These are only guidelines and in most cases these landmarks will work without any problems. However, there are clients who do have anomalies from birth or from injury that may make landmarking in this way difficult. In these cases, document any known anomaly discovered in the process of landmarking so that it may be duplicated for accurate comparison.

Cervical Range of Motion

Flexion

With the client in a seated position, manually landmark the T1 spinous process using a washable marker. Align the sensors in the sagittal plane and place one of the Inclinometers on the T1 spinous process. Place the other over the calvarium. Take the initial reading. Have the client maximally flex the head. Take the final reading.Return the client to a neutral position and repeat these steps two more times.

Alternatively, the evaluator may place the Inclinometer on top of the head.

Extension

With the client in a seated position, manually landmark the T1 spinous process using a washable marker. Align the sensors in the sagittal plane and place one of the Inclinometers laterally on the T1 spinous process. Place the other over the calvarium. Take the initial reading. Have the client maximally extend the head. Take the final reading. Return the client to a neutral position and repeat these steps two more times.

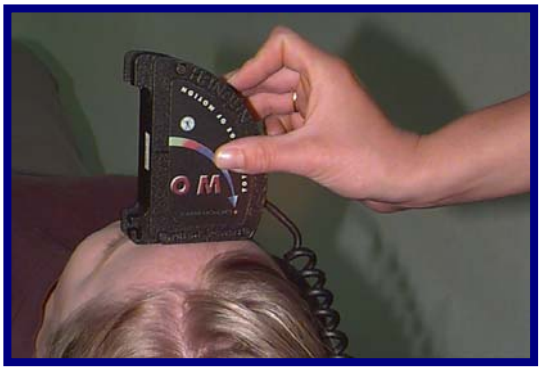
Lateral Flexion

With the client in a seated position, manually landmark the T1 spinous process using a washable marker. Align the sensors in the coronal plane and place one of the Inclinometers laterally on the T1 spinous process. Place the other over the calvarium. Take the initial reading. Have the client maximally laterally flex the head to one side. Take the final reading. Return the client to a neutral position. Repeat these steps two more times to the same side and then repeat 3 times to the opposite side.

Alternatively the superior, or upper-most Inclinometer may be placed on the top of the head.

Rotation

Only with cervical rotation do you use a single Inclinometer. Have the client lie in a supine position (this will stabilize the client's shoulders). The shoulders should be exposed, to allow the evaluator to note excessive shoulder rotation. Align the sensor in the transverse plane and place the Inclinometer at the superior portion of the head. Take the initial reading. Have the client maximally rotate their head to one side. Take the final reading. Return the client to a neutral position. Repeat these steps two more times to the same side and then repeat 3 times to the opposite side.



Thoracic Range of Motion

Since thoracic is quite dependent on the individual's posture, it is best to have the client use a military type stance. This will minimize the client's kyphosis.

Flexion

With the client in a seated or standing position, manually landmark the T1 and T12 spinous processes using a washable marker. Align the sensors in the sagittal plane and place one of the Inclinometers on the T1 spinous process. Place the other at the T12 Spinous Process. Take the initial reading. Have the client maximally flex the thoracic spine. Take the final reading. Return the client to a neutral position and repeat these steps two more times.

Minimal Kyphosis

With the client in a seated or standing position, manually landmark the T1 and T12 spinous processes using a washable marker. Align the sensors in the sagittal plane. Take the initial reading by zeroing the Inclinometers against a true vertical surface such as a wall, then place one of the Inclinometers on the T1 spinous process. Place the other on the T12 Spinous Process. Take the final reading. Return the client to a neutral position and repeat these steps two more times.

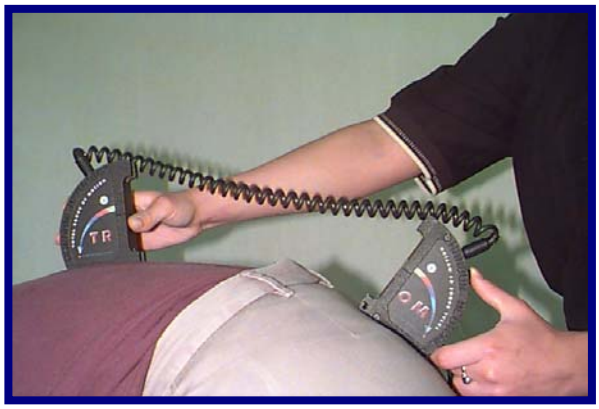
Rotation

With the client in a standing position, instruct them to forward flex until the thoracic spine is in as horizontal a position as possible. Manually landmark the T1 and T12 spinous processes using a washable marker. Aligning the sensors in the axial and vertical planes, place one of the Inclinometers on the T1 spinous process and place the other at the T12 Spinous Process. Take the initial reading. Have the client maximally rotate the thoracic spine to one side. Take the final reading. Return the client to a neutral position. Repeat these steps two more times to the same side and then repeat 3 times to the opposite side.

Lumbosacral Range of Motion

Flexion

With the client in a standing position, manually landmark the T12 spinous process using a washable marker. Align the sensors in the sagittal plane and place one of the Inclinometers on the T12 spinous process. Place the other at S1 spinous process. Take the initial reading. Have the client maximally flex the lumbar spine. Take the final reading. Return the client to a neutral position and repeat these steps two more times.



Extension

With the client in a standing position, manually landmark the T12 spinous process using a washable marker. Align the sensors in the sagittal plane and place one of the Inclinometers on the T12 spinous process. Place the other at S1 spinous process. Take the initial reading. Have the client maximally

extend the lumbar spine. Take the final reading. Return the client to a neutral position and repeat these steps two more times.

Lateral Flexion

With the client in a standing position, manually landmark the T12 spinous process using a washable marker. Aligning the sensors in the coronal plane, place one of the Inclinometers on the T12 spinous process and place the other at the sacral midpoint. Take the initial reading. Have the client maximally laterally flex the lumbar spine to one side. Take the final reading. Return the client to a neutral position. Repeat these steps two more times to the same side and then repeat 3 times to the opposite side.

Straight Leg Raise

Have the client lie in a supine position. Aligning the Master sensor in the sagittal plane, place it along the anterior lower third of the tibia. Take the initial reading. Perform a straight leg raise. Take the final reading at the end range. Return the client's leg to the resting position and repeat these steps two more times.

The straight leg raise on the tightest side should be within 10 degrees of the total hip motion (i.e. hip flexion + hip extension).

Determining the Degree of Ankylosis

When the degree of ankylosis needs to be documented, the steps listed above must be slightly adjusted.

The first reading should be taken against a wall or on a tabletop.

Next, place the client in as close to a neutral position as possible.

Place the two Inclinometers at the appropriate landmarks.

Then take the second reading. This is the degree of ankylosis.

Performing Extremity Range of Motion Evaluations

While ideally the integrated goniometer would be used for the larger extremity joints, the dual or single Inclinometer method may also be used to assess them.

Below are some examples that may be applied to any of the larger extremity joints.

Shoulder Flexion

With the client in a standing position, manually landmark the lateral upper arm. Using only the Master sensor, align it in the sagittal plane. Click the button on the Master sensor to take the initial reading. Have the client maximally flex the shoulder. Click the button on the Master sensor a second time to take the final reading. ODES will automatically document the final true range. Return the client's shoulder to the neutral position. Repeat these steps two more times on the same side and then repeat 3 times for the other side.

Elbow Flexion

With the client in a standing position, manually landmark the lateral forearm with the hand in a supinated position. Using only the Master sensor, align it in the sagittal plane. Click the button on the Master sensor to take the initial reading. Have the client maximally flex the elbow. Click the button on the Master sensor a second time to take the final reading. ODES will automatically document the final true range. Return the client's elbow to the neutral position. Repeat these steps two more times on the same side and then repeat 3 times for the other side.

Wrist Pronation

With the client in a standing position, manually landmark the distal radial head with the wrist in a neutral position. Using only the Master sensor, align it in the coronal plane. Click the button on the Master sensor to take the initial reading. Have the client maximally pronate the wrist. Click the button on the Master sensor a second time to take the final reading. ODES will automatically document the final true range. Return the client's wrist to the neutral position. Repeat these steps two more times on the same side and then repeat 3 times for the other side.

Using the Small Goniometer Feature

When assessing motion in the smaller joints of the digits in the hand or foot, the Dual Inclinometers may be interlocked to form a small goniometer.

Once interlocked tight together they form a perfectly level and zeroed surface. As with the landmarking instructions above, place the goniometer so that one Inclinometer is on the proximal side and the other on the distal side of the joint being assessed.

Digit Ankylosis

If there is joint ankylosis that is to be documented, the following steps are required to obtain the measurement.

The first reading should be taken with the goniometer interlocked and placed against a wall or on a tabletop. Next place the client's joint in as close to a neutral position as possible. Place the inclinometer appropriately, then take the second reading. This is the degree of ankylosis.

Digit Range of Motion Evaluation

To document small digit range of motion, manually landmark the joint being assessed proximally and distally while in a neutral position, with the client in a seated or lying position. Align the sensors in the plane of movement (generally sagittal) and position the Inclinometers. Click the button on the master sensor to take the initial reading. Have the client maximally flex (or extend / abduct / adduct / etc. as the case requires) the digit. Click the button on the Master sensor a second time to take the final reading. ODES will automatically document the final true range. Return the client's digit to the neutral position. Repeat these steps two more times on the same side and then repeat 3 times for the other side.

The BTE Goniometer

The goniometer calculates the amount of displacement in degrees to arrive at a true range of motion value. The goniometer is used to evaluate extremity range of motion. The large goniometer setup may also be used to evaluate range of motion of the large joints, such as the knee, hip and shoulder. The small goniometer setup can be used to evaluate the range of motion of the smaller joints in the hand and foot.

When performing impairment evaluations, the American Medical Association states that the goniometer is necessary for evaluating the extremities.

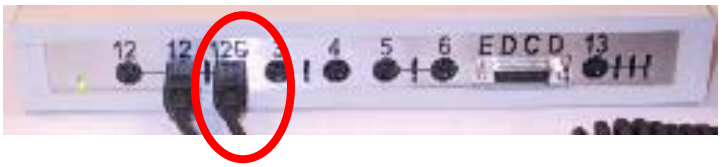
Components of the Goniometer

The goniometer includes the long and short arms as well as a foot pedal.

The BTE Goniometer is self-calibrating and never needs to be manually calibrated.

Connecting the Goniometer

The goniometer is connected to the Data Acquisition Device via PORT 12G.



Once the goniometer is connected properly, the red light on the base of the device will light up. See below.

To connect the Foot Pedal, locate the FP port on the back of your Data Acquisition Device. To utilize the Foot Pedal, attach its cord to the FP port.

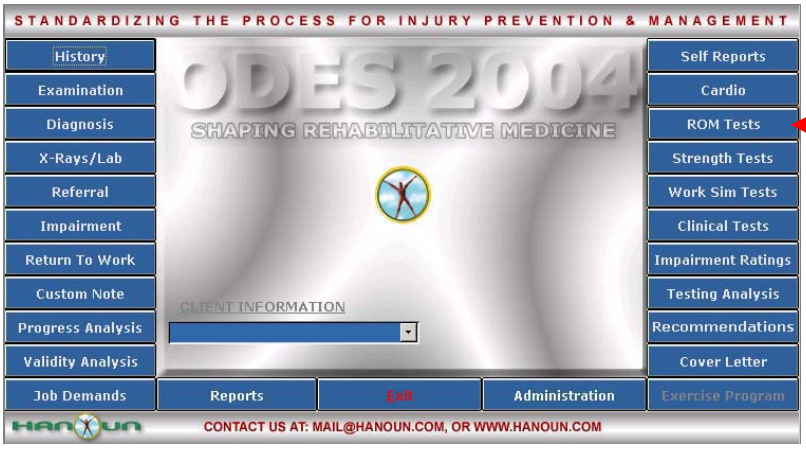
Connecting and Disconnecting the Goniometer Arms:

The small and large goniometer arms can be easily removed from the device. Simply hold the goniometer in one hand and gently twist the arm off of the device.

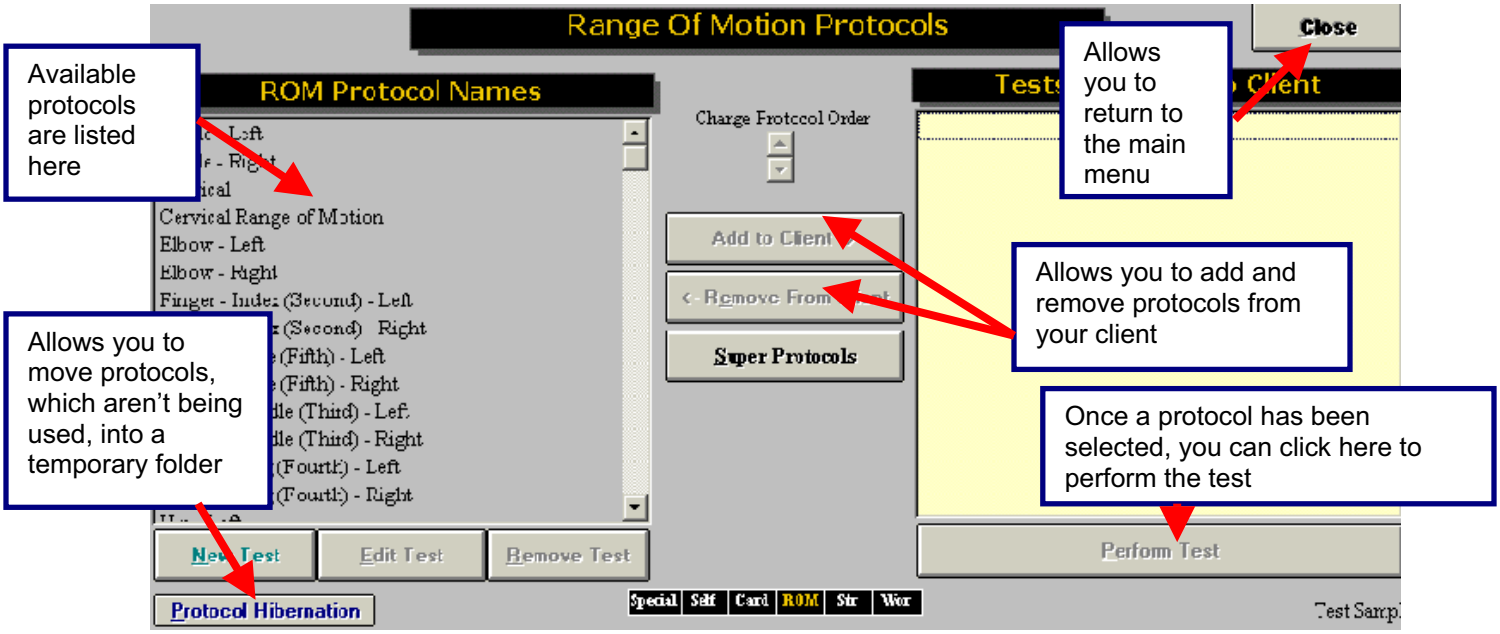
Once removed, the goniometer will appear as follows:

Performing Range of Motion Tests

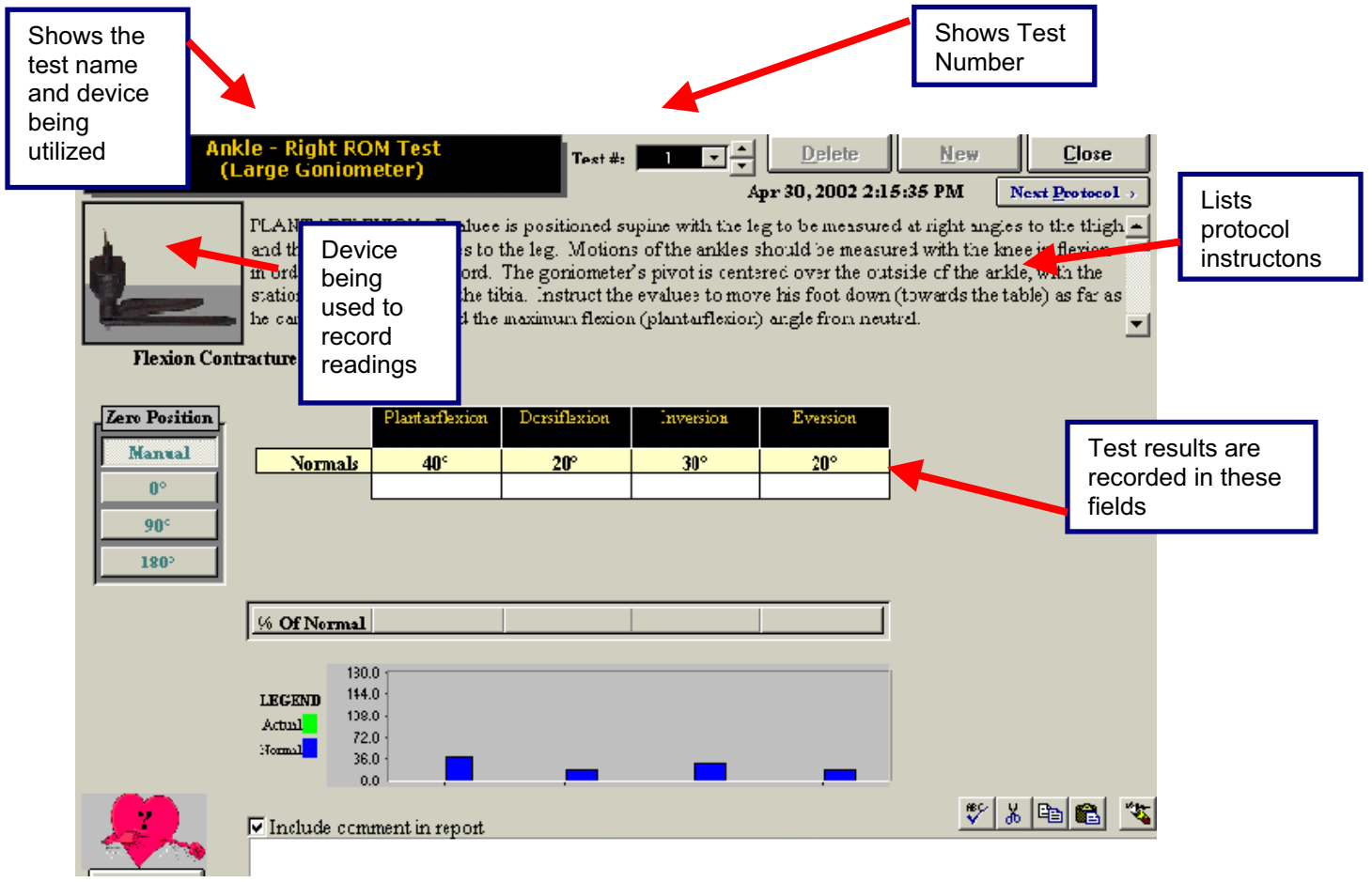
The following is an example of how to perform a Pre-Programmed Range of Motion Protocol



From the ODES home page, click on ROM Test. This will bring you to the Range of Motion Test page. From here, you have access to all of the pre-programmed tests. You can add tests to clients, create new custom range of motion tests, edit tests and delete tests.

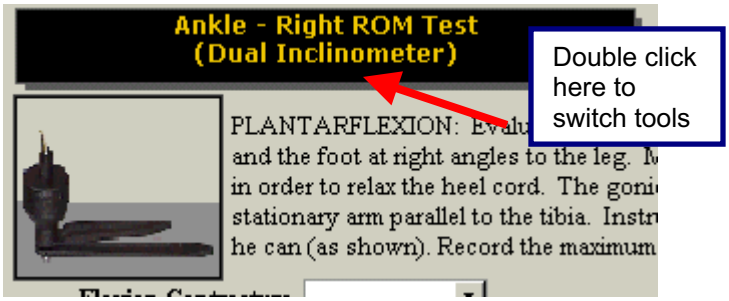


Once you have chosen a test, the following testing page appears:



If the device that you wish to use is not connected properly, or if the DAC box is not communicating with your computer, you will not be able to perform the test. If this is the case, a red 'X' will appear beside the name of the tool you wish to utilize and the picture of the tool will appear as a keyboard. If this happens, please see the trouble shooting section of this manual.

If the wrong tool appears in the upper left-hand corner of the screen (for example, the dual inclinometers instead of the goniometer), double click on the name of the tool. This allows you to alternate between the two range of motion tools.

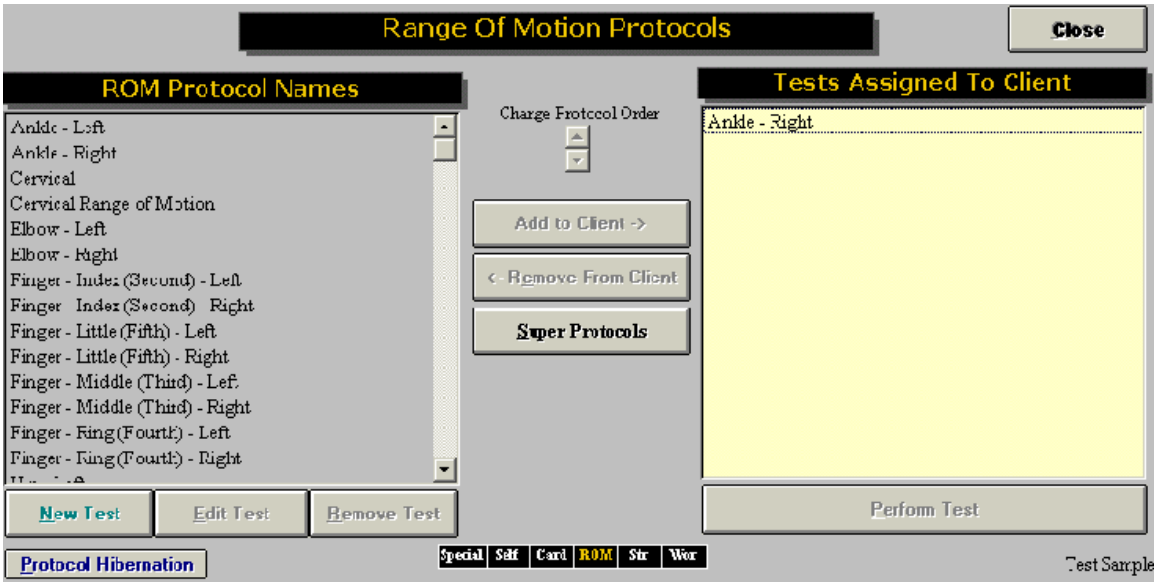


Customizing the Goniometer Tests

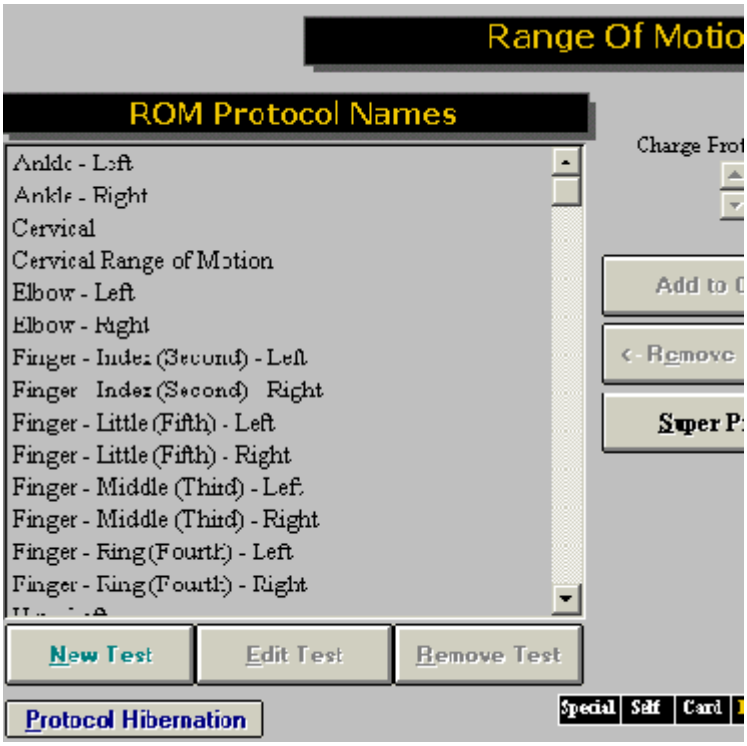
In addition to alternating between testing tools, the range of motion testing screen allows you to test in an AMA or COV format, utilize 1 or 3 trials for each movement, and it allows you to include additional initial settings that you may wish to note.

