:	0 - 30 ˚
Seatback Tilt:	70 - 85 ˚
Axis of Rotation:	Compromise axis is acromial process in the sagittal plane.
Ready Position:	Full Extension

Parts Needed

Dynamometer:	Neuro Shoulder Attachment
Positioning Chair:	Footrest (optional)

Shoulder: Extension/Flexion

Shoulder extension/flexion is a motion that is usually initiated early in the rehabilitation process. However, clinicians must be careful not to cause impingement. An impingement sign is produced when the shoulder is fully flexed and there is jamming of the greater tuberosity against the antero inferior surface of the acromion. For this reason, the clinician may want to limit flexion range of motion in the early stages of the rehabilitation process.

Setup and Positioning
(Starting Movement: Away/Extension)

NOTE: This pattern may be accomplished with the positioning chair seatback reclined to any position which provides for both subject comfort and proper alignment of the anatomical axis.

1. Seat patient on chair.
2. Align dynamometer shaft red dot with red dot on attachment, and then place the attachment on the shaft.
3. Select left or right positioning for the attachment by rotating the Range Of Motion (ROM) stop until the pin is aligned with the correct slot (either Right or Left). Then turn the knob until the attachment is firmly affixed onto the dynamometer.
4. Move attachment to almost full extension. Press Hold.
5. Slide dynamometer along travel to position outside of shoulder to be tested.
6. Rotate dynamometer to 0 – 15 degrees.
7. Tilt dynamometer to 0 – 10 degrees.
8. Rotate chair to 0 – 30 degrees.
9. Move patient into position.
10. Align (approximately) patient axis of rotation. Raising dynamometer or tilting seat-back can accommodate various size patients.
11. Position patient's elbow at the elbow joint of the attachment. If you are going to ask the patient to use the handgrip, have them grasp it. (Or if the patient is not going to use the handgrip, push it back out of the way.) Then strap the patient's upper arm in the upper arm cuff—the tricep muscle will rest on the pad and the strap will go over the bicep. Then strap in the lower arm cuff.
12. Check for proper ROM and alignment.
13. Stabilize patient with shoulder, waist and thigh straps. Tighten forearm and upper arm cuffs.
12. Proceed with biofeedback mode in system software.

Shoulder: Abduction/Adduction

Figure 10.

Figure 11.

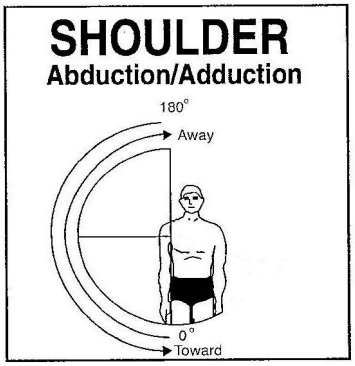


Figure 12.

Quick Reference

Dynamometer Orientation:	35˚
Dynamometer Tilt:	0 - 10˚
Seat Orientation:	60˚
Seatback Tilt:	70 - 85˚
Axis of Rotation:	Axis of rotation for this pattern approximates the axis of the acromio clavicular joint, which connects the distal end of the clavicle to the anterior medial portion of the acromial process.
Ready Position:	Full adduction

Parts Needed

Dynamometer:	Neuro Shoulder Attachment
Positioning Chair:	Footrest (optional)

Shoulder: Abduction/Adduction

The shoulder complex is made up of multiple linkages. These include the glenohumeral joint, acromioclavicular joint, sternoclavicular joint, and scapulothoracic articulation. The glenohumeral joint is the most mobile joint in the body with global freedom. Because of this, stability is sacrificed. Only a little more than 1/3 of the head of the humerus makes contact with the glenoidfosa at any one time.

Abduction/adduction is usually one of the last motions exercised in rehabilitation of the shoulder. The clinician must exercise great care in order to avoid impingement.