Changing From AMA to COV Format

In order to change from AMA to COV format, you must first go into the Range of Motion Protocols page. Click ROM Test from the ODES main menu.

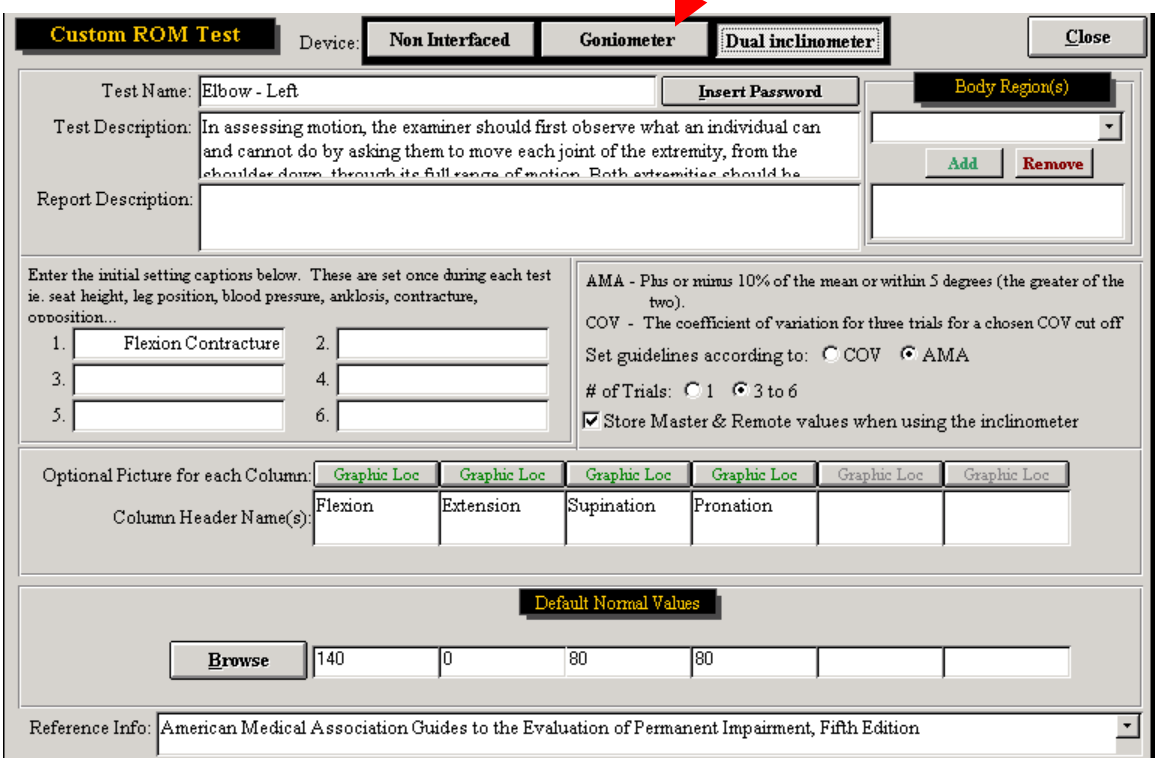


Highlight the test you wish to modify and then click Edit.



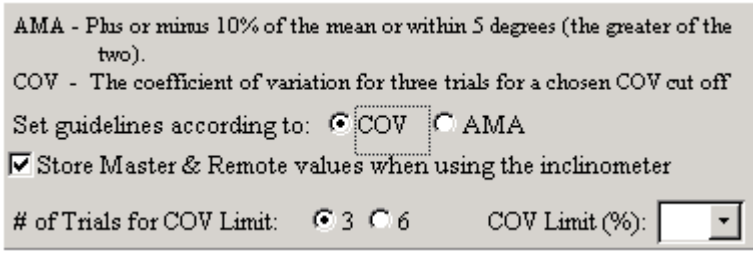
The following page will appear:

Shows which tool is set as the default



To switch between COV and AMA, use the ‘Set guidelines’ radio buttons. The American Medical Association (AMA) guidelines indicate a range of motion test is valid if the measurement is within 5

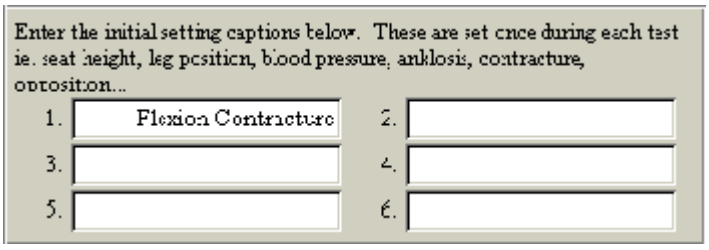
degrees or within 10% of each other. Coefficient of Variance (COV) is a statistical measurement. The current research indicates that a COV 15% or greater is an indication of invalid effort.



You can also modify the number of trials from this page. Just select how many trials you wish to have (1 or 3-6).

Entering In Additional Settings:

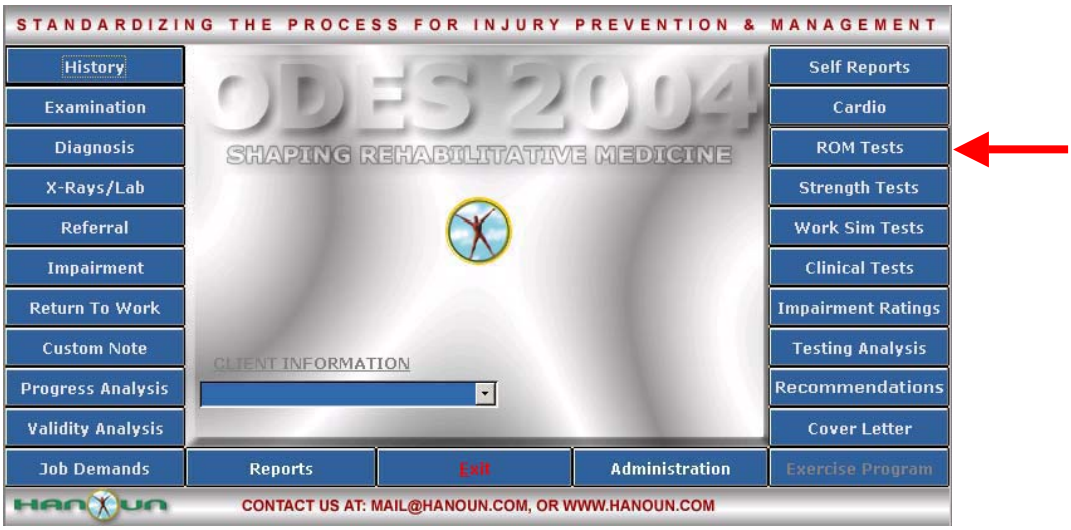
In order to modify the initial settings, open the Edit Test page for the test that you wish to modify. This can be done by going to ROM Test | Edit Test from the ODES main menu. Enter the name of the setting in one of the white fields (as shown below) and the setting will now appear on your testing page for that test.

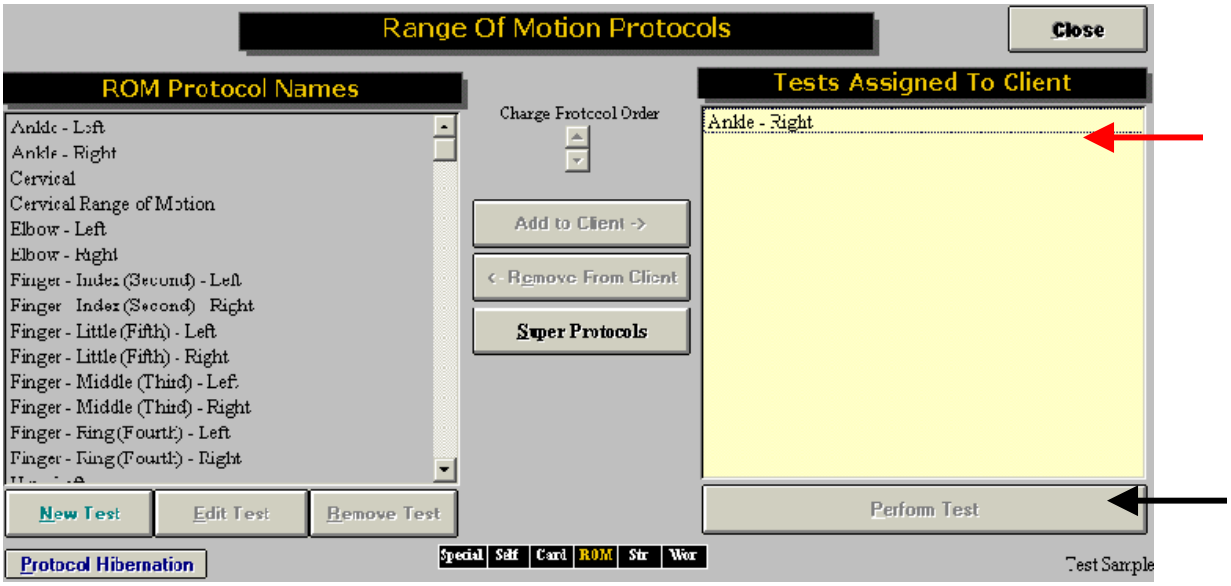


Appears as an option on your testing screen

Performing a Range of Motion Test with the Goniometer

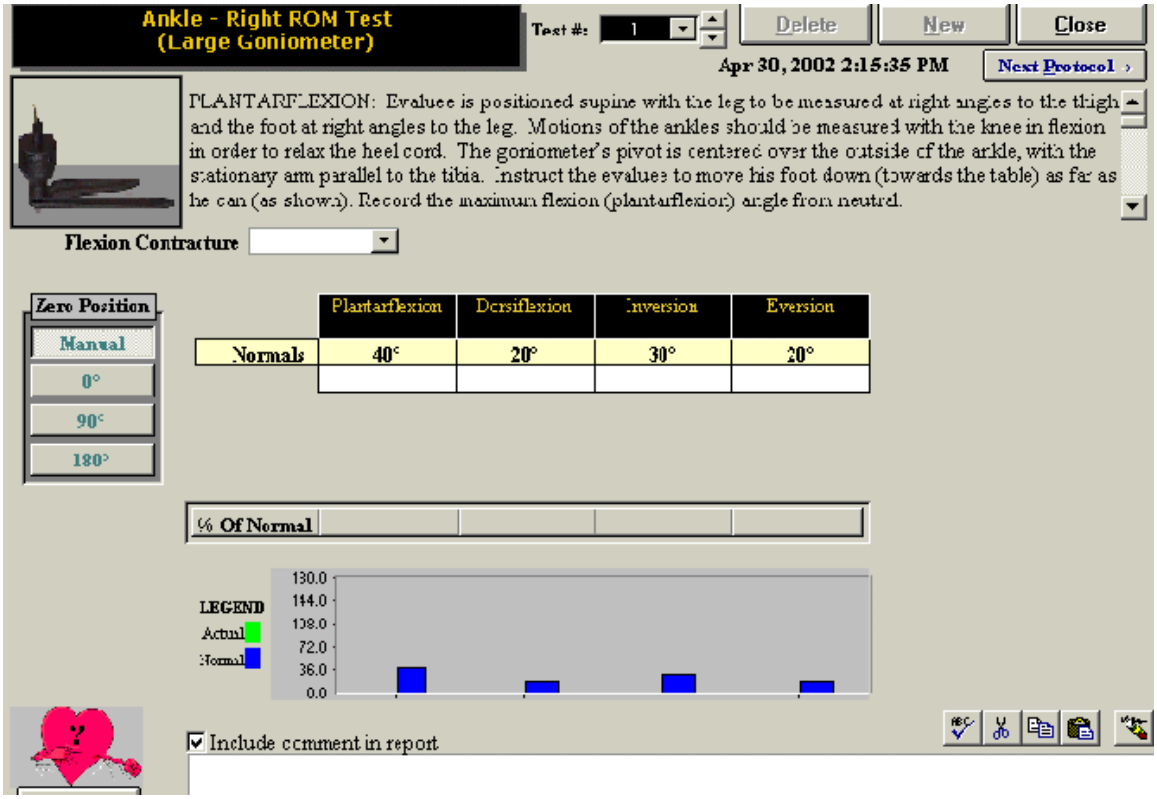
From the ODES main menu, you must first select or create a client. You will then be able to click ROM Test to enter the Range of Motion Protocols page.





Highlight the test that you wish to perform (in this case, right ankle range of motion has been selected). In order to add the protocol to your client, click Add to Client. You will now see you're the selected test appear in the 'Test Assigned to Client' box. To perform this test you may either double-click on the protocol name, or highlight it and click Perform Test.

The testing page for the selected protocol will be displayed. In order to begin a test, make sure that the correct tool is listed in the upper left-hand corner of the testing page (underneath the protocol name). In order to perform the test make sure that your cursor is flashing in the space beside Trial #1.



You may now begin testing with your goniometer. Press the red button located on the bottom of the device or depress the foot pedal to begin and end each trial. The computer will prompt you during each reading.

Range of Motion Protocols

The following are the protocols for range of movement as outlined in the ODES software.

Ankle

PLANTARFLEXION: Client is sitting with the leg to be measured at right angles to the thigh and the foot at right angles to the leg. Motions of the ankles should be measured with the knee at 45 degree flexion in order to relax the heel cord. The goniometer's pivot is centered over the outside of the ankle, with the stationary arm parallel to the tibia. Instruct the client to move their foot down (away from their body) as far as they can. Record the maximum flexion (plantar flexion) angle from neutral.

FLEXION CONTRACTURE: Flexion contracture is a measure of limited ROM due to muscle contracture. If the client is capable of both plantar flexion and extension (dorsiflexion), do not measure flexion contracture. Otherwise, client should be sitting, with the leg to be measured at right angles to the thigh and the foot at right angles to the leg. Instruct the client to relax the ankle so that it is in its own natural neutral position. The goniometer's pivot is centered over the outside of the ankle, with the stationary arm parallel to the tibia. Record the flexion contracture angle.

DORSIFLEXION: Client is sitting with the leg to be measured at right angles to the thigh and the foot at right angles to the leg. Motions of the ankles should be measured with the knee in flexion in order to relax the heel cord. The goniometer's pivot is centered over the outside of the ankle, with the stationary

arm parallel to the tibia. Instruct the client to pull their foot back, towards their body, as far as they can. Record the maximum extension (dorsiflexion) angle from neutral.

INVERSION: The client should be seated, with the bottom of the foot to be measured parallel to the floor. (Note: If the foot cannot be placed in this 0-degree neutral position, consider rating ankylosis instead of range of motion). The goniometer's pivot is centered over the back of the heel, with the stationary arm parallel to the tibia. Instruct the client to invert the foot as far as they can. Record the maximum inversion angle.

EVERSION: The client should be seated, with the bottom of the foot to be measured parallel to the floor. (Note: If the foot cannot be placed in this 0-degree neutral position, consider rating ankylosis instead of range of motion). The goniometer's pivot is centered over the back of the heel, with the stationary arm parallel to the tibia. Instruct the client to evert the foot as far as they can. Record the maximum eversion angle.

Knee

FLEXION: The client should be lying supine with the goniometer next to the knee joint; one arm of the goniometer is parallel to the lower leg, and the other is parallel to the femur. Record the maximum flexion angle from the starting point.

FLEXION CONTRACTURE: Measuring flexion contracture is similar to measuring ankylosis of the knee in flexion/extension. The client should be lying supine with the goniometer next to the knee joint; one arm of the goniometer is parallel to the lower leg, and the other is parallel to the femur. Record any deviation from 0-degrees.

EXTENSION: The client should be lying supine with the goniometer next to the knee joint; one arm of the goniometer is parallel to the lower leg and the other is parallel to the femur. Record the maximum extension angle from the starting point.

Hip

FLEXION: The client is supine on a firm, flat surface with the opposite joint (the hip that is not being measured) held in flexion until the lumbar spine is flat. (Note: If hip flexion contracture is present, do not measure it at this time.) Place the goniometer's pivot at the outside of the hip to be measured. One arm of the goniometer is parallel to the opposite flexed leg and the other parallel to the femur. The evaluator should place one hand on the iliac crest to note the point at which the pelvis begins to rotate. Record the maximum flexion angle.

EXTENSION: The client is prone on a firm, flat surface. Place the goniometer's pivot at the outside of the hip to be measured. One arm of the goniometer is parallel to the opposite extended leg and the other is parallel to the femur of the leg being measured. Record the maximum extension angle.

FLEXION CONTRACTURE: To measure loss of extension of one hip, the contralateral hip if flexed until the lumbar spine is flat on the examining table, as determined by the evaluator's hand, which is placed between the lumbar spine and table surface. The thigh to be measured should rest flat on the table; and hip flexion is recorded as flexion contracture. (Note: If the client can extend the hip back to or beyond the neutral position, do not record flexion contracture.)

INTERNAL ROTATION: The client should be lying prone, the knee flexed 90-degrees, with the thigh perpendicular to the transverse line across the anterior superior spines of the pelvis. The stationary arm of the goniometer is parallel to the flat surface, and the other is along the tibia. Instruct the client to rotate the leg away from the midline of the trunk with the thigh as the axis of rotation, thus producing inward rotation of the hip. Record the maximum internal rotation angle.

EXTERNAL ROTATION: The client should be lying supine, the knee flexed 90-degrees, with the thigh perpendicular to the transverse line across the anterior superior spines of the pelvis. The stationary arm of the goniometer is parallel to the flat surface, and the other is along the tibia. Instruct the client to rotate the leg toward the midline of the trunk with the thigh as the axis of rotation, thus producing outward rotation of the hip. Record the maximum external rotation angle.

ABDUCTION: (Note: If the client has limited motion due to abduction contracture, do not measure abduction.) The client should be lying supine on a flat surface with the leg to be measured extended at a right angle to a transverse line across the anterior superior spines of the pelvis. The contralateral hip should be passively held in flexion. The outward motion of the extremity is measured from the starting position. Record the maximum abduction angle.

ADDUCTION: (Note: If the client has limited motion due to adduction contracture, do not measure adduction.) The client should be lying supine on a flat surface with the leg to be measured extended at a right angle to a transverse line across the anterior superior spines of the pelvis. The contralateral hip should be passively held in flexion. In measuring adduction, the evaluator should ensure adequate elevation of the opposite extremity to allow the leg to pass under it.

ABDUCTION CONTRACTURE: The client should be lying supine on a flat surface with the leg to be measured extended at a right angle to a transverse line across the anterior superior spines of the pelvis. The contralateral hip should be passively held in flexion. The outward motion of the extremity is measured from the starting position. Record the smallest abduction contracture angle.

Great Toe

MP EXTENSION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed under the MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

MP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the foot and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed over the MTP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP flexion.

IP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Interphalangeal (IP) joint are in the neutral position. The small goniometer is placed over the IP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of IP flexion.

Lesser 2 Toe

MP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed over the MTP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP flexion.

MP EXTENSION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed under the

MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

IP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed over the MTP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP flexion.

IP EXTENSION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed under the MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

Toe Lesser 4

MP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed over the MTP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP flexion.

MP EXTENSION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed under the MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

IP Extension: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The goniometer is placed under the MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

Toe Lesser 5

MP FLEXION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The small goniometer is placed over the MTP joint, and its angle is read as a baseline. The client flexes (plantarflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP flexion.

MP EXTENSTION: The client is in a seated position. The knee is flexed to 45-degrees and the ankle and Metatarsophalangeal (MTP) joint are in the neutral position. The goniometer is placed under the MTP joint, and its angle is read as a baseline. The client extends (dorsiflexes) the toe maximally, and the angle subtending the maximum arc of motion is read. Subtract the baseline angle and record the angle of MP extension.

Shoulder

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both

extremities should be compared. Individual joints are then evaluated separately. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

FLEXION: The client should be standing erect, with the arm to be measured at the side of the body. Place the goniometer's pivot on the outside of the shoulder joint to be measured with the stationary arm perpendicular to the ground. The movable arm will remain parallel to the humerus. Instruct the client to move the arm in a forward upward motion in the anterior sagittal plane of the body. Record the maximum forward flexion angle.

EXTENSION: The client should be standing erect, with the arm to be measured at the side of the body. Place the goniometer's pivot on the outside of the shoulder joint to be measured with the stationary arm perpendicular to the ground. The movable arm will remain parallel to the humerus. Instruct the client to move the arm in an upward motion in the posterior sagittal plane of the body. Record the maximum backward extension angle.

ABDUCTION: The client should be standing erect, with the arm to be measured at the side of the body, palm in. Place the goniometer's pivot in front of the shoulder joint to be measured with the stationary arm perpendicular to the ground.; The movable arm will remain parallel to the humerus. Instruct the client to move the arm in an upward motion away from the side of the body in the coronal plane as far as possible. Record the maximum abduction angle.

ADDUCTION: The client should be standing erect, with the arm to be measured at the side of the body, palm in. Place the goniometer's pivot in front of the shoulder joint to be measured with the stationary arm perpendicular to the ground. The movable arm will remain parallel to the humerus. Instruct the client to move the arm toward the midline of the body, and beyond it in an upward plane as far as possible. Record the maximum adduction angle.

INTERNAL ROTATION: The client should be supine on a flat surface, with the arm to be measured in 90-degrees of abduction, the elbow in 90-degrees of flexion, and the forearm in neutral. Place the goniometer's pivot at approximately the lateral epicondyle with the stationary arm perpendicular to the floor. The movable arm will remain in alignment with the ulna. Instruct the client to move the arm as far as possible in a rotational orientation so that the palm goes down, toward the floor. Record the maximum internal rotation angle.

EXTERNAL ROTATION: The client should be supine on a flat surface, with the arm to be measured in 90-degrees of abduction, the elbow in 90-degrees of flexion, and the forearm in neutral. Place the goniometer's pivot at approximately the lateral epicondyle with the stationary arm perpendicular to the floor. The movable arm will remain in alignment with the ulna. Instruct the client to move the arm as far as possible in a rotational orientation so that the back of the hand goes back, toward the floor. Record the maximum external rotation angle.

Elbow

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

FLEXION: The client should be standing with the arm to be measured flexed at the elbow in a forearm supination, and 90-degrees of shoulder forward flexion. The goniometer's pivot should be centrally placed lateral to the lateral epicondyle with the stationary arm in alignment to the lateral aspect/midline of the humerus, and the movable arm in alignment to the lateral aspect/midline of the radius. Record the maximum flexion angle.

EXTENSION: The client should be standing with the arm to be measured extended at the elbow in forearm supination, and 90-degrees of shoulder forward flexion. The goniometer's pivot should be centrally placed lateral to the lateral epicondyle with the stationary arm in alignment to the lateral aspect/midline of the humerus, and the movable arm in alignment to the lateral aspect/midline of the radius. Record the maximum extension angle up to the 0-degree/neutral position.

SUPINATION: The client should be sitting on a flat surface, or standing with the arm to be measured in midposition with the palm vertical in relation to the floor ("thumbs up" position), with the upper arm close to the side of the body, and the elbow flexed at 90-degrees. The goniometer's pivot should be placed medial to the ulnar styloid process. The stationary arm of the goniometer should be parallel to the anterior midline of the humerus, and the movable arm across the volar aspect of the forearm, just proximal to the styloid processes. Instruct the client to turn "palm up" as far as possible. Record the maximum supination angle.

PRONATION: The client should be sitting on a flat surface, or standing with the forearm to be measured in midposition with the palm vertical in relation to the floor ("thumbs up" position), with the upper arm close to the side of the body, and the elbow flexed at 90-degrees. The goniometer's pivot should be centrally placed lateral to the ulnar styloid process. The stationary arm of the goniometer should be parallel to the anterior midline of the humerus, and the movable arm across the dorsal aspect of the forearm just proximal to the styloid processes of the radius and ulna. Instruct the client to turn "palm down" as far as possible. Record the maximum pronation angle.

Wrist

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

FLEXION: The client should start with the elbow flexed, the forearm positioned in neutral pronation/supination, and the wrist to be measured in neutral flexion/extension and radioulnar deviation. The fingers should be relaxed to avoid active finger flexion. The goniometer's pivot is placed over the dorsal surface of the wrist joint using the capitate as a reference. Align the stationary arm with the dorsal midline of the forearm using the lateral epicondyle of the humerus as a reference. Align the movable arm in between the dorsal heads of the index and middle metacarpals. Record the maximum wrist flexion angle.

EXTENSION: The client should start with the elbow flexed, the forearm positioned in neutral pronation, and the wrist to be measured in neutral flexion/extension and radioulnar deviation. The goniometer's pivot is placed over the volar surface of the wrist joint at the level of the capitate with the stationary arm in alignment with the volar midline of the forearm, and the movable arm in between the volar heads of the index and middle metacarpals. Record the maximum wrist extension angle.

RADIAL DEVIATION: The client should start with the hand to be measured in forearm pronation and the wrist in neutral flexion/extension and radioulnar deviation. The goniometer's pivot is placed over the middle dorsal aspect of the wrist in line with the capitate. Align the stationary arm with the dorsal midline of the forearm using the lateral epicondyle of the humerus for a reference. Align the moving arm with the dorsal midline of the third metacarpal. Instruct the client to move the hand towards the thumb in the same plane as the table. Record the maximum radial deviation angle.

ULNAR DEVIATION: The client should start with the hand to be measured in forearm pronation and the wrist in neutral flexion/extension and radioulnar deviation. The goniometer's pivot is placed over the middle dorsal aspect of the wrist in line with the capitate. Align the stationary arm with the dorsal midline

of the forearm using the lateral epicondyle of the humerus for a reference. Align the moving arm with the dorsal midline of the third metacarpal. Instruct the client to move the hand towards the little finger in the same plane as the table. Record the maximum ulnar deviation angle.

Thumb

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

MP EXTENSION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to extend, or straighten the MPJ as far as possible. Record the maximum MP extension angle.

MP FLEXION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to flex the MPJ as far as possible. Record the maximum MP flexion angle.

PIP EXTENSION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the proximal phalanx and the movable arm in alignment with the middle phalanx. Instruct the client to extend, or straighten the PIP joint as far as possible. Record the maximum PIP extension angle.

PIP FLEXION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the dorsal midline of the proximal phalanx and the movable arm in alignment with the dorsal midline of the middle phalanx. Instruct the client to flex the PIP as far as possible. Record the maximum PIP flexion angle.

DIP EXTENSION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

DIP FLEXION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the

stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

Finger Index 2

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

EXTENSION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to extend, or straighten the MPJ as far as possible. Record the maximum MP extension angle.

FLEXION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to flex the MPJ as far as possible. Record the maximum MP flexion angle.

PIP EXTENSION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the proximal phalanx and the movable arm in alignment with the middle phalanx. Instruct the client to extend, or straighten the PIP joint as far as possible. Record the maximum PIP extension angle.

PIP FLEXION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the dorsal midline of the proximal phalanx and the movable arm in alignment with the dorsal midline of the middle phalanx. Instruct the client to flex the PIP as far as possible. Record the maximum PIP flexion angle.

DIP EXTENSION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

DIP FLEXION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the

stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to flex the DIP joint as far as possible. Record the maximum DIP flexion angle.

Finger Middle 3

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

EXTENSION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to extend, or straighten the MPJ as far as possible. Record the maximum MP extension angle.

MP FLEXION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to flex the MPJ as far as possible. Record the maximum MP flexion angle.

PIP EXTENSION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the proximal phalanx and the movable arm in alignment with the middle phalanx. Instruct the client to extend, or straighten the PIP joint as far as possible. Record the maximum PIP extension angle.

PIP FLEXION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the dorsal midline of the proximal phalanx and the movable arm in alignment with the dorsal midline of the middle phalanx. Instruct the client to flex the PIP as far as possible. Record the maximum PIP flexion angle.

DIP EXTENSION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

DIP FLEXION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion.

Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

Finger Ring 4

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

EXTENSION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to extend, or straighten the MPJ as far as possible. Record the maximum MP extension angle. MP

FLEXION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to flex the MPJ as far as possible. Record the maximum MP flexion angle.

PIP EXTENSION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the proximal phalanx and the movable arm in alignment with the middle phalanx. Instruct the client to extend, or straighten the PIP joint as far as possible. Record the maximum PIP extension angle.

PIP FLEXION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the dorsal midline of the proximal phalanx and the movable arm in alignment with the dorsal midline of the middle phalanx. Instruct the client to flex the PIP as far as possible. Record the maximum PIP flexion angle.

DIP EXTENSION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

DIP FLEXION: The client's forearm should be pronated or in neutral pronation/supination, wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in

alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

Finger Little 5

In assessing motion, the examiner should first observe what an individual can and cannot do by asking them to move each joint of the extremity, from the shoulder down, through its full range of motion. Both extremities should be compared. Individual joints are then evaluated separately. Similarly, movements of the digits are first evaluated as a unit by having the client make a complete fist, and then individually by extending the digits fully over several repetitions. In determining the range of motion of individual joints, the examiner must evaluate both the active and passive motion.

MP EXTENSION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to extend, or straighten the MPJ as far as possible. Record the maximum MP extension angle.

MP FLEXION: The client's hand should be flat on a table with the volar head of the metacarpal supported at the table's edge, and neutral wrist flexion/extension and radioulnar deviation. Place the goniometer's pivot over the dorsal head of the metacarpophalangeal (MPJ) joint with the stationary arm in alignment with the dorsal midline of the metacarpal and the movable arm in alignment with the dorsal midline of the proximal phalanx. Instruct the client to flex the MPJ as far as possible. Record the maximum MP flexion angle.

PIP EXTENSION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the proximal phalanx and the movable arm in alignment with the middle phalanx. Instruct the client to extend, or straighten the PIP joint as far as possible. Record the maximum PIP extension angle.

PIP FLEXION: The client's forearm should be pronated, the wrist in neutral flexion/extension and radioulnar deviation, and the metacarpophalangeal joint in 0-degrees of extension. If possible, place the hand to be measured flat on a table with the volar head of the proximal phalanx supported at the table's edge. Place the goniometer's pivot over the dorsal head of the proximal interphalangeal joint (PIP) with the stationary arm in alignment with the dorsal midline of the proximal phalanx and the movable arm in alignment with the dorsal midline of the middle phalanx. Instruct the client to flex the PIP as far as possible. Record the maximum PIP flexion angle.

DIP EXTENSION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

DIP FLEXION: The client's forearm should be pronated or in neutral pronation/supination, and the wrist in neutral flexion/extension and radioulnar deviation. The metacarpophalangeal joint is positioned in 0-degrees of extension and the proximal interphalangeal joint in approximately 70-90 degrees of flexion. Place the goniometer's pivot over the dorsal head of the distal interphalangeal joint (DIP) with the

stationary arm in alignment with the dorsal midline of the middle phalanx and the movable arm in alignment with the distal phalanx. Instruct the client to extend, or straighten the DIP joint as far as possible. Record the maximum DIP extension angle.

Reference: American Medical Association Guides to the Evaluation of Permanent Impairment, Fifth Edition

Digit Ankylosis:

If there is joint ankylosis, which will require documentation, follow these steps:

The first reading should be taken with the goniometer interlocked and placed against a wall or on a tabletop. Next place the client's joint in as close to a neutral position as possible. Place the goniometer appropriately. Then take the second reading. This is the degree of ankylosis.

This value is then entered under flexion contracture. Delete the information for that trial and start a range of motion test.

The Hand Grip

Force Measurement

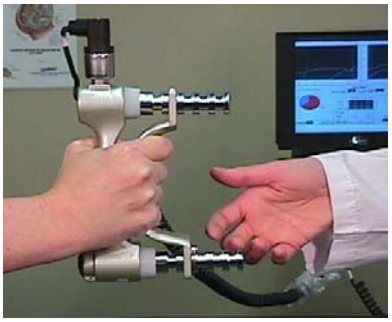
The main force measurement device can accurately document values from 0—200 lbs. The device itself is accurate to within 0.5% over a full scale, and when combined with the software and other components is accurate to within 0.6% over the full scale (i.e. within 1.2 pounds at all times).

Cables

BTE uses high grade cabling to ensure durability of its connections.

Protocols

The Hand Grip tests can be used to determine a client's handgrip strength relative to a population of the client's age and sex, using a normative database. There are several protocols that are used -- these are listed below.
Standard Hand Grip
Maximum Voluntary Effort
Modified Maximum Voluntary Effort
Rapid Exchange



Design

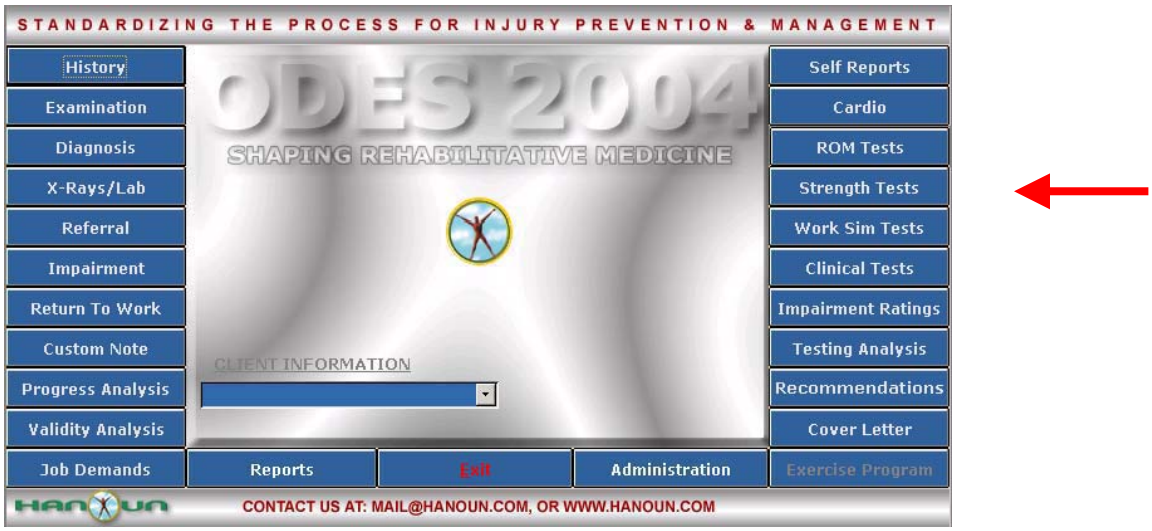
This tool is made of aluminium and documents values via a pressure transducer.

Accessories

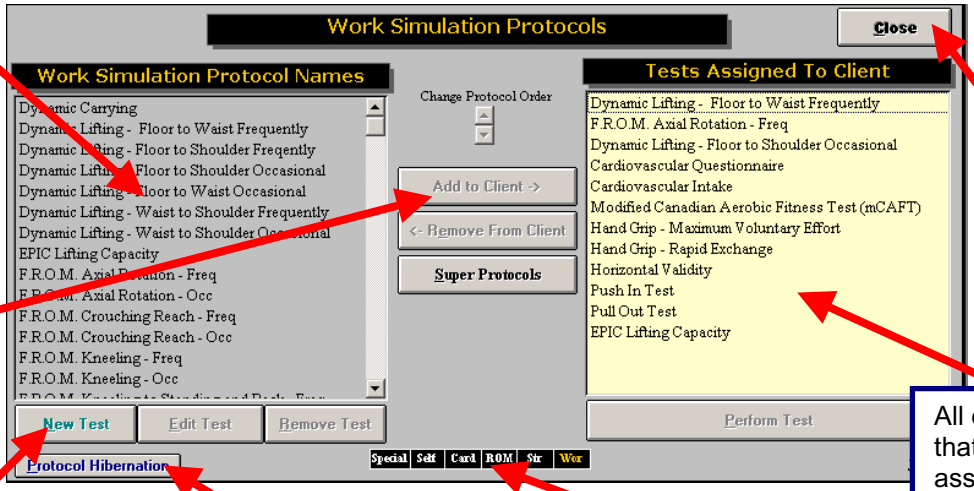
The Hand Grip comes with the following pieces for calibration:

Using the Hand Grip For A Pre-Programmed Strength Protocol:

You are now ready to enter the Strength Test page.



Click on Strength Test from the ODES main menu. The following Strength Test Protocol page will appear. From here, all of the pre-programmed tests may be accessed. Tests can be added to clients, new custom isometric strength tests may be created, and tests can be edited or deleted.



This is a list of all the tests found in the Strength Test menu.

Double click on the test or click here to add it to the tests assigned to the client.

Select this icon to return to the ODES™ main menu.

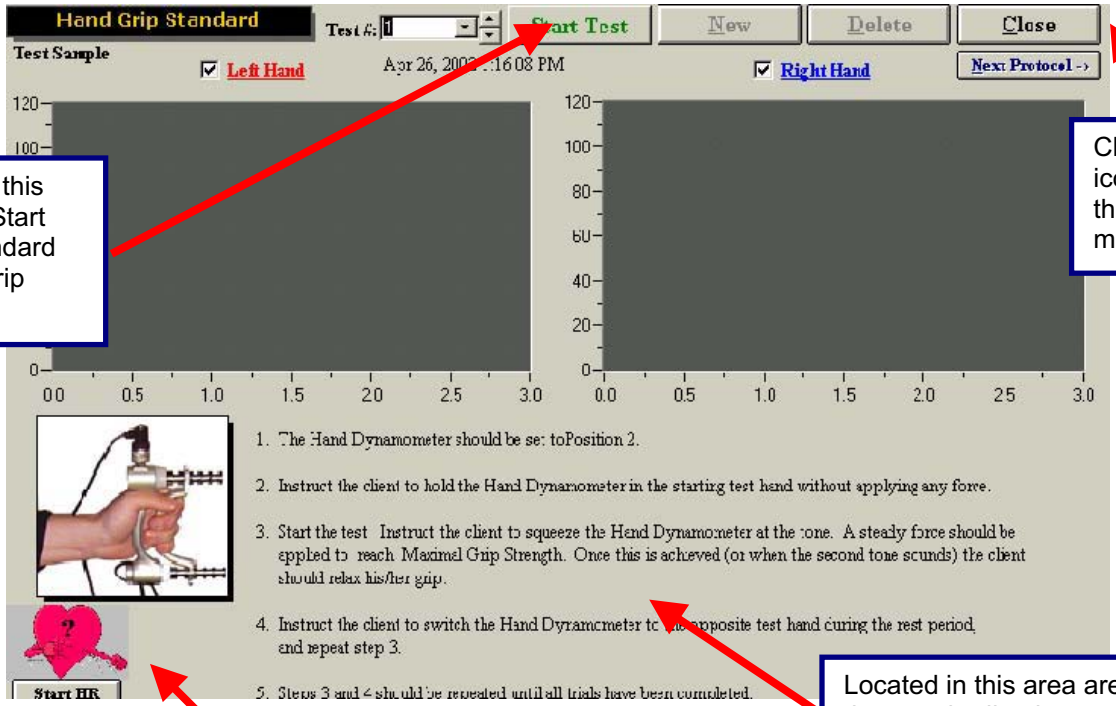
All of the tests that are assigned to the client will appear in this area.

In order to edit, create or remove tests, highlight the work simulation protocol then click on the appropriate icon.

Protocol Hibernation puts unused protocols in storage without removing data.

This is a short cut to return to any of the test menu screens in ODES™. The test menu that is in use will appear in yellow.

Once a test has been added to a client, and Perform Test has been selected from the bottom right hand corner of the page, the test page will appear. Below is an example of what the test page looks like for the Standard Hand Grip.



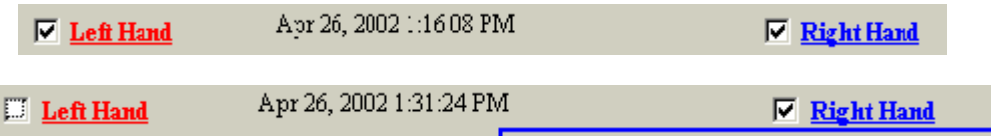
Choose this icon to Start the Standard Hand Grip Test.

Choose this icon to return to the Strength menu.

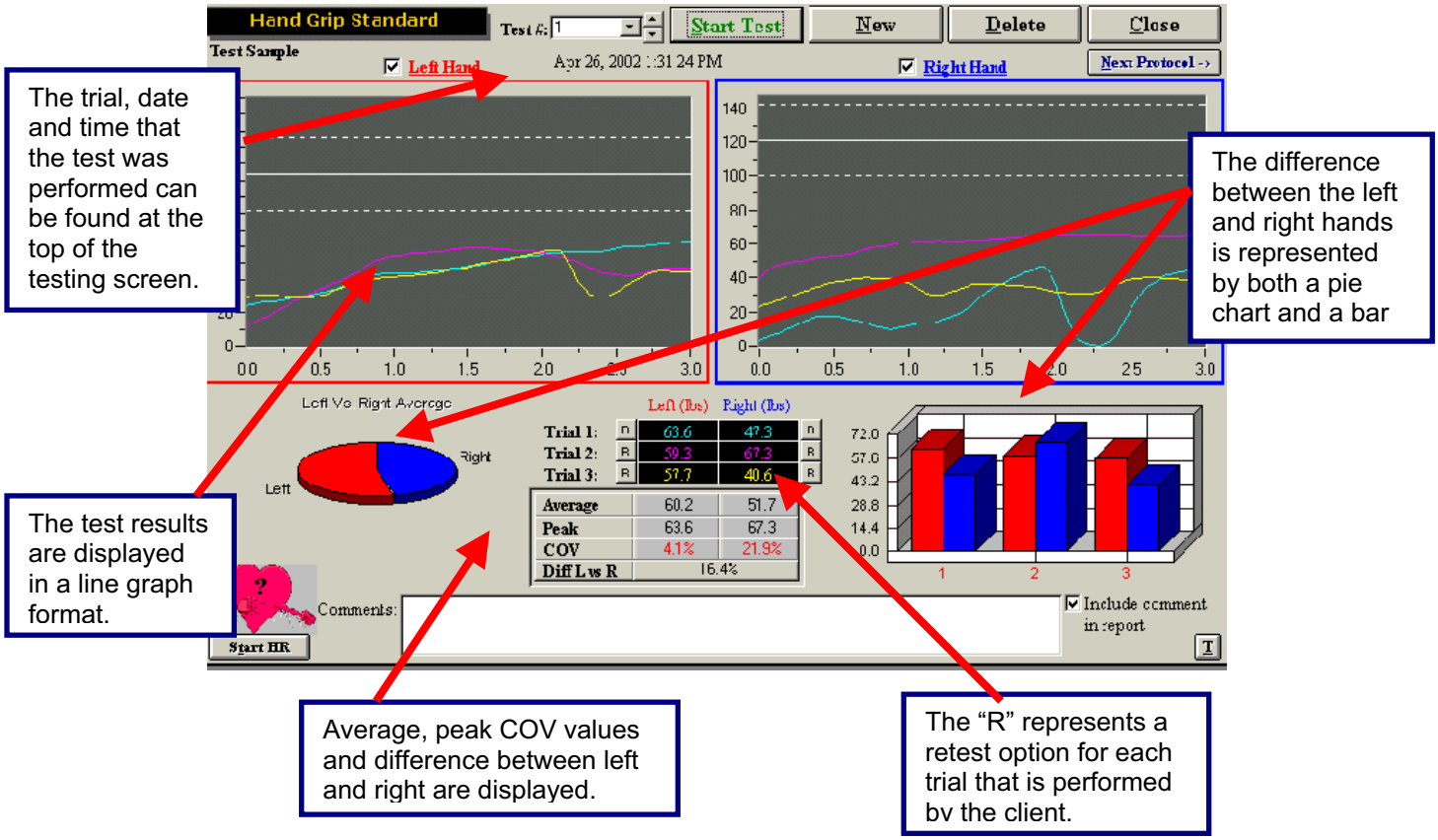
Located in this area are the standardized instructions for the Hand Grip tests.

Click on Start HR to start real time heart rate monitoring. . There is also the option of entering the heart rate manually by double clicking on the question mark.

Notice that trials alternate between the client's right and left hands. If only one hand requires testing, simply remove the check mark beside the hand that is not required.



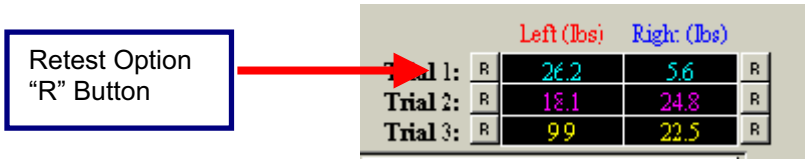
Below is an example of a completed Standard Hand Grip test.



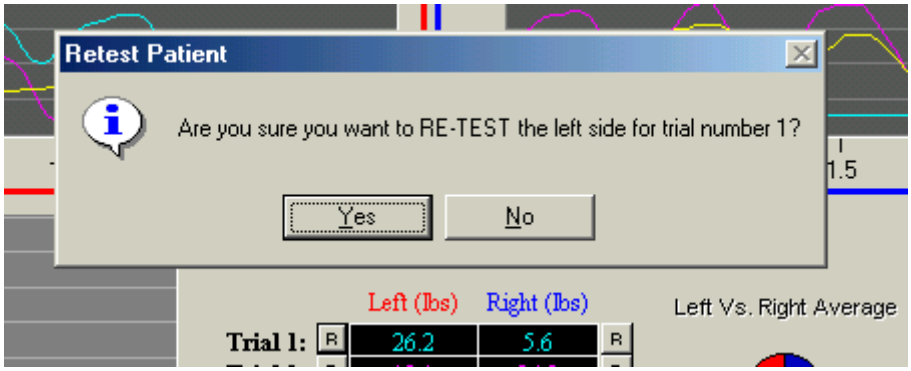
The above is a completed Standard Hand Grip test. There are three trials on each side, each represented by a different colour. The first trial is blue, the second is pink and the third trial is yellow.

Retesting Trials

Trials can be retested if the COV is off by more than 15%; if there is an error in technique; due to inconsistent effort; or as a result of poor performance at the start or finish of the trials. There is no set number of times that this option can be utilized.



The “R” that corresponds with each trial is located to either the left or right of the initial result obtained. For example, for trial one on the left side of the body, the “R” is located to the left of the result obtained by the client. To redo this trial, click the R. ODES will then ask if this trial should be retested. Click OK and perform the trial again.



It is important to note that once a testing screen is closed or a new trial is created, the measurements that were obtained will be locked and none of these can be retested.

Protocol Information

Standard Hand Grip:

The “Hand Grip – Standard” test is performed per the BTE Hand Grip Protocol with a JAMAR handgrip dynamometer. This device is utilized to measure handgrip strength in both the right and left hands.

Prepare the grip dynamometer by setting the adjustable handle spacing in position 2 (1-1/2 inches), or the second position away from the fixed handle.

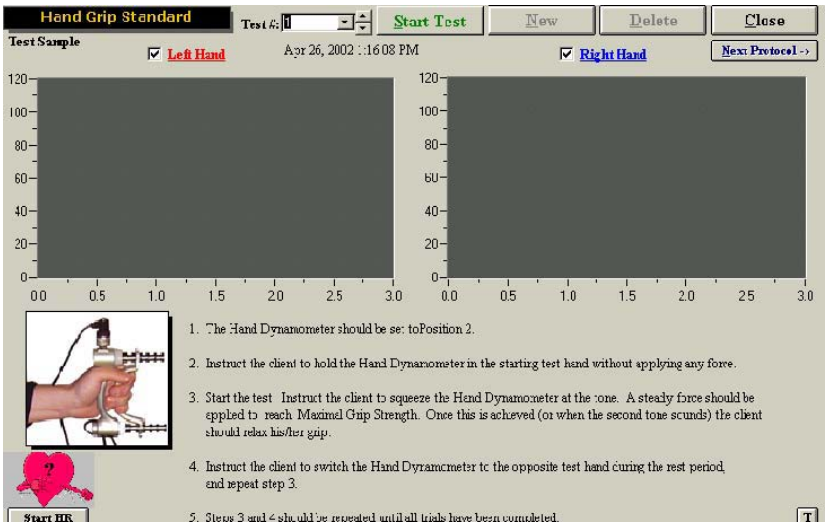
The device must be presented to the client with the cord attachment on top in order to conform to the metacarpal arch of the hand.

The client should optimally be positioned sitting as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Forearm neutral (thumb up)
Hand & forearm in slight shoulder internal rotation (toward the center front of the torso)
Forearm should not be resting on any surface while gripping

If possible, have the client remove all rings from his/her fingers, as these can interfere with the performance of this test.