Setup and Positioning
(Starting Movement: Away/Abduction)

NOTE: *This pattern may be accomplished with the seatback reclined to any position which provides for both patient comfort and proper alignment of the anatomical axis. The seatback and dynamometer tilt must, however, be set to the same angle.*

1. Seat patient on chair.
2. Align dynamometer shaft red dot with red dot on attachment, and then place the attachment on the shaft.
3. Select left or right positioning for the attachment by rotating the Range Of Motion (ROM) stop until the pin is aligned with the correct slot (either Right or Left). Then turn the knob until the attachment is firmly affixed onto the dynamometer.
4. Move attachment to almost full abduction. Press Hold.
5. Slide dynamometer along travel to position outside of shoulder to be tested.
4. Rotate chair to 60 degrees.
5. Rotate dynamometer to 0 degrees.
6. Raise dynamometer.
7. Tilt dynamometer to 0 - 10 degrees.
8. Move patient into position (patient is facing away from dynamometer). Slide dynamometer along travel to align axis of rotation.
10. Align (approximately) patient axis of rotation. Raising dynamometer or tilting seat-back can accommodate various size patients.
11. Position patient's elbow at the elbow joint of the attachment. If you are going to ask the patient to use the handgrip, have them grasp it. (Or if the patient is not going to use the handgrip, push it back out of the way.) Then strap the patient's upper arm in the upper arm cuff—the tricep muscle will rest on the pad and the strap will go over the bicep. Then strap in the lower arm cuff.
9. Check for proper ROM and alignment.
10. Stabilize patient with shoulder and waist straps. Tighten forearm and upper arm cuffs if needed.
11. Proceed with biofeedback mode in system software.

Shoulder: External/Internal Rotation In The Modified Neutral Position

Figure 13.

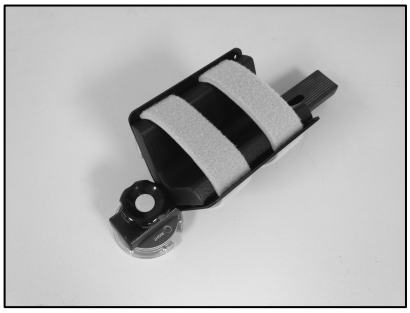


Figure 14.

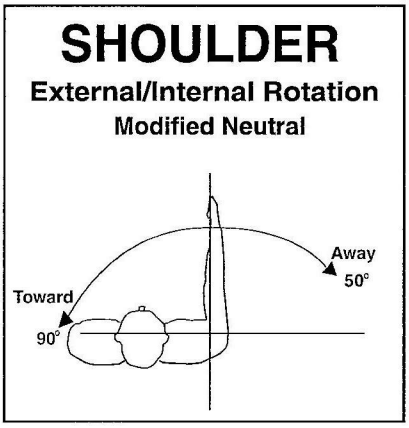


Figure 15.

Quick Reference

Dynamometer Orientation:	0˚
Dynamometer Tilt:	50˚
Seat Orientation:	0˚
Seatback Tilt:	55 - 85˚
Axis of Rotation:	Axis alignment is longitudinal through the head of the shaft of the humerus in a horizontal plane.
Ready Position:	Full Internal Rotation

Parts Needed

Dynamometer:	Neuro Elbow/Shoulder Attachment
Positioning Chair:	Footrest (optional)

Shoulder: External/Internal Rotation In The Modified Neutral Position

The rotator cuff is one of the most important structures in maintaining the integrity of the shoulder complex. The stability of the glenohumeral joint depends largely on an intact and functioning rotator cuff. A strong rotator cuff is especially important for a balanced and smooth movement of the upper extremity.

Setup and Positioning
(Starting Movement: Away/External Rotation)

NOTE: *Consider placing a pillow on the patient's lap so that when you hit clear limits during software setup the attachment will not fall against the patient's leg.*

1. Seat patient on chair.
2. Rotate chair to 0 degrees.
3. Rotate dynamometer to 0 degrees.
4. Tilt dynamometer to 50 degrees.
5. Align dynamometer shaft red dot with red dot on attachment, and then place the attachment on the shaft.
6 . Select left or right positioning for the attachment by rotating the Range Of Motion (ROM) stop until the pin is aligned with the correct slot (either Right or Left). Then turn the knob until the attachment is firmly affixed onto the dynamometer.
7. Move patient into position—the patient's elbow should be directly over the knob. Strap in the patient's forearm. Loosen the small knob / thumbwheel on the underside of the attachment. Adjust the positioning of the forearm, and then re-tighten the thumbwheel.
8. Raise dynamometer to align patient axis of rotation. If needed, raise chair or adjust seat back tilt to accommodate various patient sizes.
9. Stabilize patient with shoulder, waist and thigh straps. Tighten cuff.
10. Proceed with biofeedback mode in system software.