Click Start Test at the top of the page.



The client is required to perform three trials with each hand with the dynamometer set to position 2, beginning with the right hand and alternating between trials.

Voice prompts will guide the tester and the client through the trials. Observe the client closely to ensure he/she understands.

It is important that the client does not grip the dynamometer firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce "Start Test Now" to indicate when firm pressure should be applied.

Instruct the client to begin gripping the device in a smooth motion, steadily maintaining that grip until the prompted "Rest Period," then direct the client to switch the device to the contra lateral hand.

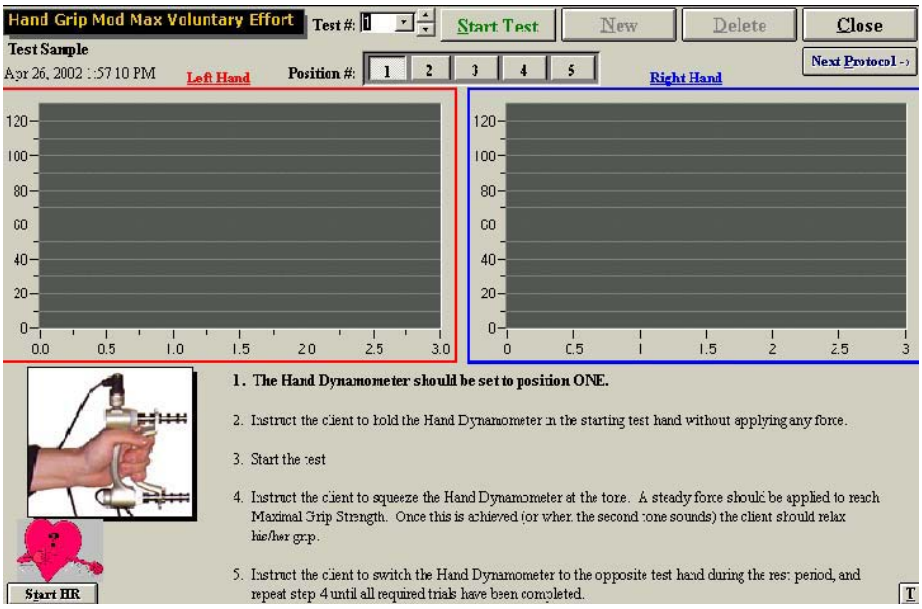
As with all interfaced test screens, data is automatically analyzed for the standard handgrip strength test. A Comment section is available at the bottom of the screen. Double-click the text box to increase its size if additional space is required. Click the box adjacent to "Include Comment in Report" if these comments are to be included in the final printed report. A summary of test results and comparison to normal values is provided in the report.

Modified Maximum Voluntary Effort:

The Handgrip Modified Maximum Voluntary Effort test page has two grids for real-time graphs of the left and right hand strength curves. Each grid contains three reference lines that represent the normal values as well as upper and lower limits for the client, based on his/her age and gender. These criteria are obtained through the information the evaluator provides on the Client Information page of ODES. The correct gender and date of birth of the client must be entered when performing these tests to ensure accurate and complete data analysis. Hand dominance is also entered on the Client Information page. This is also used in data analysis: right-dominant individuals are considered to be 10% stronger on the right.

The MMVE test pages look much like the Handgrip Standard test page(s) with the following exceptions:

The main page has a row of buttons from 1 to 5 to indicate the spacing position on the handgrip dynamometer.
The page displayed at the conclusion of testing at each handgrip position has a Summary button.



Click button number 1 (from 1 – 5) at the top of the screen. These buttons represent the choice of spacing positions on the grip dynamometer.

The test is performed with one trial of each hand at spacing positions 1, 3, 4 and 5 on the dynamometer, and three trials of each hand for spacing position 2.

The Modified Maximum Voluntary Effort Handgrip test is performed per the BTE Handgrip Protocol with a JAMAR handgrip dynamometer. This device is utilized to measure handgrip strength in both the right and left hands.

Prepare the grip dynamometer by setting the adjustable handle spacing for the position to be tested:

Position One: 1 inch
Position Two: 1-1/2 inches
Position Three: 2 inches
Position Four: 2-1/2 inches
Position Five: 3 inches

The test is generally conducted with position one first, and progresses chronologically until position five is completed.

The device must be presented to the client with the cord attachment on top in order to conform to the metacarpal arch of the hand.

The client should optimally be positioned sitting as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Forearm neutral (thumb up)
Hand & forearm in slight shoulder internal rotation (toward the center front of the torso)
Forearm should not be resting on any surface while gripping

Text instructions are given on the test page. Voice prompts will guide the tester and the client through the test. Observe the client closely to ensure he/she understands.

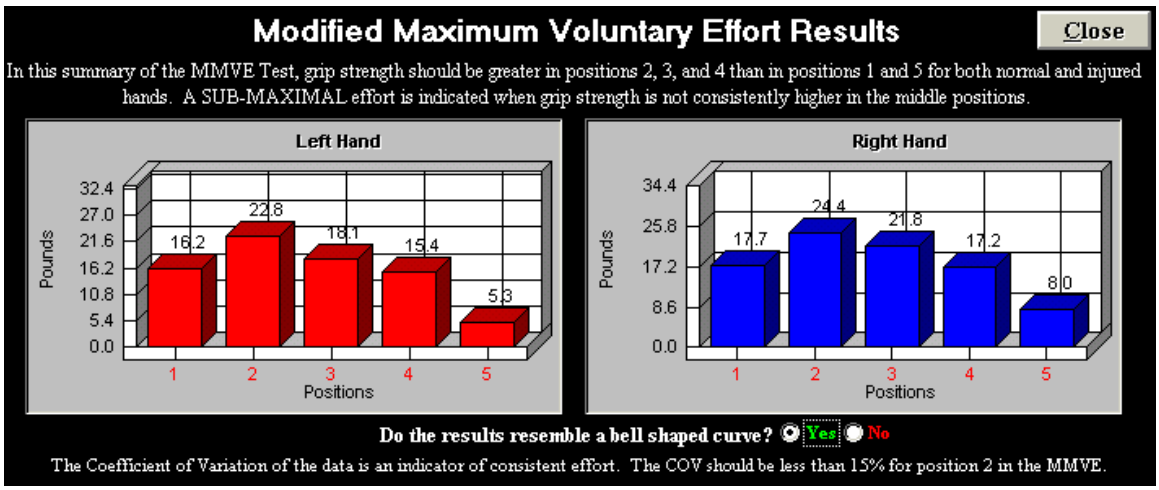
It is important that the client does not grip the dynamometer firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce “Start Test Now” to indicate when firm pressure should be applied.

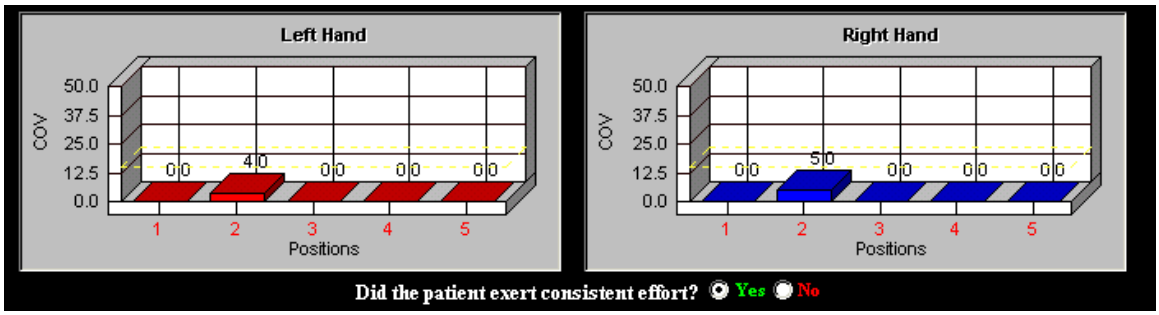
Instruct the client to begin gripping the device in a smooth motion, steadily maintaining that grip until the prompted “Rest Period,” then direct the client to switch the device to the contra lateral hand.

Repeat these steps for all five-grip positions.

The MMVE test is performed over a range of positions effecting varying degrees of difficulty. Therefore, it is possible to determine whether a client has performed with consistent effort by comparing the objective strength values recorded at each position for each hand. Shown graphically, the plots of these values would be expected to create a bell-shaped pattern, paralleling that of the contra lateral hand. A significant-appearing deviation in the size of the curve or the absence of a bell-shaped curve would connote non-compliance of the client with the strength test.

ODES immediately plots the data. Graphic representations for both right and left-hand results are found by clicking the Summary button located at the bottom right corner of the page.



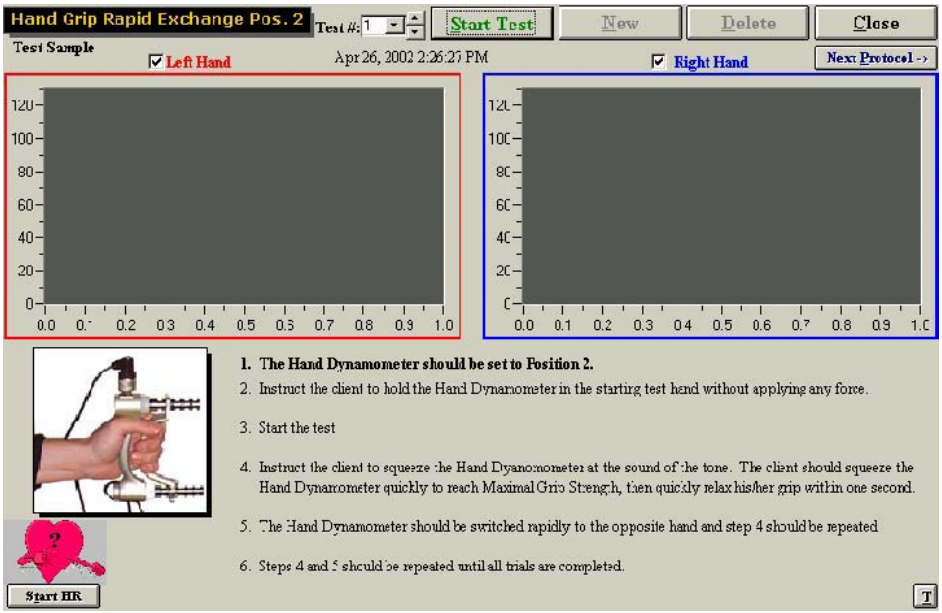


Click Yes if both graphs follow a bell-shaped distribution.
Click No if one or both graph(s) does/do not correspond to the bell-shaped curve.

If the evaluator does not click on Summary, the cross validation section of the report (assuming the Rapid Exchange Grip and the Standard Hand Grip tests were completed) will not be included.

Rapid Exchange:

The “Rapid Exchange Grip” test page has two grids for real-time graphs of the left and right-hand strength curves.



The “Hand Grip – Rapid Exchange” test is performed with a JAMAR handgrip dynamometer. This device is utilized to measure handgrip strength in both the right and left hands.

The “Hand Grip – Rapid Exchange” test is performed by having the client rapidly squeeze the grip dynamometer and move it to the other hand for a series of six trials each for both right and left hands. The adjustable handle component of the grip dynamometer is to be set up in spacing position two. The average maximum force for all six trials is compared to the values obtained for the standard or MMVE handgrip strength test for validity purposes.

Prepare the grip dynamometer position as indicated on the screen. If the client has completed the Modified Maximum Validity Effort test, the adjustable handle spacing will be in position 2 (1-1/2 inches), or the second position away from the fixed handle. If the Maximum Validity Effort test was completed the position will be based on the position where the client registered the strongest readings. The device must be presented to the client with the cord attachment on top in order to conform to the metacarpal arch of the hand.

The client should optimally be positioned sitting as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Forearm neutral (thumb up)
Hand & forearm in slight shoulder internal rotation (toward the center front of the torso)
Forearm should not be resting on any surface while gripping

Click Start Test at the top of the page.

Voice prompts will guide the tester and the client through the test. Observe the client closely to ensure he/she understands.

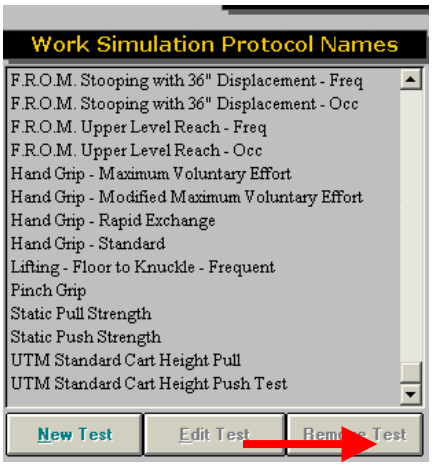
Instruct the client to begin gripping the device quickly and with maximum force for a one-second trial duration beginning with the right hand. The client must follow the voice prompts to “Switch to Left,” and “Switch to Right” to complete 6 consecutive trials each of both right and left hands.

It is important that the client does not grip the dynamometer firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce “Start Test Now” to indicate when firm pressure should be applied.

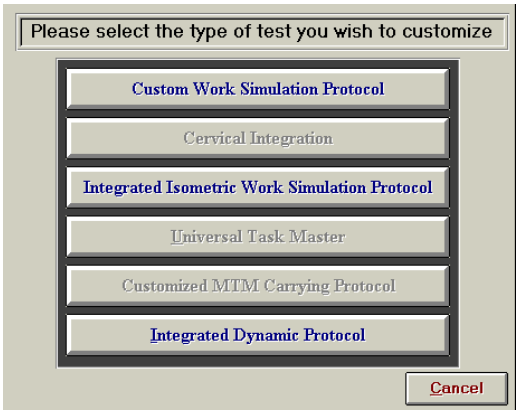
The BTE Protocol for Rapid Exchange Handgrip Strength testing will automatically prompt ODES to perform a cross-reference validity check to compare the results of the Rapid Exchange or MMVE to the Standard handgrip results. ODES will automatically calculate and compare the values obtained from strength test performance using the grip dynamometer in position two for all tests. The client’s strength values recorded during the Standard or MMVE tests are not expected to show a variance of greater than 15% from those recorded during Rapid Exchange handgrip strength testing.

Creating A New Hand Grip Test:

The ODES software allows for the creation of new protocols. In order to do so, enter the page from which tests can be chosen. In this case, enter the Strength Test or Work Sim Test page. At the bottom of the page is a button labelled New Test.

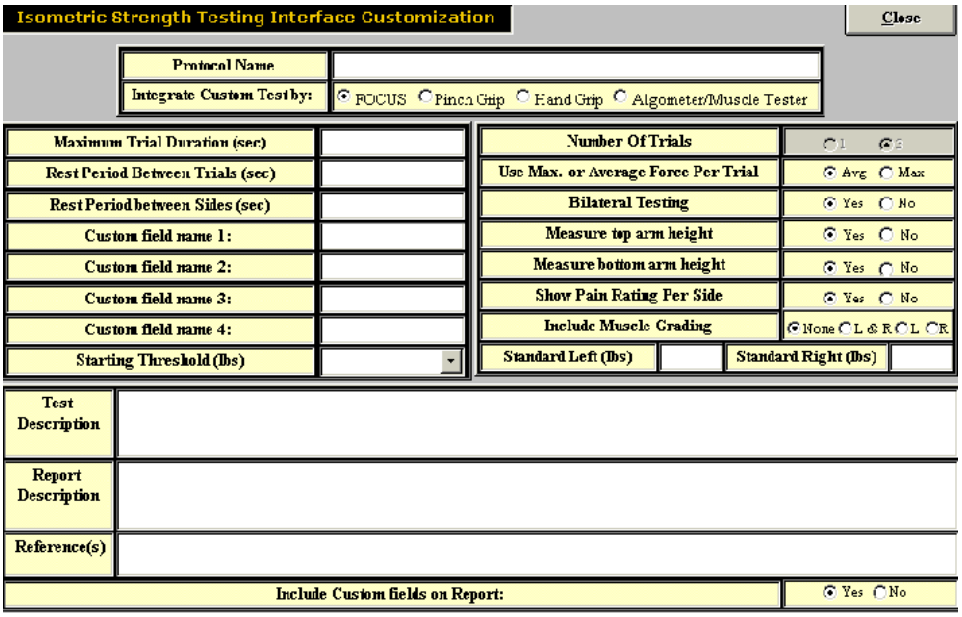


After selecting this option, the following page will appear:



Select the Integrated Isometric Work Simulation Protocol or Integrated Strength Test Protocol option in this menu in order to begin customizing the new Hand Grip test.

A page will then appear which will allow input of all the essential protocol information.



Once all of the vital information has been entered, click Close. The test should now appear in the protocol listing.

The Pinch Grip

Force Measurement

The main force measurement device can accurately document values from 0—70 lbs. The device itself is accurate to 0.037% over a full scale and, when combined with the software and other components, is accurate to 0.2% over the full scale (i.e. within one pound at all times).

Cables

BTE uses high grade cabling to ensure the durability of its connections.

Protocols

The standardized Pinch Grip tests in the ODES software can be used to determine a client's Pinch Grip strength relative to a population of the client's age and sex, using normative data. There are various protocols for performing Pinch Grip testing and these are listed below.

Tip Pinch

Key Pinch

Palmar Pinch

Design

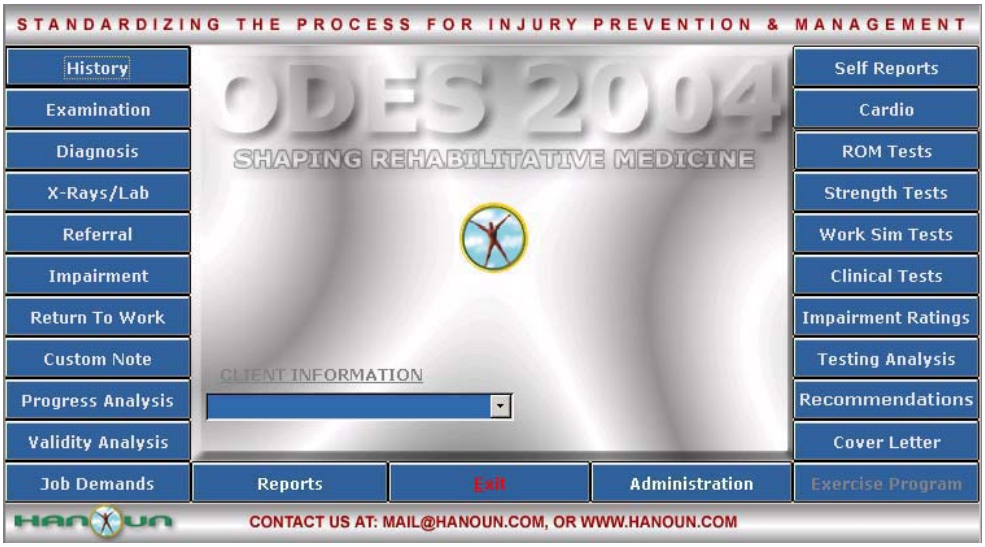
This tool is made of aluminum and documents values via a load cell device.

Accessories

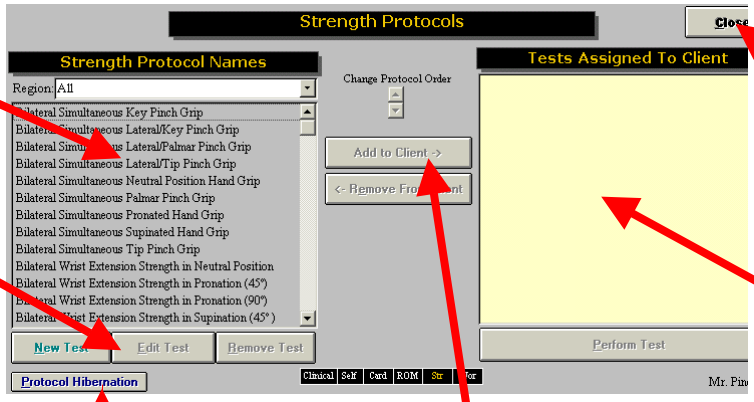
The Pinch Grip comes with the following pieces for calibration. Weight of the calibration disc = 0.3 lbs.

Using the Pinch Grip For A Pre-Programmed Strength Test Protocol:

The following is an example of how to perform a pre-programmed Strength Test Protocol.



From the ODES main menu, click Strength Test. This will bring you to the Strength Protocols page. From here, you have access to all of the pre-programmed tests. You can add tests to clients, create new custom isometric strength tests, edit tests and delete tests.



This is a list of all the protocols found in the Work Simulation menu.

Select this button to return to the ODES™ main menu.

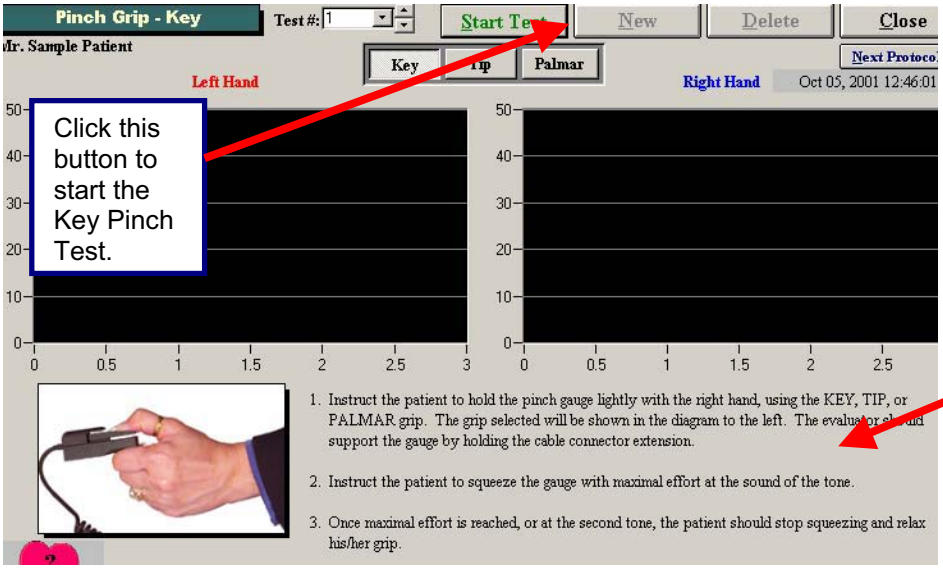
In order to edit, create or remove tests, highlight the work simulation protocol then click on the appropriate button.

All of the tests that are assigned to the client will appear in this area.

Protocol Hibernation puts unused protocols in storage without removing data.

Double click on the test or highlight the test and click here to assign it to the client.

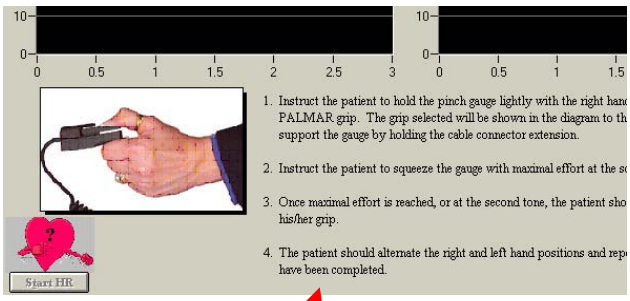
Once a test has been added to a client, and Perform Test has been clicked in the bottom right hand corner of the page (or the test itself has been double-clicked), the test page will appear. Below is an example of what the test page looks like for the standardized Pinch Grip.



Click this button to start the Key Pinch Test.

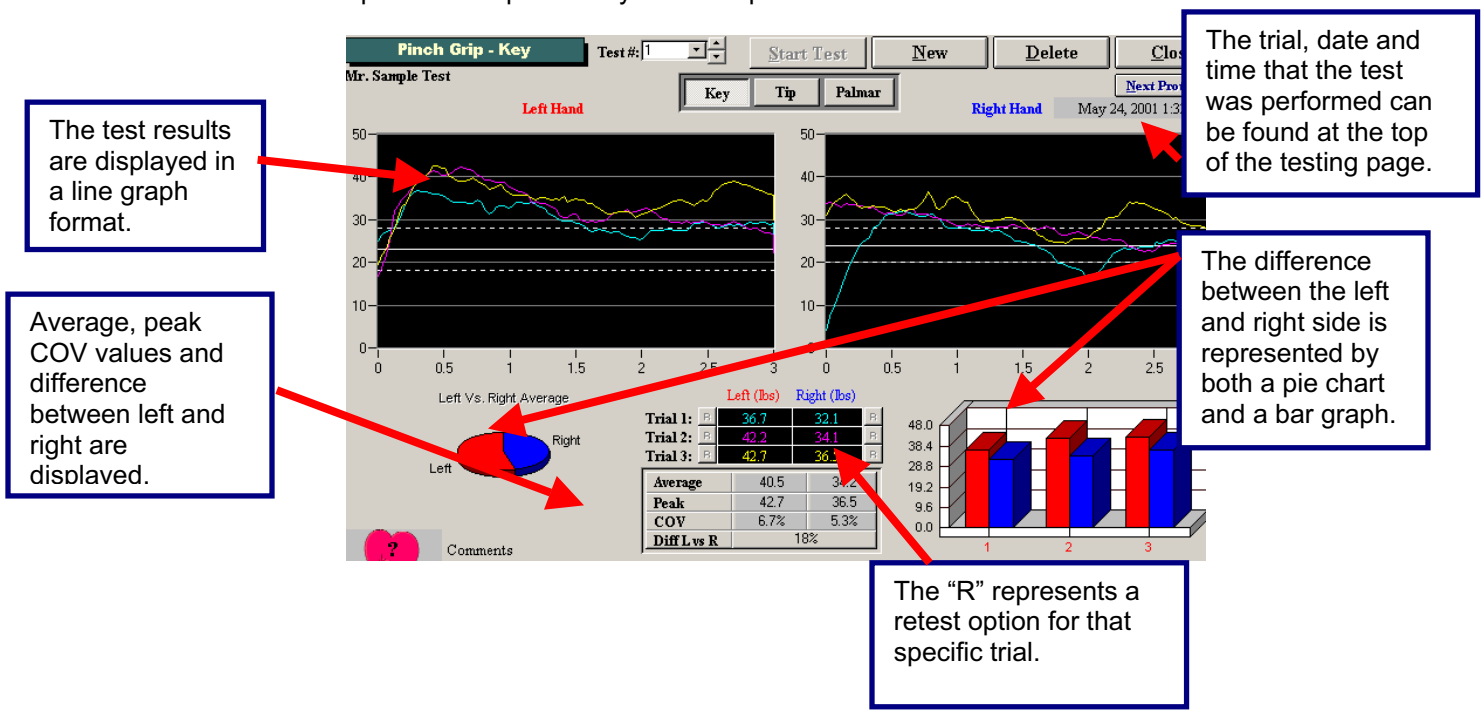
Click this button to return to the Strength menu.

Located in this area are the standardized instructions for the Pinch Grip tests.



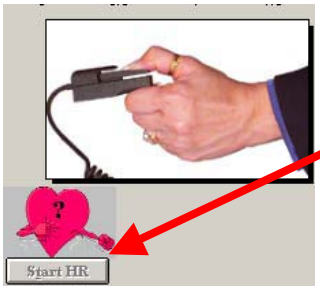
Click Start HR to capture the client's heart rate during the test. You also have the option of entering the heart rate manually by double-clicking on the heart graphic

Below is an example of a completed Key Pinch Grip test.



Three trials are performed on each hand, represented by a different color. Trial number one is blue, trial number two is pink and trial number three is yellow.

Capturing Client's Heart Rate:

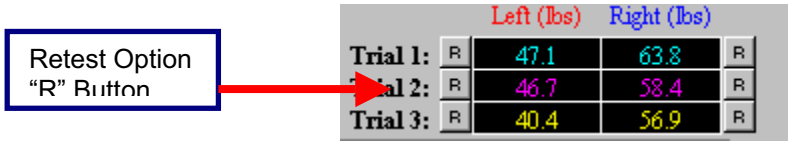


This can be done by either clicking the start HR button, or by double-clicking on the heart graphic and entering the value manually.

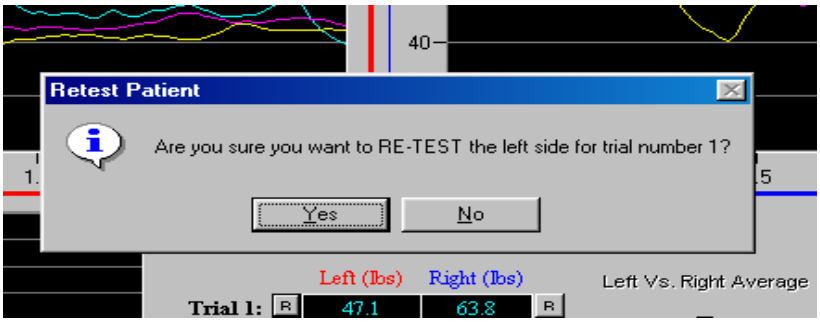
Retesting Trials

Trials can be retested if the COV is off by more than 15%. In addition, if there is an error in technique, inconsistent effort, or poor performance at the start or finish of a test the trials may also be re-tested.

There is no set number of times that this option can be utilized.



The "R" that corresponds with each trial is located to either the left or right of the initial result obtained. For example, for trial one on the left side of the body, the "R" is located to the left of the result obtained by the client. To redo this trial, click on "R". ODES will then ask if you would like to redo this trial. Click OK and perform the trial again.



It is important to note that once you either close the testing page or create a new trial, the measurements that were obtained will be locked and you will be unable to retest any of the trials.

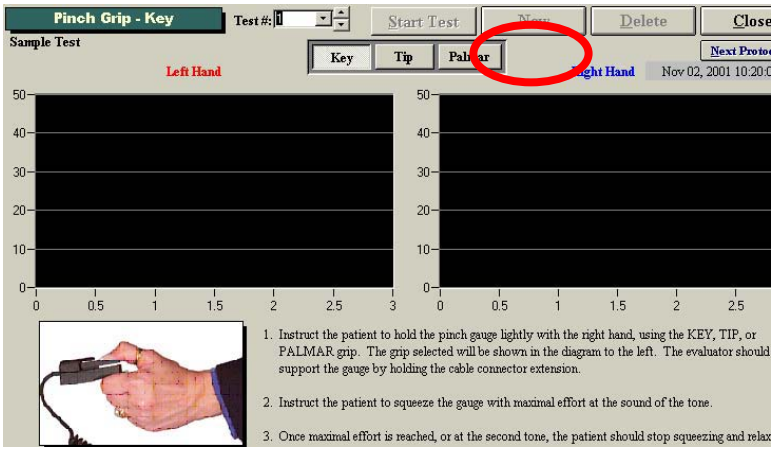
Protocol Information

Key Pinch:

The Key Pinch strength test is performed as per the protocol outlined in published research (refer to abstracts on ODES CD). This pinch dynamometer measures strength in the key (lateral) pinch position of both the right and left hands.

To access the test from the ODES main menu, go to Strength Test and select Pinch Grip from the list on the left-hand side of the page. Within this testing page, you will find a row of buttons located at the top labelled 'Key,' 'Tip,' and 'Palmar.' These buttons correspond to the three types of Pinch Grip tests.

Click Key to perform a Key Pinch Grip Test.



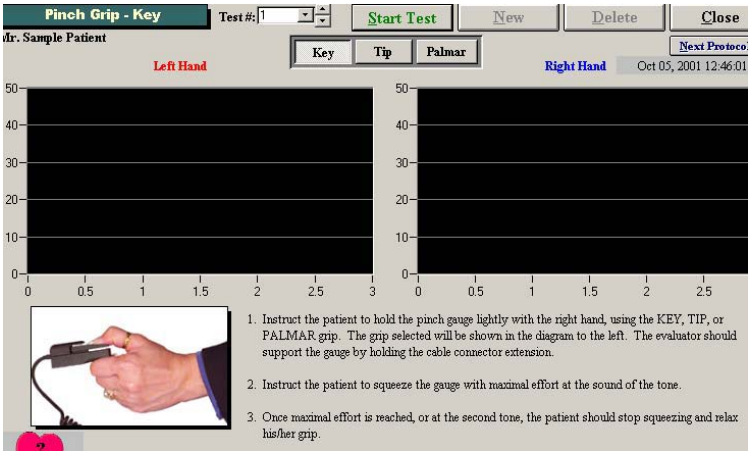
The "Pinch Grip – Key" screen has two grids for real-time graphs of the left and right hand strength curves. Each grid contains three reference lines that represent the normal values as well as upper and lower limits for the client, based on their age and gender, and hand dominance. This information is obtained through the information the evaluator provides in the Client Information screen of ODES. The correct gender, date of birth and hand dominance of the client must be entered when performing these tests to ensure accurate and complete data analysis.

Instruct the client to hold the Pinch Grip dynamometer between the thumb and the lateral aspect of the index finger, middle phalanx similar to how they would hold a key.

3. The client is in a seated position as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Hand & forearm in slight shoulder internal rotation (toward the centre front of the torso)
Forearm should not be resting on any surface while pinching

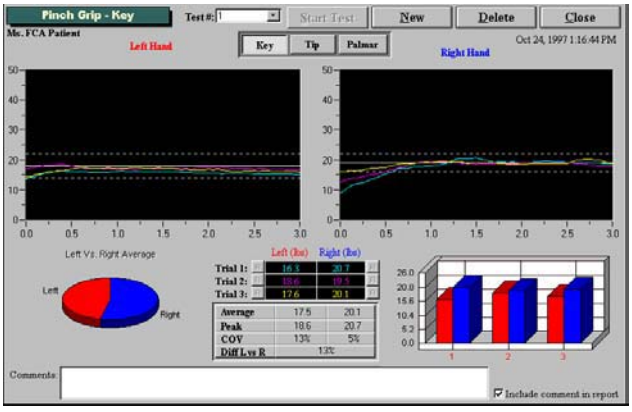
Click Start Test to start the Pinch Grip Test.



The client is required to perform three trials with each hand, beginning with the right hand and alternating with the contra lateral hand between trials. Voice prompts will guide the evaluator and the client through the test. Observe the client closely to ensure they understand and have assumed correct Key Pinch-type positioning.

When beginning the Key Pinch test, have the client grip the pinch gauge loosely. It is important that the client does not grip the pinch gauge firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce "Start test now," at which time the client may begin pinching the device in a smooth motion, steadily maintaining the Key Pinch grip for a three-second trial duration until prompted "Rest period," and directed to switch the device to the contra lateral hand. This process is repeated three times.

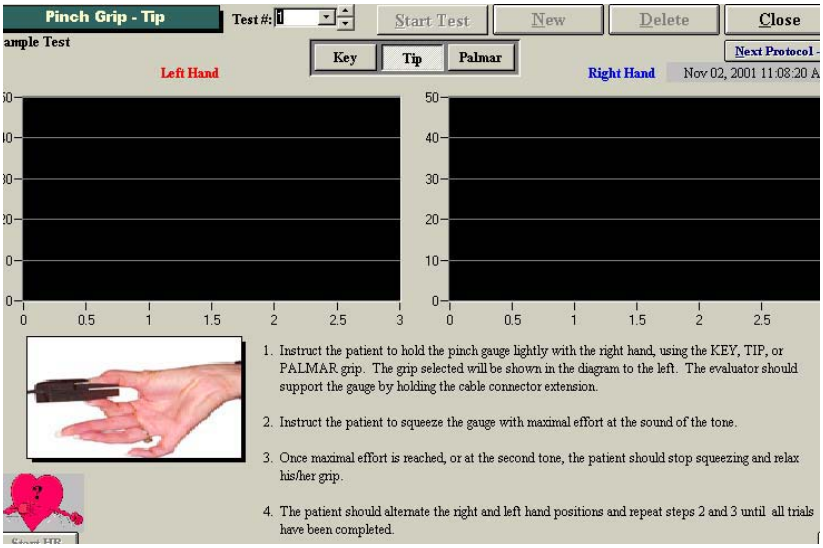
As with all interfaced test pages, data is automatically analyzed for the Key Pinch strength test. The average of the three trials is compared to published population normative values. A 'Comment' section is available at the bottom of the page. You may double-click the text box to increase its size as indicated by the length of your commentary. You have the choice to include or not include your comments in the report by selecting the 'Include comment in report' checkbox A summary of test results and comparison to normative values is provided in the report.



Tip Pinch:

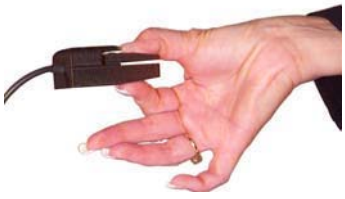
The Tip Pinch strength test is performed per the protocol outlined in published research (see ODES CD for abstracts) with a Pinch Dynamometer. This Pinch Grip dynamometer measures strength in the tip (tip-to-tip) pinch position of both the right and left hands.

Click Tip to perform a Tip Pinch Grip Test.



The Tip Pinch Grip screen has two grids for real-time graphs of the left and right hand strength curves. Each grid contains three reference lines that represent the normal values as well as upper and lower limits for the client, based on their age, gender and hand dominance. This information is obtained through the information the evaluator provides in the Client Information screen of ODES. The correct gender, date of birth and hand dominance of the client must be entered when performing these tests to ensure accurate and complete data analysis.

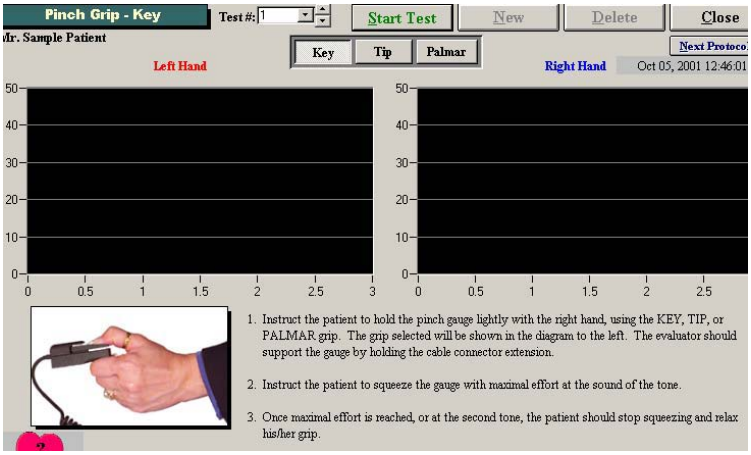
Instruct the client to hold the Pinch Grip device between the thumb tip and the tip of the index finger as shown below.



The client should optimally be in a seated position as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Hand & forearm in slight shoulder internal rotation (toward the centre front of the torso)
Forearm should not be resting on any surface while pinching

Click Start Test to start the Tip Pinch Grip Test.

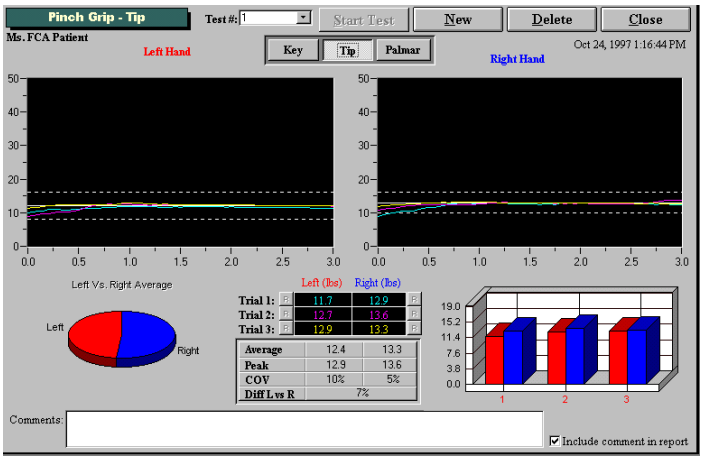


The client is required to perform three trials with each hand, beginning with the right hand and alternating with the contra lateral hand between trials.

Voice prompts will guide the evaluator and the client through the test. Observe the client closely to ensure they understand and have assumed correct Tip Pinch-type positioning.

When beginning the Tip Pinch test, have the client grip the pinch gauge loosely. It is important that the client does not grip the pinch gauge firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce “Start test now,” at which time the client may begin pinching the device in a smooth motion, steadily maintaining the Tip Pinch grip for a three-second trial duration until prompted “Rest period,” and directed to switch the device to the contra lateral hand. This process is repeated three times.

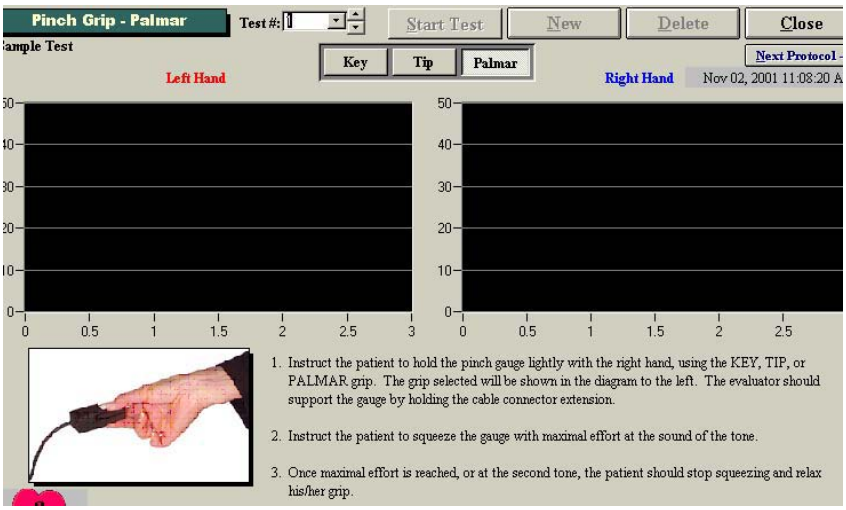
As with all interfaced test pages, data is automatically analyzed for the Tip Pinch strength test. The average of the three trials is compared to published population normative values. A “Comment” section is available at the bottom of the page. You may double-click the text box to increase its size as indicated by the length of your commentary. You have the choice to include or not include your comments in the report by selecting the “Include comment in report” checkbox. A summary of test results and comparison to normative values is provided in the report.



Palmar Pinch:

The Palmar Pinch Grip strength test is performed per the protocol outlined in published research (see ODES CD for Pinch Strength Protocol) with a Pinch Dynamometer. This Pinch Grip dynamometer measures strength in the Palmar Pinch position of both the right and left hands.

Click Palmar to perform a Palmar Pinch Grip Test.



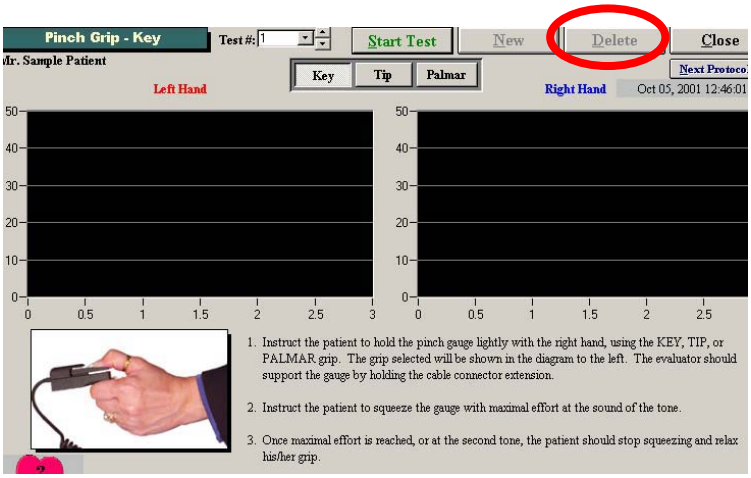
The "Pinch Grip – Palmar" screen has two grids for real-time graphs of the left and right hand strength curves. Each grid contains three reference lines that represent the normal values as well as upper and lower limits for the client, based on their age, gender and hand dominance. This information is obtained through the information the evaluator provides in the Client Information screen of ODES. The correct gender, date of birth and hand dominance of the client must be entered when performing these tests to ensure accurate and complete data analysis.

Instruct the client to hold the pinch dynamometer between the tip of the thumb and the tips of the index and middle fingers.

The client should be in a seated position as follows:

Both feet flat on the floor
Upper arm next to body
Elbow flexed at 90 degrees
Hand & forearm in slight shoulder internal rotation (toward the centre front of the torso)
Forearm should not be resting on any surface while pinching

Click Start Test to start the Palmar Pinch Grip Test.

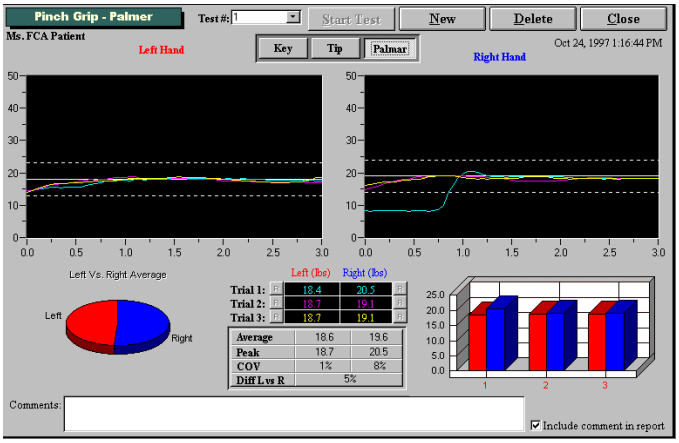


The client is required to perform three trials with each hand, beginning with the right hand and alternating with the contra lateral hand between trials.

Voice prompts will guide the evaluator and the client through the test. Observe the client closely to ensure they understand and have assumed correct Palmar Pinch-type positioning.

When beginning the Palmar Pinch test have the client grip the pinch gauge loosely. It is important that the client does not grip the pinch gauge firmly prior to beginning the test to ensure proper calculation of the starting threshold. The voice prompt will announce “Start test now,” at which time the client may begin pinching the device in a smooth motion, steadily maintaining the Tip Pinch grip for a three-second trial duration until prompted “Rest Period,” and directed to switch the device to the contra lateral hand. This process is repeated three times.

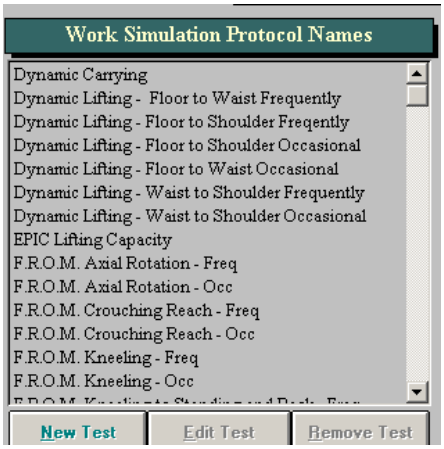
As with all interfaced test pages, data is automatically analyzed for the Palmar Pinch strength test. The average of the three trials is compared to published population normative values. A “Comment” section is available at the bottom of the page. You may double-click the text box to increase its size as indicated by the length of your commentary. You have the choice to include or not include your comments in the report by selecting the “Include comment in report” checkbox. A summary of test results and comparison to normative values is provided in the report.