Elbow: Extension/Flexion (Seated, Gravity Neutral)

Figure 17.

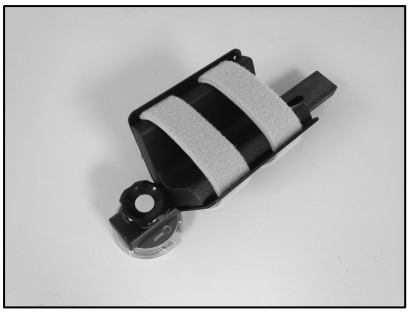


Figure 16.

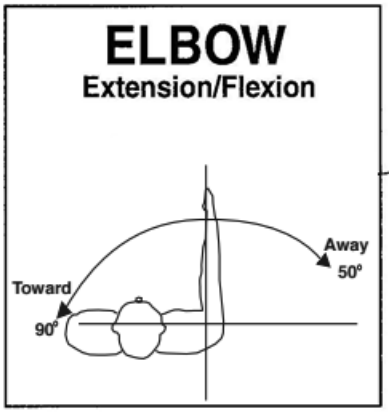


Figure 18.

Quick Reference

Dynamometer Orientation:	20 - 30˚
Dynamometer Tilt:	80 - 90˚
Positioning Chair Orientation:	20 30˚
Seatback Tilt:	85˚
Axis of Rotation:	Passes through the center of the trochlea and the capitulum,bisecting the longitudinal axis of the shaft of the humerus.
Ready Position:	Full Flexion

Parts Needed

Dynamometer:	Neuro Elbow/Shoulder Attachment
Positioning Chair:	Footrest (optional)

Elbow: Extension/Flexion (Seated, Gravity Neutral)

The elbow joint consists of the articulation between the trochlea of the humerus and the trochlear notch of the ulna, the capitulum of the humerus and the facet on the head of the radius and the circumference of the head of the radius and the radial notch of the ulna. Any bony malalignment (such as a fracture) interferes with the critical angles of these articulations making normal move-ment impossible.

Of special note at the elbow are the tendinous origins of the wrist musculature. The flexor/pronator muscles of the wrist originate at the medial epicondyle of the humerus and wrist extensor group at the lateral epicondyle. These are areas that frequently become inflamed with overuse.

Setup and Positioning
(Starting Movement: Away/Extension)

***NOTE:** Away and Toward reversal message will appear in the system software setup. Select <OK> to continue. (See Figure 19.)*

1. Seat patient on chair
2. Align dynamometer shaft red dot with red dot on attachment, and then place the attachment on the shaft.
3. Select left or right positioning for the attachment by rotating the Range Of Motion (ROM) stop until the pin is aligned with the correct slot (either Right or Left). Then turn the knob until the attachment is firmly affixed onto the dynamometer.
6. Rotate chair to 20 - 30 degrees.
7. Rotate dynamometer to 20 - 30 degrees.
8. Tilt dynamometer to 80 - 90 degrees.
9. Move patient into position. Slide dynamometer along travel and raise to align axis of rotation.
10. Stabilize patient with shoulder, waist and thigh straps. Attach optional handgrip, if desired.
12. Proceed with biofeedback mode in system software.