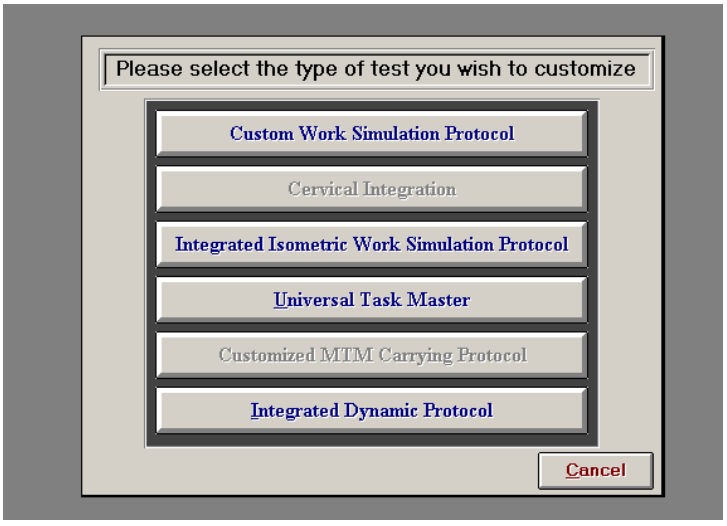
Make sure that you press the next Pinch Grip test (i.e. key, Tip or palmar) before hitting the "Start" button. If not, you will repeat the same test that was just

Creating A Custom Pinch Grip Test:

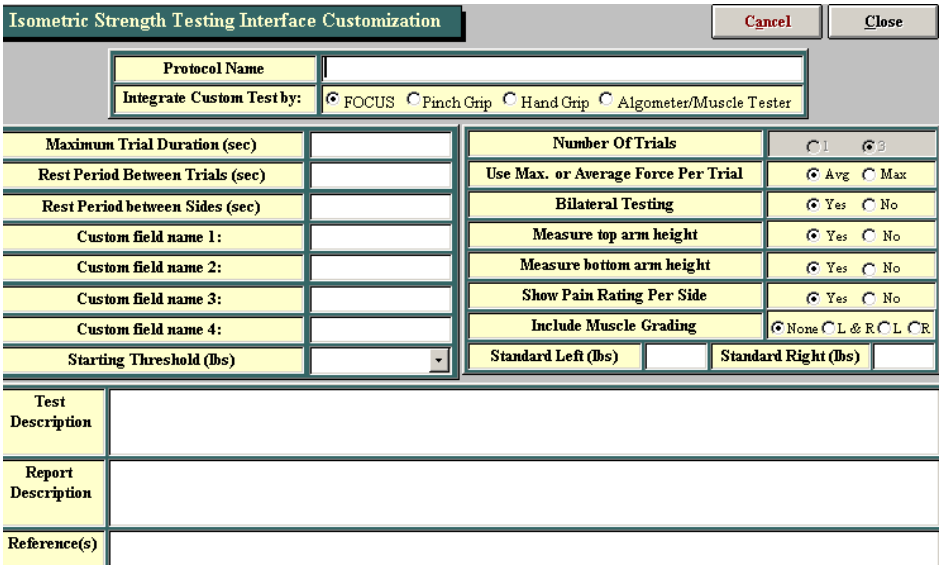
The ODES software allows for the creation of custom protocols. To do so, from the ODES main menu go to either the Strength Tests or Work Simulation Tests pages from which tests can be chosen. In this case, we have entered the Work Simulation page. Along the bottom is a button labelled New Test. Click New Test to begin creating a new protocol.



After selecting this option, the following page will appear:



Click on Integrated Isometric Work Simulation Protocol or Integrated Isometric Strength Protocol, depending on from which page you are creating the new test. A page will be displayed which allows you to input all of the essential protocol information.



Select the tool you wish to use for this particular test and add in the protocol name. The maximum trial duration, rest period between trials, and rest period between sides will be based on the type of test you are trying to create. If you are trying to develop a strength test, consideration needs to be made regarding the fatigability of the muscle(s) you are trying to test and the rest period created must be sufficient to regain energy supplies. Generally a 3 second trial duration, with a 5 second rest period between trials and a 5 second rest period between sides are acceptable parameters for testing muscle strength. If developing the test to simulate a specific activity, set the parameters based on the task you are trying to simulate. The closer the test is to the task the more valid the results will be.

Once all of the vital information is completed on this screen click Close. Your test should now appear in your protocol listing under the protocol name.

The BTE Algometer

Force Measurement

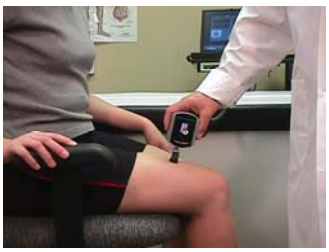
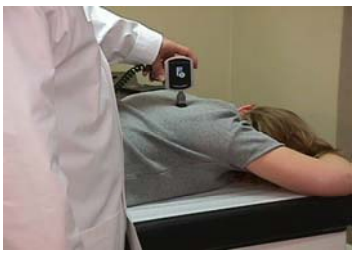
The main force measurement device can accurately document values from 0—500 lbs. The device itself is accurate to 0.037% over the full scale and when combined with the software and other components are accurate to 0.2% over the full scale (i.e. within one pound at all times).

Cables

BTE uses high grade cabling to ensure the durability of its connections.

Protocols

The pressure Algometer can be used for manual muscle testing or for evaluating the consistency of a client's self-report of pain. The pressure Algometer is an excellent tool in documenting point-tenderness, especially in chronic pain clients. The pressure Algometer can also be used to develop customized work simulation protocols.


Job Site Analysis—The pressure Algometer can be used to document the weights and forces required at the workplace. This is ideal when you need to determine these measures prior to performing a functional evaluation.





Design

This tool is made of aluminum and documents values via a load cell device. There is a fixed bolt in one end, and a bolt can be added at the other end so that attachments can be fixed to both ends of the tool.

Accessories

The pressure Algometer comes with a round pad, a large concave manual muscle testing pad, a small rectangular muscle testing pad, a 1 cm squared point tenderness testing pad, a single handle, a straight bar, a clip, small and large corner accessories, an extension piece, a nylon strap, and a bolt. Depending on the year and the type of system purchased, the accessories below may vary.

Round Pad:

Concave Pad:

Rectangular Pad:

Tenderness Testing Pad:

Single Handle:

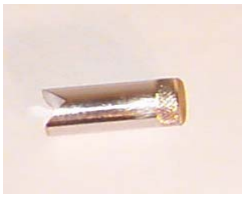
Push/Pull Bar:

Clip:

Small Corner Accessory:

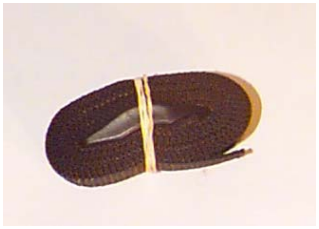
Large Corner Accessory:

Calibration Tool (Pinch Grip or Algometer):



wt = 0.4 lbs

Strap Attachment:



Bolt:

Extension Piece for Hard to Reach Areas:

Factors To Take Into Consideration:

There are several factors that need to be taken into account when developing an isometric strength test. The evaluator should ensure that the test isolates the targeted muscle group and that it reduces the amount of accessory muscle use.

Types of Strength Protocols

The ODES™ 2002 software has many Strength protocols pre-programmed into the software. These tests include:

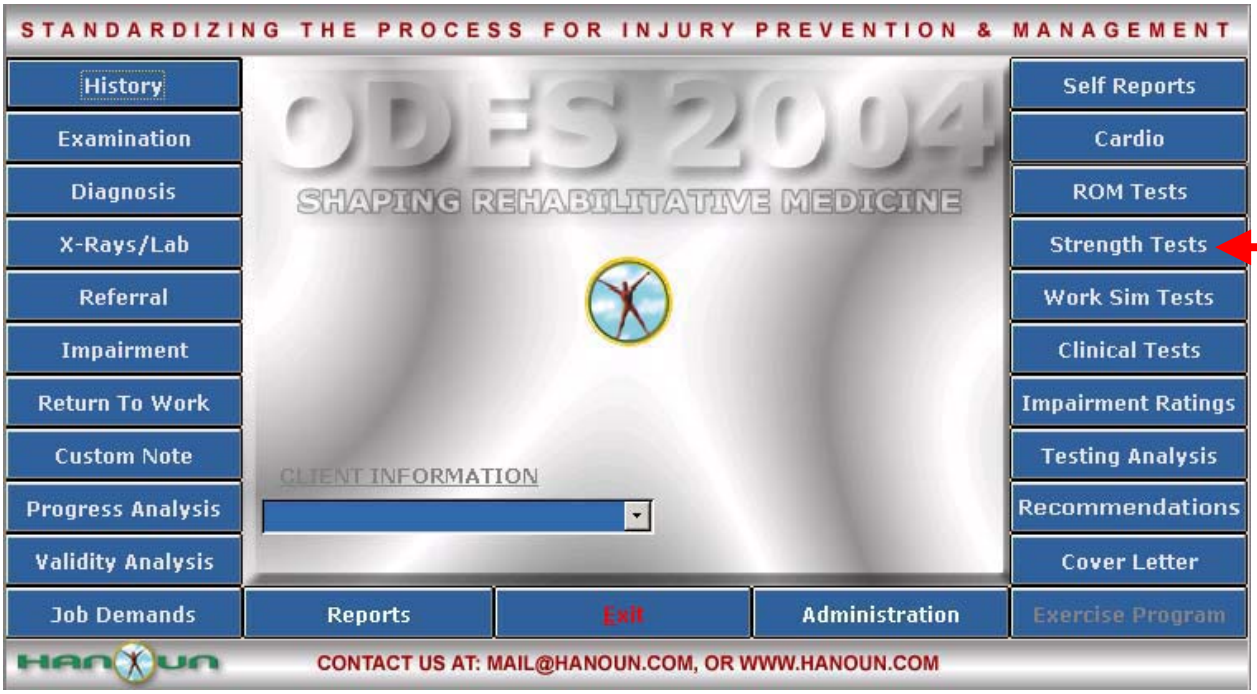
Spinal strength tests such as Cervical Neutral Flexion, Extension and Side Flexion

Upper Extremity strength tests such as Wrist Flexion and Extension, Elbow Flexion and Extension, Shoulder Flexion, Extension, Abduction, Adduction, Internal Rotation and External Rotation

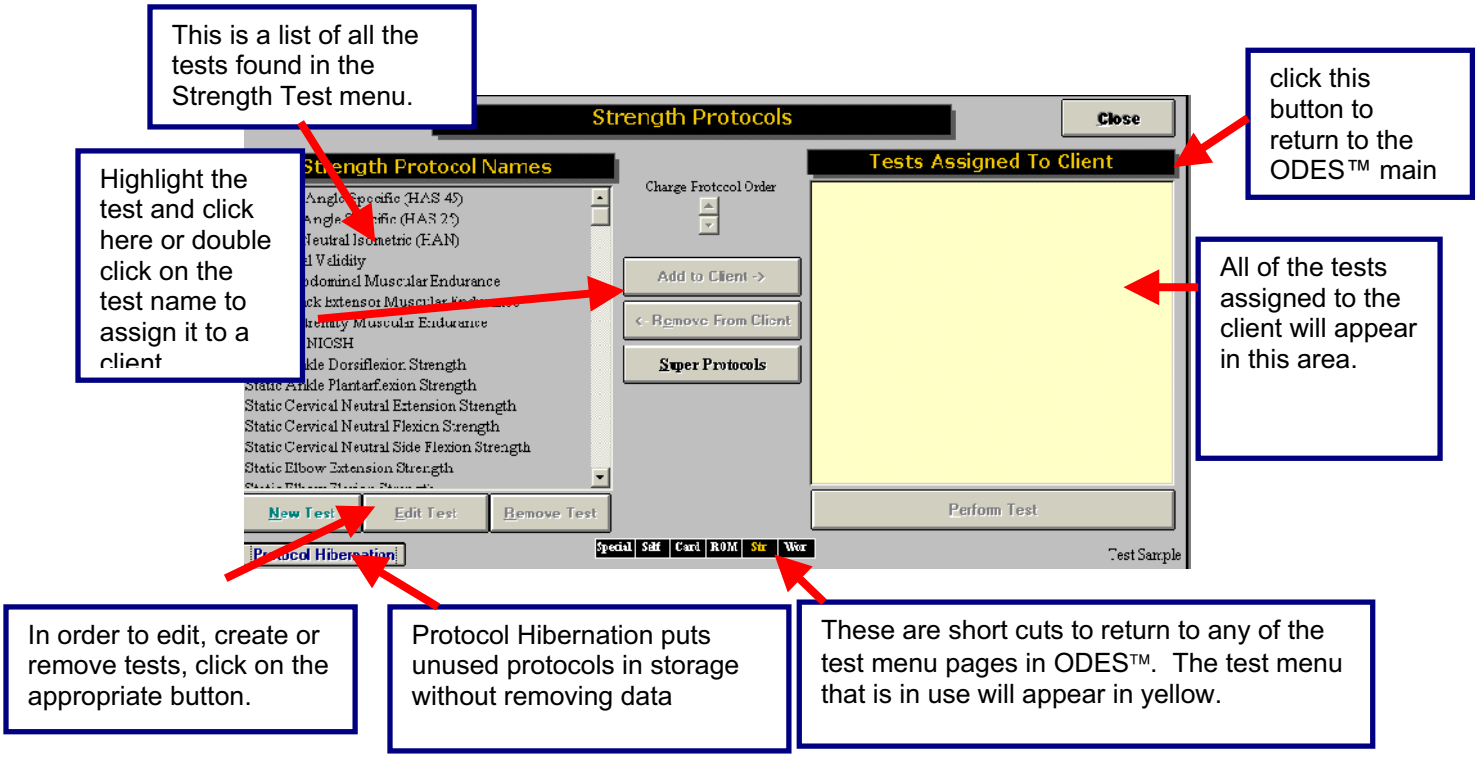
Lower Extremity strength tests such as Ankle Plantarflexion and Dorsiflexion, Knee Flexion and Extension, Hip Flexion, Extension and Abduction

The software also permits the user to customize a Strength test.

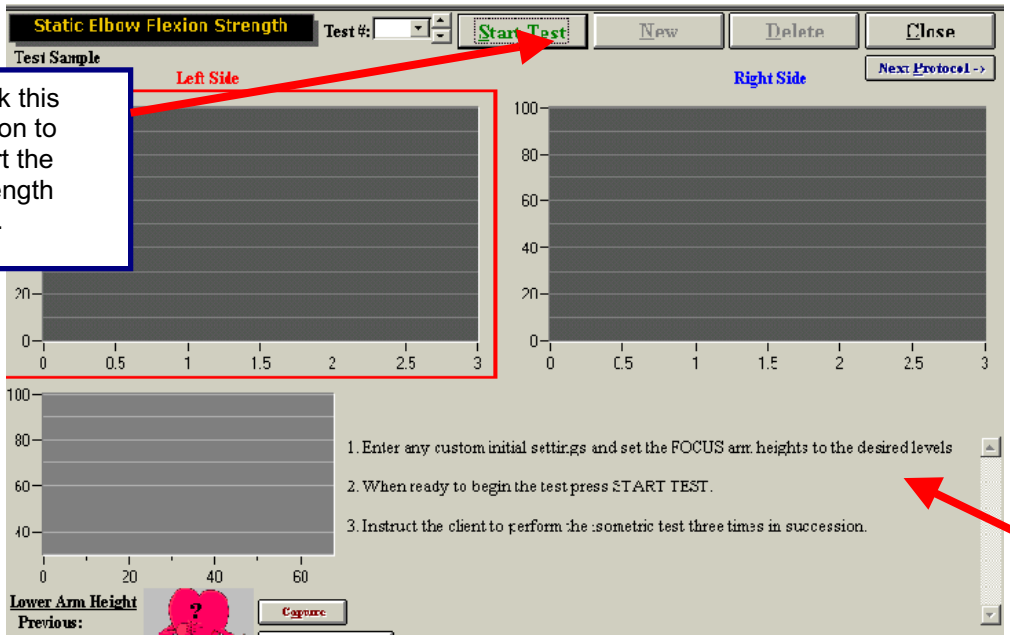
Using the Pressure Algometer for A Pre-Programmed Isometric Strength Protocol:



Click Strength Test from the main menu of ODES. This will bring you to the Strength Test page. From here, you have access to all of the pre-programmed strength tests. You can add tests to clients, create new custom isometric strength tests, edit tests and delete tests.



Once a test has been assigned to a client, and Perform Test has been selected at the bottom right-hand corner of the page (alternately, you may double click on the test name), your test page will appear.

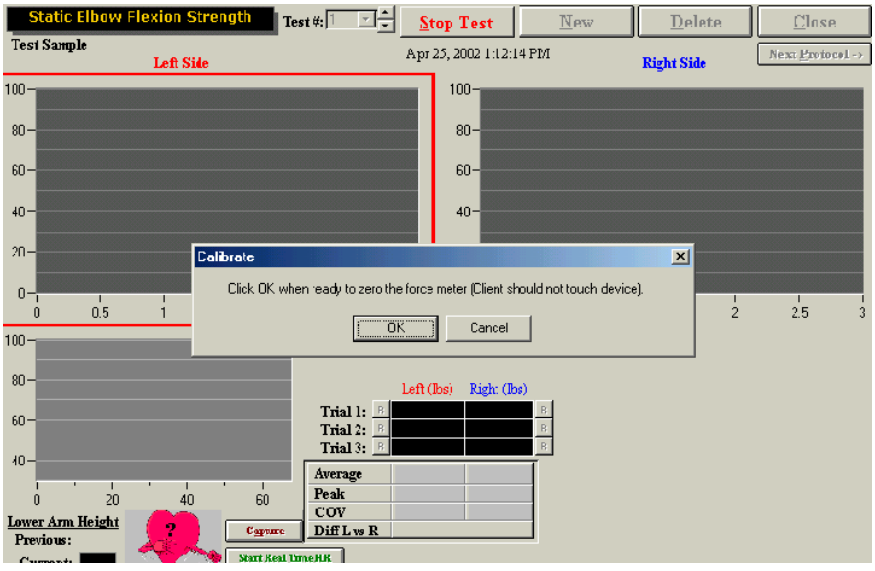


Click this button to Start the Strength test.

Click this button to return to the Strength menu.

Located in this area are the default or custom instructions for the corresponding test.

It should be noted that once the Start button is selected, a message will appear stating that the force meter needs to be zeroed. This is seen in the picture below. As there are many attachments for each load cell, ODES™ will account for the weight of the accessory attachment during each test. No force should be applied to the force meter.



It is important to note that only one device can be linked with a static test. For example, if you have done a static shoulder abduction strength test with the FOCUS unit, you will always have to use this device for this test. This ensures that the data being recorded remains objective. If you have a larger system (a FOCUS platform and an Algometer) you should create duplicate copies of the tests. This will allow you to utilize both pieces of equipment – the FOCUS and Algometer (since both devices can measure static strength). For example, you could name the existing cervical strength test in the database "Cervical Strength – FOCUS" and create another identical test and name it "Cervical Strength – Algometer." Each test would utilize a different tool. In order to understand this further, please see the troubleshooting section at the end of this manual. If you have a smaller system (such as the Evaluator or CIRES) you will only have an Algometer and will not have to create different tests.

Once the Algometer has been zeroed (i.e. no force applied to it), you are ready to begin the strength test. With the static strength tests, all trials are performed on the left side initially and then repeated on the right side.

The trial, date and time that the test was performed can be found at the top of the testing page.

The test results are displayed in a line graph

Avg., peak and COV values are listed for right and left comparison.

The difference between the left and right side is represented by both a pie chart and a bar graph. In addition, the total elapsed time is displayed.

The "R" represents a retest option for each trial that is performed by the client.

The comments button allows the evaluator to enter their observations from the test.

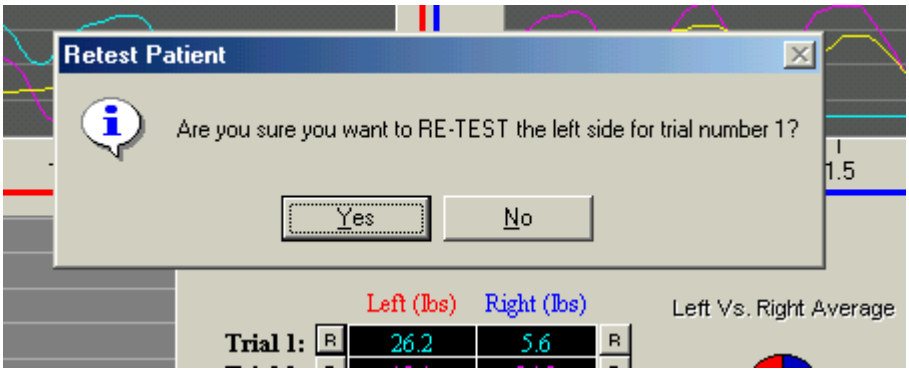
completed static shoulder abduction strength test. There are three trials on each side, each represented by a different colour. Trial number one is blue, trial number two is pink and trial number three is yellow.

Retesting Trials

If there is an error in technique, inconsistent effort, or poor performance at the start or finish of a test the trials can be re-tested. There is no set number of times that this option can be utilized.

The 'R' that corresponds with each trial is located at either the left or right of the initial result obtained. For example, for trial one on the left side of the body, the 'R' is located to the left of the result obtained by the client. To redo this trial, click the R.

ODES will then ask you if you would like to redo this trial. Click Yes and perform the trial again.

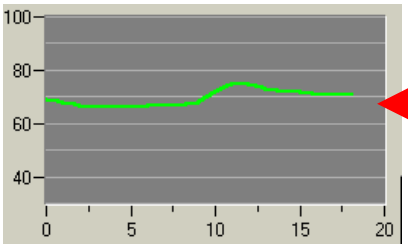


It is important to note that once you either close the testing page or create a new trial, the measurements that were obtained will be locked and you will be unable to retest any of the trials.

Checking the Heart Rate:

Recording the Heart Rate can be performed by either clicking the Capture button, or by double clicking on the heart graphic and entering the value manually (once you have entered the heart rate in the white box hit the enter key).

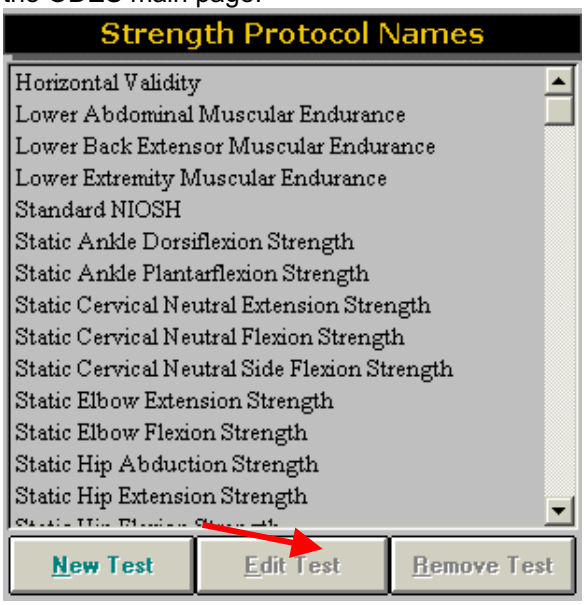
Click Start Real Time HR to start the real time heart rate function.



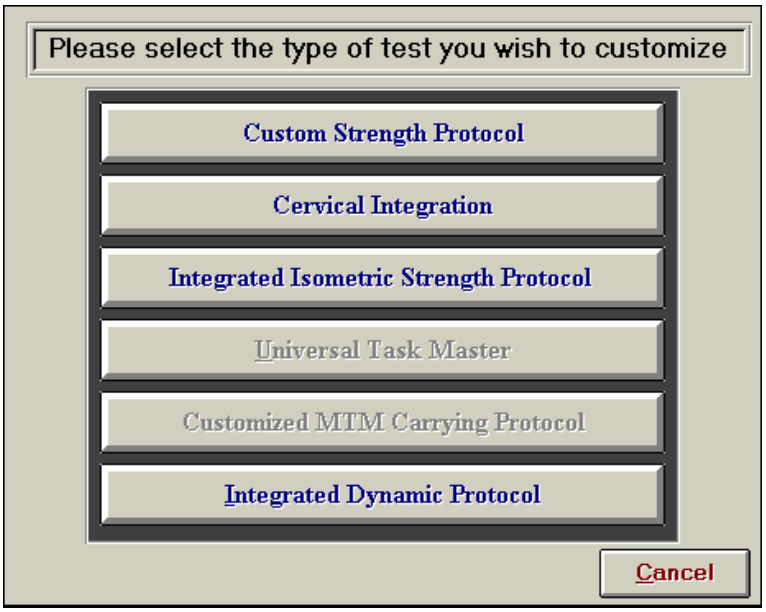
Real Time Heart Rate allows you to track the HR in a graph format. This is only for those who have the TEST, evalTECH, or ER Systems..