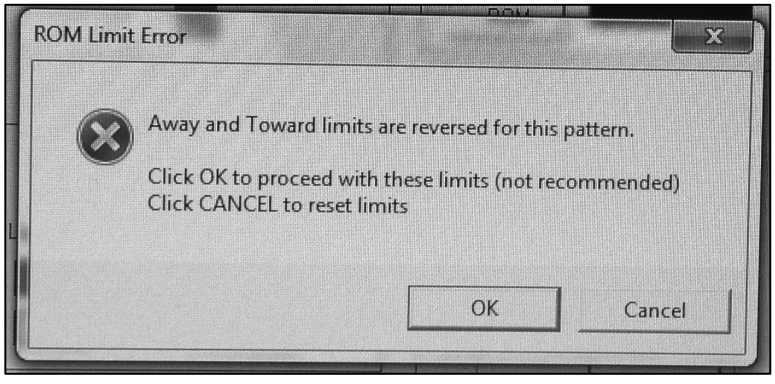
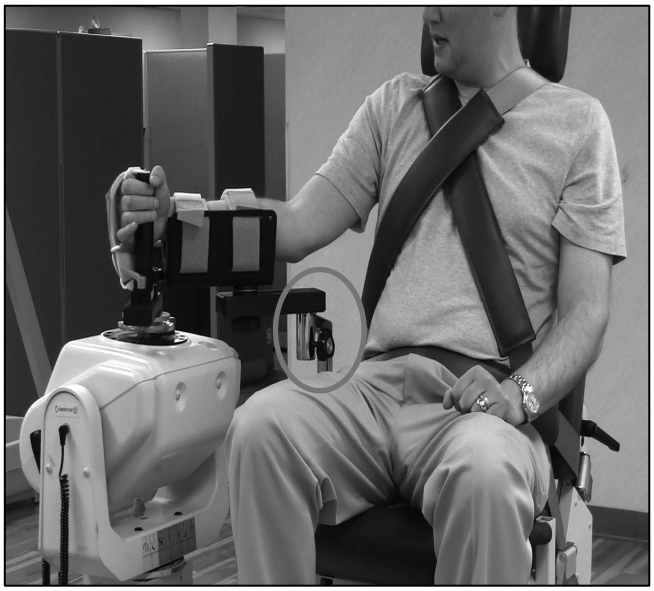


***Figure 19.** ROM Limit Error message. Click OK to continue session.*

Wrist: Extension/Flexion (Seated, Gravity Neutral)



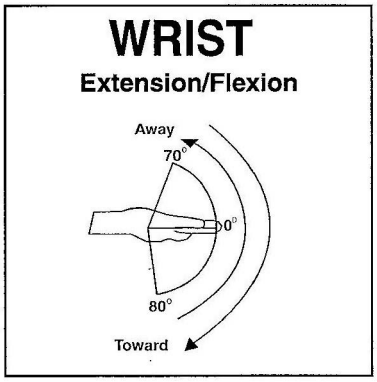


Figure 21.

Figure 20. *Be sure to use replacement knob that comes with the Wrist Stabilizer*

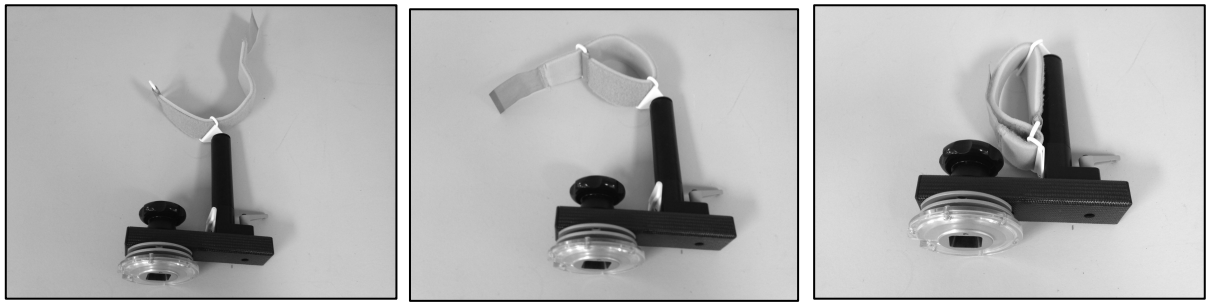


Figure 22. *Sequence for threading strap fabric through loop holes*

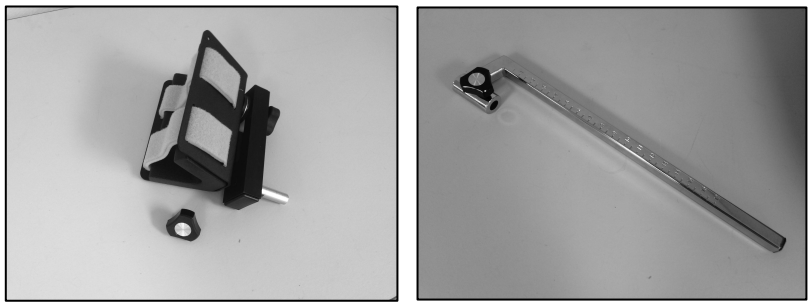


Figure 23. *Wrist stabilizer and limb support attachment with replacement knob*

Wrist: Extension/Flexion (Seated, Gravity Neutral)

Quick Reference

Dynamometer Orientation:	0˚
Dynamometer Tilt:	90˚
Seat Orientation:	15˚
Seatback Tilt:	85˚
Elbow Flexion:	70 - 90˚
Axis of Rotation:	Axis of rotation for this pattern lies between the proximal row of the carpals, at the capitate bone, and the radius at the radiocarpal joint.
Ready Position:	Full Flexion

Parts Needed

Dynamometer:	Neuro Wrist Attachment, Wrist Stabilizer
Positioning Chair:	Limb-Support attachment, Footrest (optional)

Wrist: Extension/Flexion (Seated, Gravity Neutral)

The wrist joint consists of the distal end of the radius and the articular disc of the distal radioulnar joint articulate with the proximal row of carpal bones (scaphoid, lunate, and triquetrum.) The carpal bones form a much larger surface than do the radius and the articular cartilage. This allows for adduction/abduction, flexion/extension and circumduction to occur. Movement also occurs between the proximal and distal row of carpal bones. The midcarpal joint adds considerably to flexion and extension of the wrist.

Setup and Positioning
(Starting Movement: Away/Extension)

***NOTE:** Right and left side use same red dot orientation for this pattern.*

1. Seat patient on chair.
2. Install limb support in the receiving tube on the side of the chair.
2. Align dynamometer shaft red dot with red dot on attachment, and then place the Neuro Wrist Attachment on the shaft.
3. Select left or right positioning for the Neuro Wrist Attachment by rotating the Range Of Motion (ROM) stop until the pin is aligned with the correct slot (either Right or Left). Then turn the knob until the attachment is firmly affixed onto the dynamometer.
5. Install the Wrist Stabilizer onto the Limb Support attachment. **Be sure to use replacement knob that comes with the Wrist Stabilizer Pad.** (See Figure 20.)
5. Rest patient's forearm on the Wrist Stabilizer pad. The Wrist Stabilizer should be angled slightly to allow full extension. Strap patient's forearm into the Wrist Stabilizer cuff.
6. Rotate dynamometer to 0 degrees.
5. Rotate chair to 0 degrees.
7. Set dynamometer tilt to 90 degrees.
8. Move patient into position. Slide dynamometer in front of patient's wrist to be exercised or tested.
9. Align patient's axis of rotation by positioning the wrist over the knob. Use the orange tightener to move the grip directly into the patient's palm.
10. Stabilize patient with shoulder, waist and forearm/wrist straps.
11. Proceed with biofeedback mode in system software.

4. Maintenance

Attachment Inspection
As needed, inspect all locking and adjustment mechanisms for signs of wear or damage.

Cleaning Instructions
Remove attachment from the Multi-Joint System before cleaning. Wipe down all attachment surfaces with a damp cloth. Mild soap and water can be used to remove stains and scuff marks. Pay particular attention to the straps, which can be damaged by exposure to perspiration and other body fluids.

NOTE: *DO NOT use cleaning solutions containing ammonia or alcohol to clean upholstery or straps. Mild soap and water should be sufficient. Allow attachments to dry thoroughly before resuming testing, rehab or exercise sessions.*

If you have any questions or need further assistance, contact the Biodex Customer Service Department.

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