Creating A New Isometric Strength Protocol

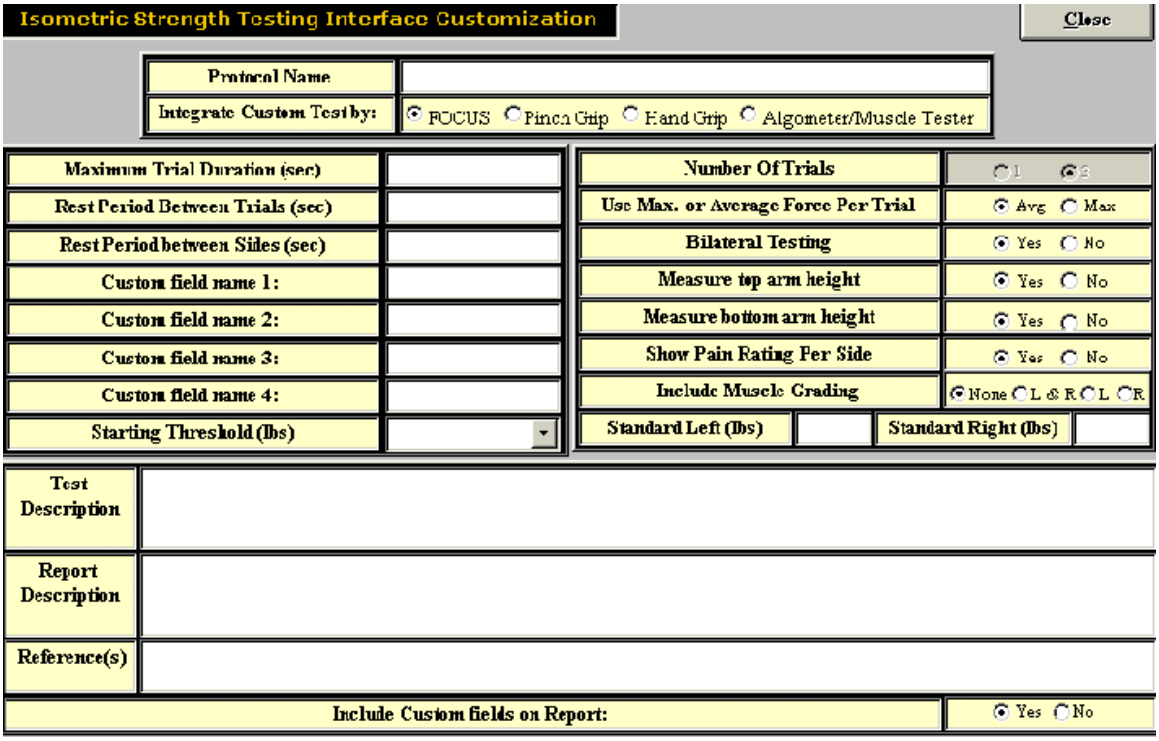
The ODES software allows you to create new protocols. To do so, open Strength Test | New Test from the ODES main page.



After clicking New Test, the following page will appear:



From this page, select the Integrated Isometric Strength Protocol option in order to begin customizing your new strength test. The customization page will be displayed, which will allow you to input all of the essential protocol information.



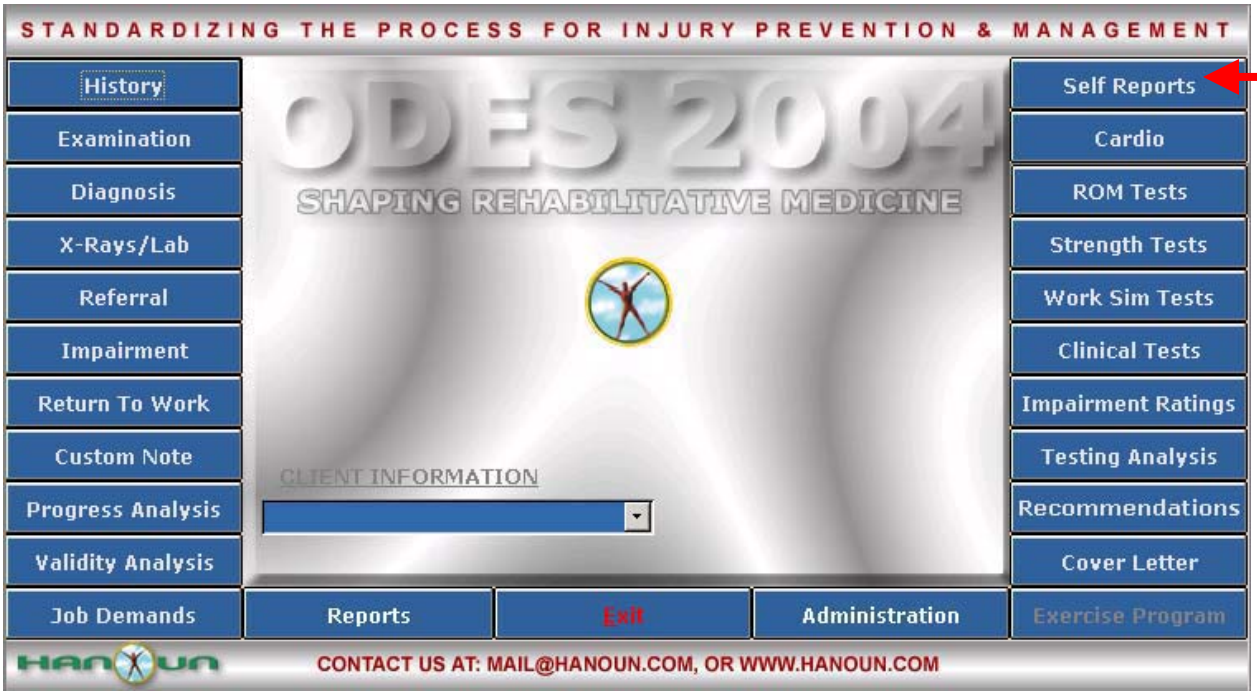
Once all of the vital information is completed on this page, click Close. Your test should now appear in your protocol listing.

Superficial Tenderness

With disorders, such as fibromyalgia, becoming more common in a clinical setting, two different superficial tenderness templates have been added into the ODES software.

For superficial tenderness testing, you will need the small square pad attachment for the Algometer.

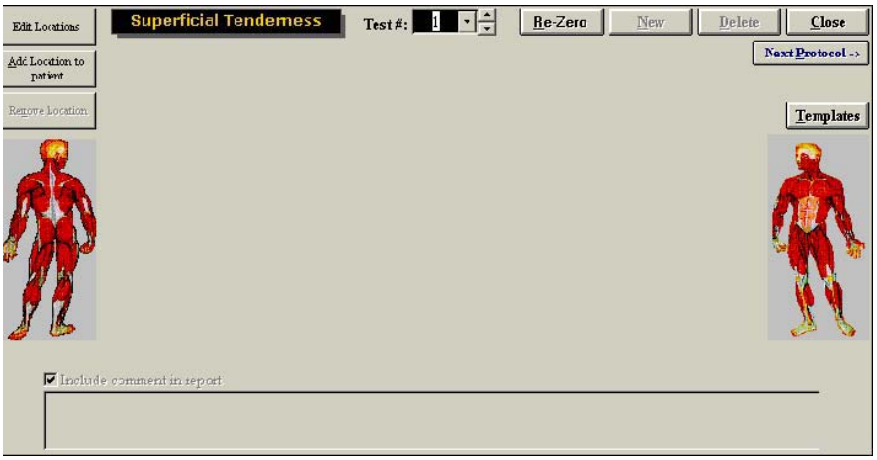
From the main screen of ODES, select Self Reports, located in the upper right-hand corner of the page.



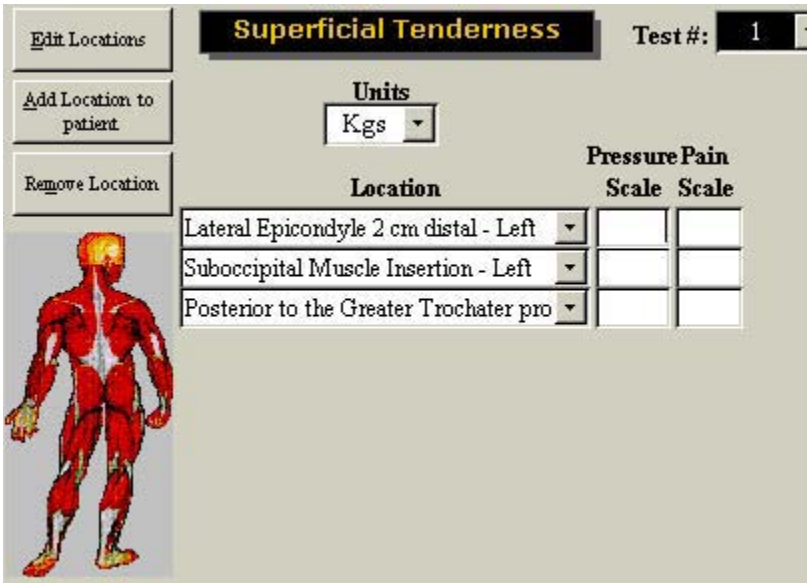
Within the Self Reports page, you will see Superficial Tenderness listed as an option. To assign the test to your client, you may either double click on the protocol name, or highlight it and click **Add to Client**.

Once the protocol has been assigned to your client, you can either double click Superficial Tenderness once again, or highlight the test name and click Perform Test.

The Superficial Tenderness Testing page will then be displayed.



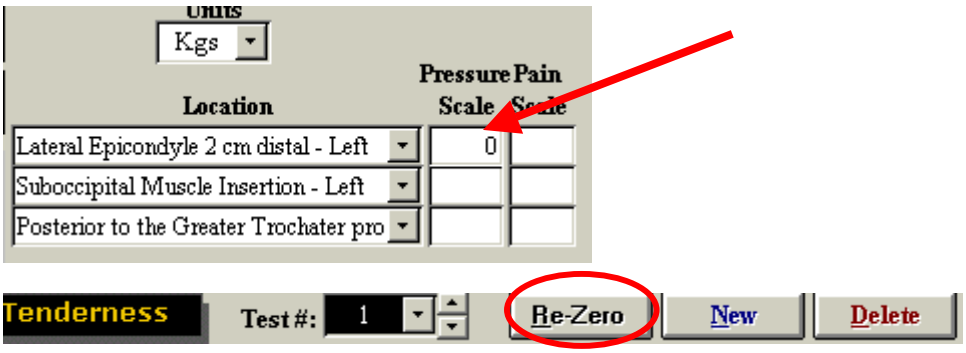
These buttons (below) allow you to Edit and Add new locations to your client for testing. If you choose to add a location to your client, you will be responsible for selecting the location and the units to be used. You may add multiple locations to make your assessment as specific as possible.



Results are recorded under the pressure scale heading once the test has begun. The evaluator needs to enter the client's pain scale rating here after each reading.

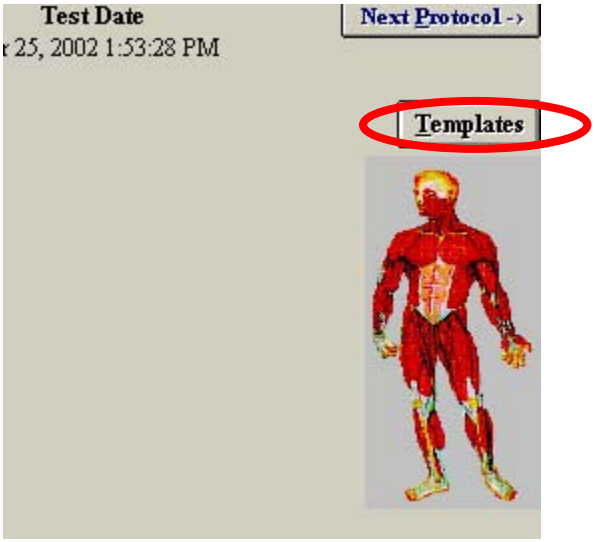
Once all of the locations have been selected and you are ready to perform a superficial tenderness test, you must first re-zero the Algometer (apply no weight).

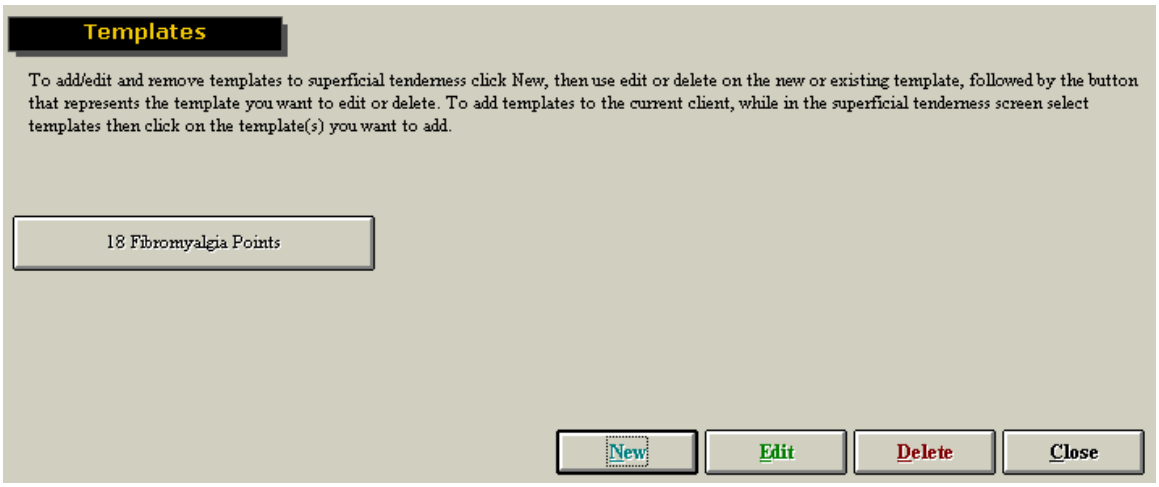
You may now begin testing. Make sure that your cursor is flashing in the first location underneath the Pressure Scale heading.



You can re-zero the device at any time by clicking on the re-zero button. You may also create new trials and delete old trials.

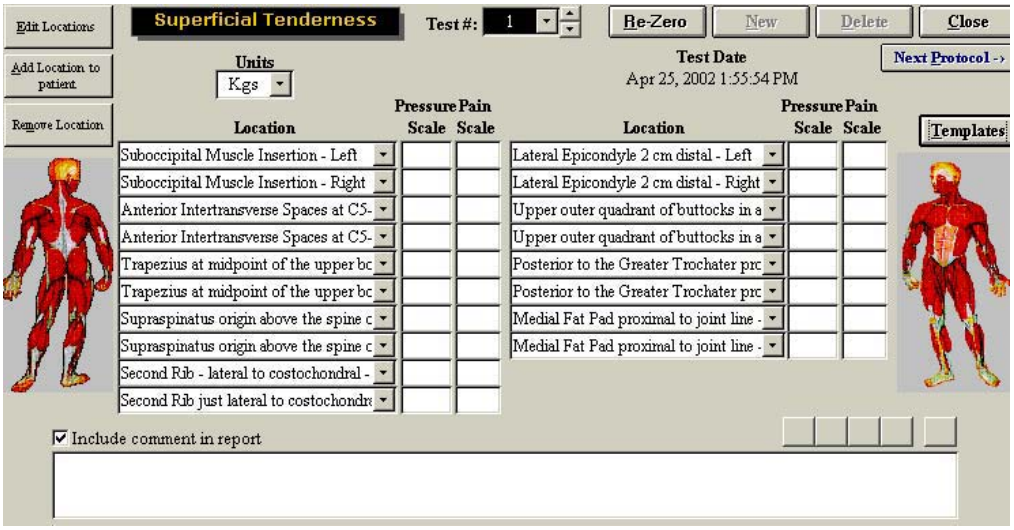
The ODES software also comes with a pre-programmed fibromyalgia template. To access this template, click Templates on the superficial tenderness page.





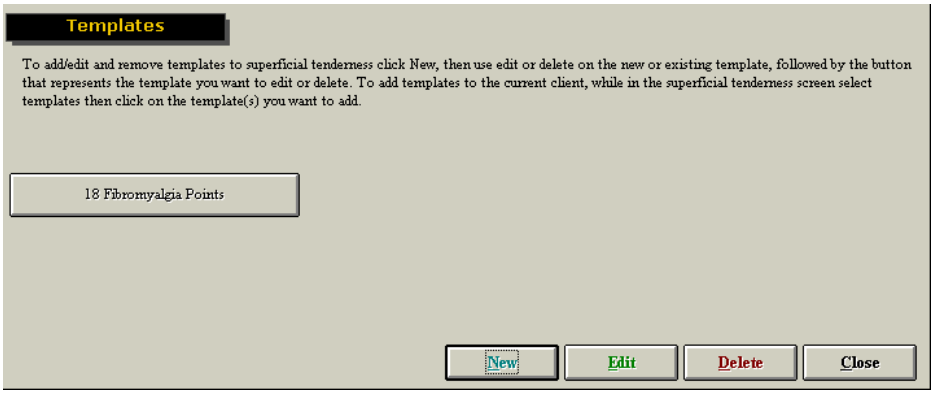
The template page allows you to create new templates, edit older templates and use the template for fibromyalgia. To access the pre-programmed fibromyalgia template, click on 18 Fibromyalgia Points.

You will now enter the testing page for fibromyalgia clients.

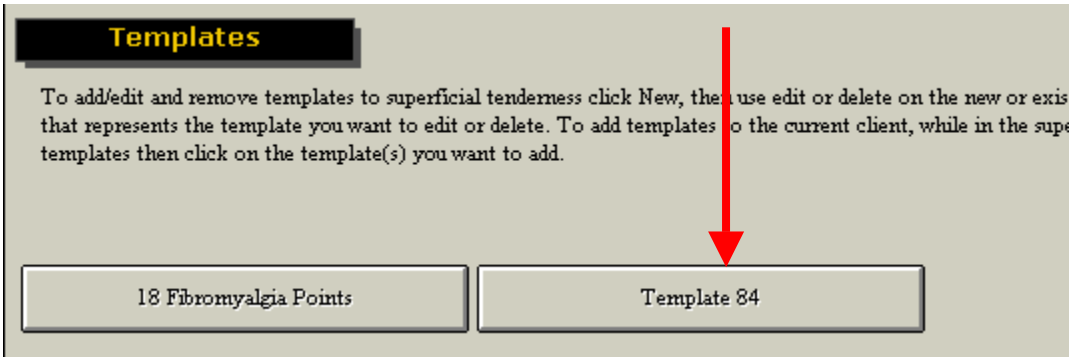


However, if you wish to create your own standardized protocol for superficial tenderness, you can create a new template. To do so, click Templates, located on the superficial tenderness page.

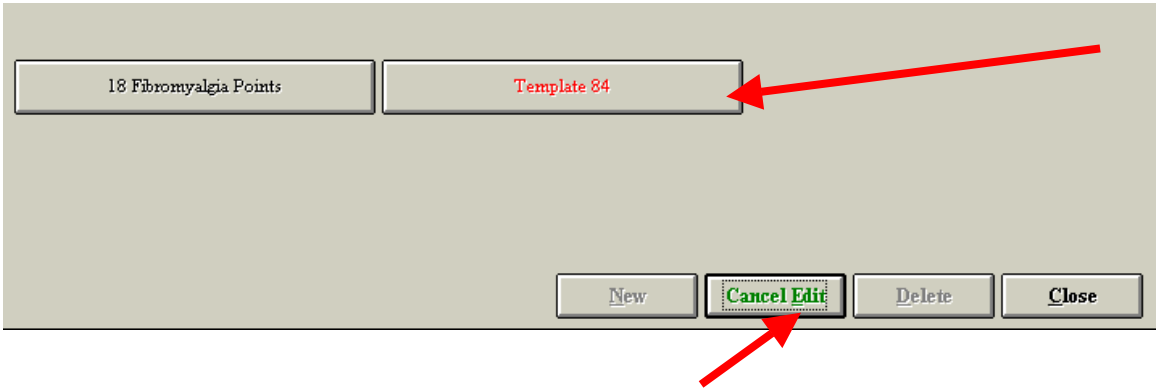
This will bring you to the template page.



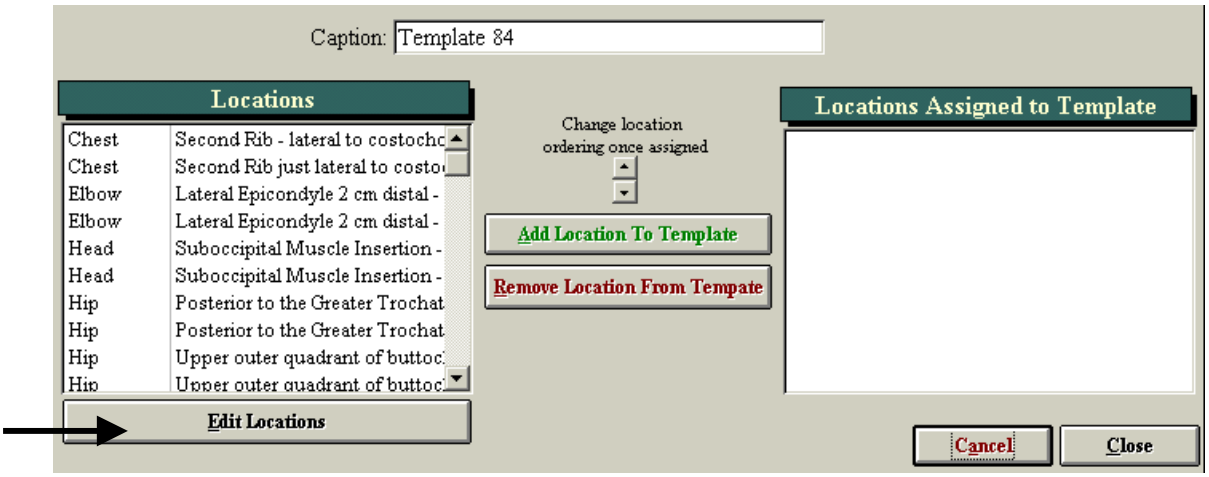
To create a new template, click New. You will now see another template button appear.



To edit/create this template, click Edit. You will now notice that the button changes to green 'Cancel Edit' and that the number template changes color to red (when you place your cursor on it).

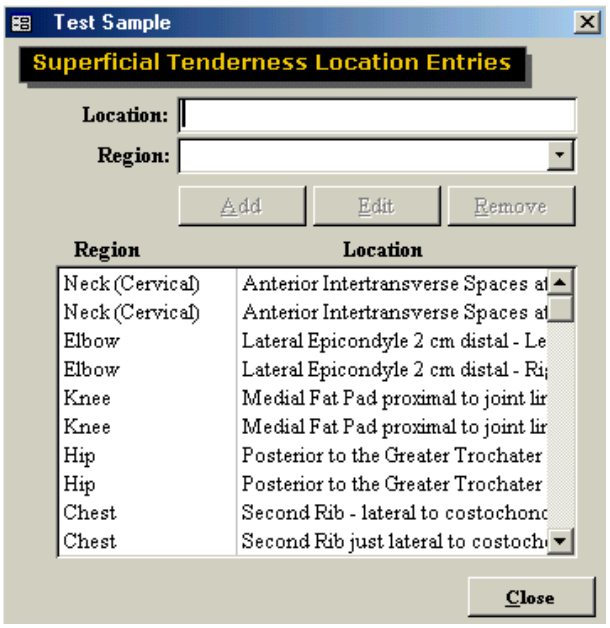


Click on the template (in this case Template 84) to begin customizing your own protocol. The following page will be displayed.



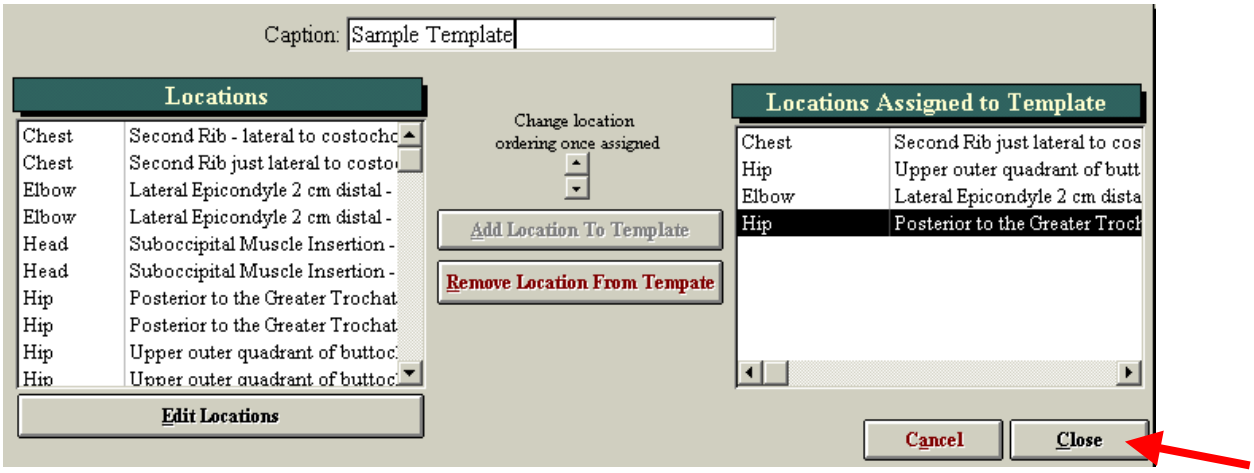
This page allows you to name the protocol, add and remove locations so that you can create a custom superficial tenderness template. If the location you wish to add is not in the current list, you may add additional locations by clicking Edit Locations.

If you choose to add new locations (by clicking on the Edit Locations button), the following page will appear.

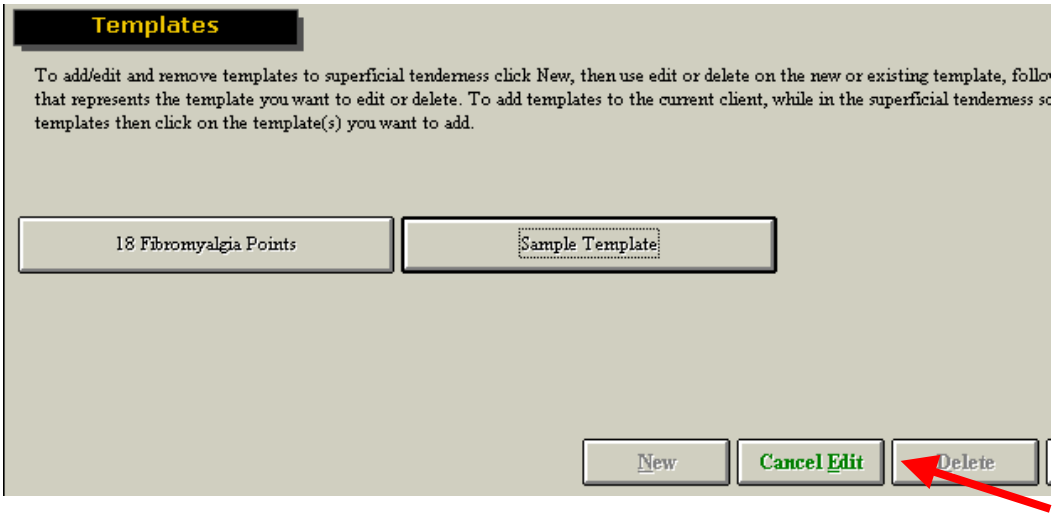


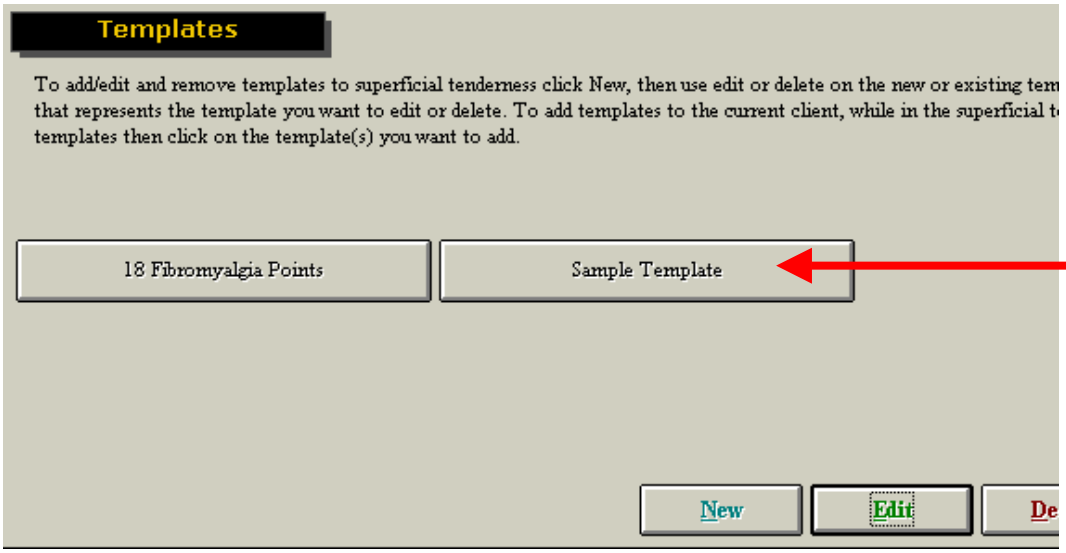
You can now further customize your location list.

When you have added all the locations you wish to have in your template, and placed them in the correct order, you may click Close to complete the template.



Your template will now appear with the correct title. To finish template creation and to view your new template, click Cancel Edit and then select your template.


Templates
To add/edit and remove templates to superficial tenderness click New, then use edit or delete on the new or existing template, follo
that represents the template you want to edit or delete. To add templates to the current client, while in the superficial tenderness sc
templates then click on the template(s) you want to add.
18 Fibromyalgia Points
Sample Template
New
Cancel Edit
Delete


Templates
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that represents the template you want to edit or delete. To add templates to the current client, while in the superficial t
templates then click on the template(s) you want to add.
18 Fibromyalgia Points
Sample Template
New
Edit
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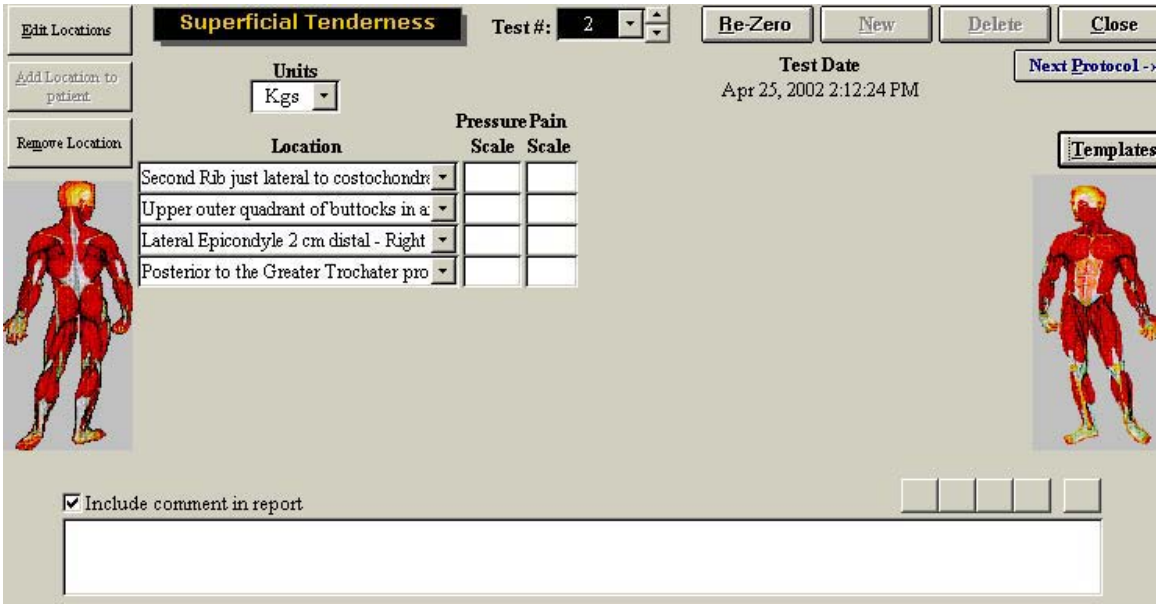
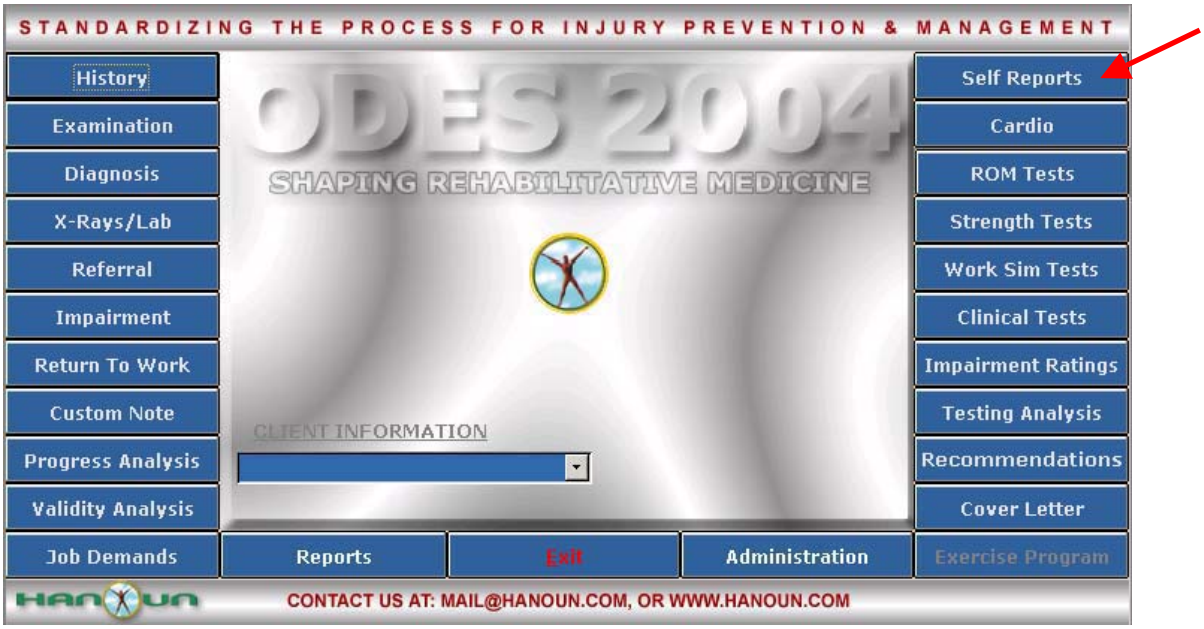

Edit Locations
Add Location to patient
Remove Location
Superficial Tenderness
Test #: 2
Re-Zero
New
Delete
Close
Units
Kgs
Test Date
Apr 25, 2002 2:12:24 PM
Next Protocol ->
Templates
Location
Pressure Scale
Pain Scale
Second Rib just lateral to costochondr
Upper outer quadrant of buttocks in a
Lateral Epicondyle 2 cm distal - Right
Posterior to the Greater Trochater pro
Include comment in report

It is important to note, that if locations are added to the client, they will always appear with that case. The maximum number of locations that can be added is 20. If you have already added this many locations to your client, you will not be able to add any more. You will have to create a second case for your client.

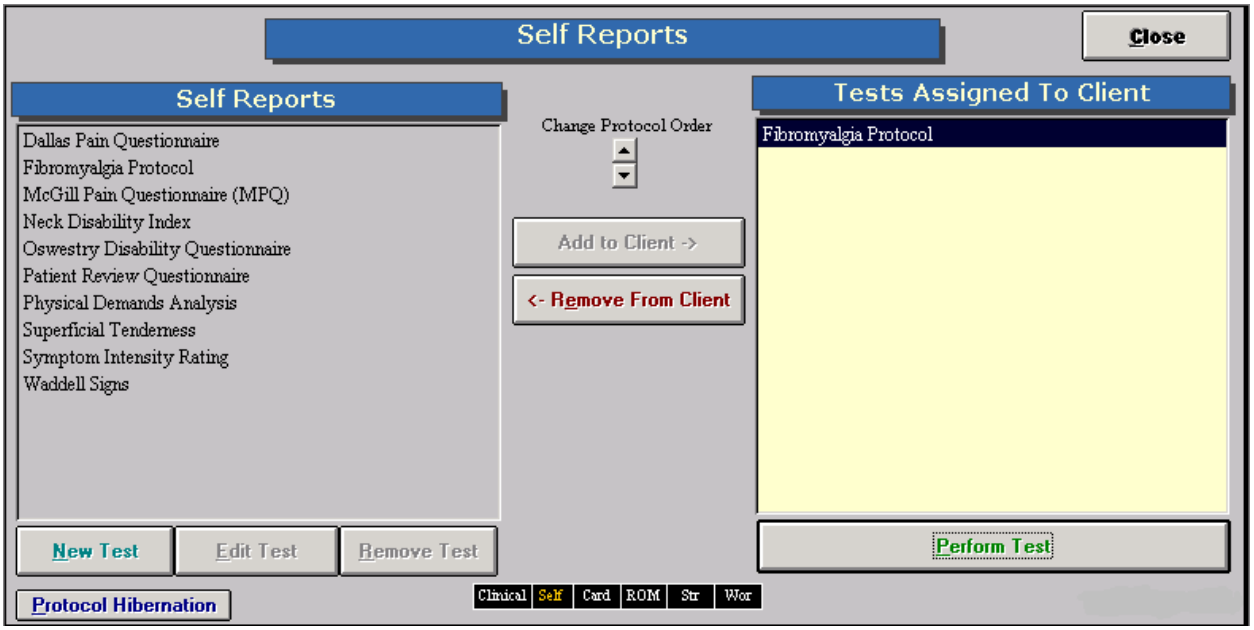
Fibromyalgia Protocol

The Fibromyalgia Protocol was developed specifically to test the 18 points used for diagnosis of this condition.

From the main screen of ODES, select Self Reports, located in the upper right-hand corner of the page.

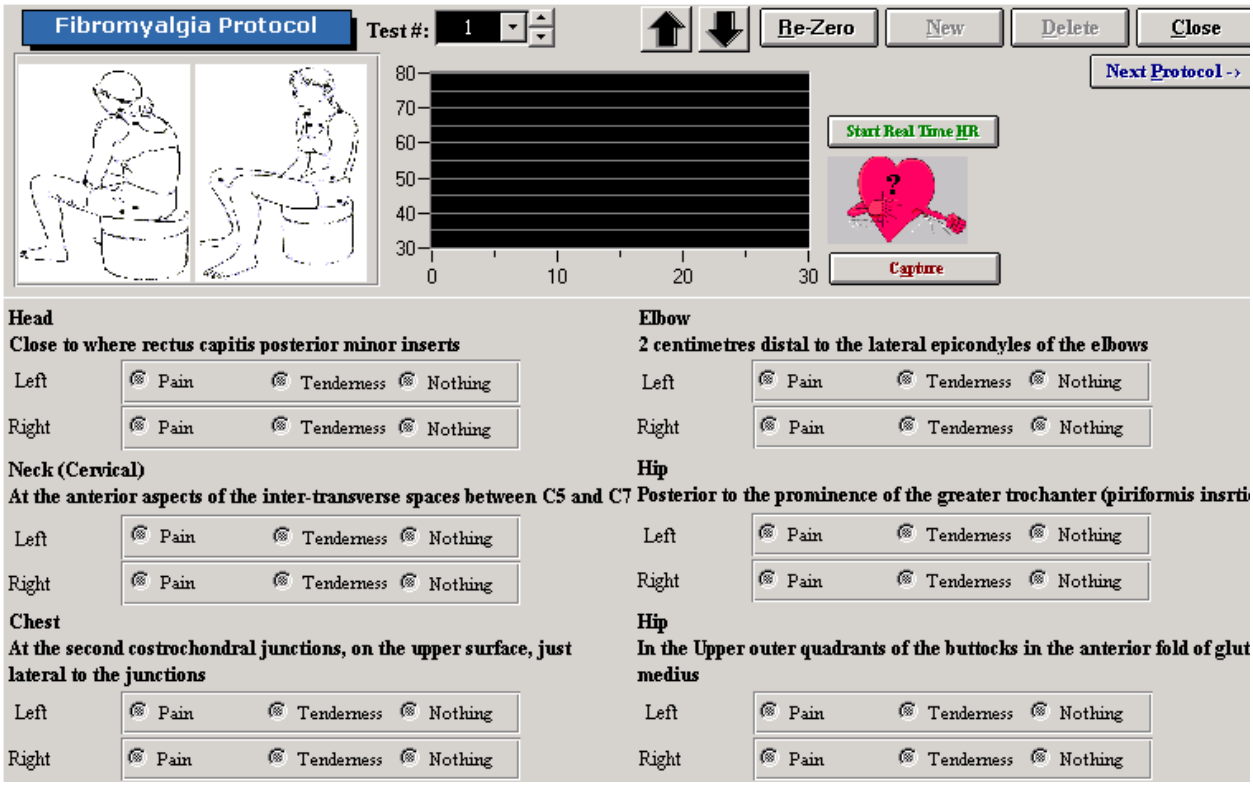


Within the Self Reports page, you will see Fibromyalgia Protocol listed as an option. To assign the test to your client, you may either double click on the protocol name, or highlight it and click Add to Client.

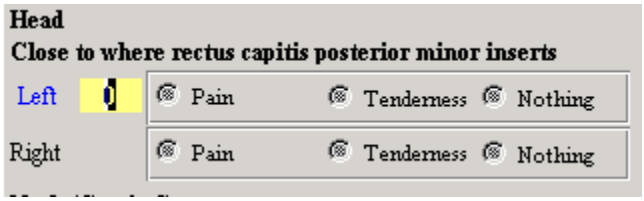


Once the protocol has been assigned to your client, you can either double click Fibromyalgia Protocol once again, or highlight the test name and click Perform Test.

The Superficial Tenderness Testing page will then be displayed. Click on Start Real Time HR if you would like to record the client's heart rate throughout the test. Click on Capture if you would like the heart rate to be captured as part of the Heart Rate Report.



Double click on the location you wish to test (Left). In this example the left side of the head is about to be tested. A yellow box will appear and the value being measured by the algometer will appear. To re-zero the algometer click on Re-Zero.



Once the force measurement has been obtained indicate whether the client experienced pain, tenderness or nothing. If the client experienced pain, once selected you will be prompted to enter a value for the pain rating.

ER Platform

ER incorporates a system of fully adjustable shelves, graded rulers and accessories to evaluate numerous occupational task demands.

The ODES diagnostic software provides the advantage of objective evaluation through computer integration.

The ER Platform has many features and capabilities.

Most of the adjustments that the evaluator will perform through the ER Platform will occur on the stand or one of its arms.

This manual will demonstrate the versatility of the ER Platform. The evaluator is able to combine various hardware and software features to simulate almost any functional task. Many tests have already been designed and programmed into the ODES software.

The ER Platform has markers every 5 inches that can be used independently or in combination to simulate unlimited functional tasks.

Standard Accessories

These are the standard accessories that are included with the ER.

2 Accessory Arms attached to the ER Platform
2 Lifting Shelves
Industry crate
Masked weights (2X15lbs, 2X5lbs, 7X10lbs)
Multiplanar accessory housing joint (single load cell)
Universal Taskmaster
Heart rate monitor (chest belt)
Heart Rate transmitter
Heart rate receiver
Goniometer (with short and long arms)
Dual Inclinometers
Handgrip dynamometer
Pinch grip dynamometer
Algometer
Strength testing pad
Narrow palmar grip handle
Wide palmar grip handle
Narrow double handle
Wide double handle
Single handle
Bar

The ER stand has two *accessory arms* that can be adjusted to any height, within the respective ranges, and rotated in various planes. This enhances the versatility of the ER. All of the ER accessories can be attached to the arms, to create tasks as individualized as the person who is being assessed.

Masked Weights

The weights can be added to the crate progressively to increase a task demand during functional testing. Different colors at the ends of the weights indicate the weight amounts.

The labels are color coded as follows:

Color	Weight
Yellow	5 lbs.
White	10 lbs.
Red	15 lbs.

Narrow and Wide Handles

The narrow and wide handles can be used for push, pull, static lift assessment, or customized tests. Protocols preprogrammed into ODES indicate to the evaluator when to use these handles; however, customized assessment protocols may be developed.

Narrow and Wide Palmer Grip Handles

The narrow and wide palmar grip handles can be used instead of gripping bars for push, pull, static lift assessment, or customized tests where the hands are in the palmar grip position.

Single Handle

The single handle can be used for many one-handed or task-specific activities.

Straight Bar

The straight bar can be used as an alternative to the double handles or during customized tests that require working with a bar or similar object(s).

Multiplanar Accessory Housing Joint

All accessories are attached to the ER arms through the Multiplanar Accessory Housing Joint. Prior to attaching or removing any accessories, become familiar with the components of the Multiplanar Accessory Housing Joint.

The Multiplanar Accessory Housing Joint can be attached to the upper or lower arm of the ER. It contains a load cell, which measures forces applied through many of the ER accessories.

The Multiplanar Accessory Housing Joint includes a unique hinge joint in its design. This joint, coupled with the Multiplanar Accessory Housing Joint's ability to rotate in horizontal planes parallel and perpendicular to the client, allows for limitless testing possibilities.

When facing the ER Stand, located on the right hand side of the upper or lower ER arm is a short black handle. Above this handle is a round silver pin. These two components are used to attach the Multiplanar Accessory Housing Joint to either of the ER arms.

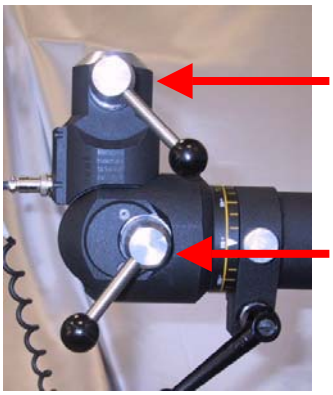
Attaching the Multiplanar Accessory Housing Joint

1. Locate the short black handle on the right-hand side of the upper or lower ER arm. The right side refers to the right when facing the ER stand.
2. Grip the handle and rotate it approximately ¼ turn in a counter clockwise direction. If this handle is overturned it will disengage and fall off the ER arm. A ¼ turn is all that is necessary when attaching the Multiplanar Accessory Housing Joint.
3. Locate the round silver pin (red arrow) above the black handle. Pull the pin outward (further to the right) and twist it gently in any direction.
4. Identify the cylinder at the end of the Multiplanar Accessory Housing Joint.
5. Insert this cylinder into the hollow end of the ER arm.
6. Relocate the silver pin at the end of the accessory arm and twist it gently until it clicks. This sound indicates that the pin has returned to its locked position. Note that the pin may be turned in any direction to lock it.
7. Relocate the short black handle and turn it slightly in a clockwise direction. The handle will come to a stop when it has locked the ER arm attachment mechanism.

Removing the Multiplanar Accessory Housing Joint

1. Locate the short black handle on the end of the upper or lower ER arm.
2. Turn the handle slightly in a counter clockwise direction. Only a ¼ turn is necessary. Overturning the handle may cause it to fall off.
3. Locate the round silver pin above the short black handle. Pull the pin outward (further to the right) and twist it in any direction slightly. This will unlock the attachment mechanism.
4. Grip the Multiplanar Accessory Housing Joint firmly and pull it out of the accessory arm.

Once the Multiplanar Accessory Housing Joint is attached to either of the ER arms, any of the standard accessories can be attached to it. When facing the ER Stand, with the Multiplanar Accessory Housing Joint inserted, there will be two handles on the right hand side of Multiplanar Accessory Housing Joint.



The handle on top is used when attaching and removing the various accessories.

The handle on the bottom is used when rotating the Multiplanar Accessory Housing Joint in a vertical plane, perpendicular to the floor. The function of this handle will be discussed later.

When using the short black handle at the end of the accessory arms, ensure that the handle is not overturned in a counterclockwise direction. Overturning will cause the handle to unscrew and fall off the accessory arm. When turning the handle in the counterclockwise direction to unlock it, only a ¼ turn is necessary.

Attaching and removing the ER Accessories

The figure below is of the Multiplanar Accessory Housing Joint, when viewed from the top. The front of the Multiplanar Accessory Housing Joint can be identified by a cord, which exits near the hinge of the joint. This cord attaches to the ER Data Acquisition Box, to register test results obtained when using the load cell.

Inserting an accessory into the Multiplanar Accessory Housing Joint

Locate the top handle on the right side of the Multiplanar Accessory Housing Joint. The right side refers to the side of the stand when viewing it from the front (i.e. the viewer's right side).

Give the handle an approximately ¼ turn in a counterclockwise direction. This will loosen the Multiplanar Accessory Housing Joint attachment mechanism.

Grip the handle, and pull it outward (further to the right), while maintaining a firm grip on it. This will unlock the accessory housing mechanism, by creating a space in the slot at the end of the Multiplanar Accessory Housing Joint. While holding the handle in this position, gently twist it in any direction. This will keep the handle in an unlocked position while you insert an accessory.

Select the accessory to be attached. On the end of the accessory there is a flattened side and a slightly rounded side.

Insert the accessory into the opening at the top of the Multiplanar Accessory Housing Joint, with the flat side of the accessory facing to the right (the side with the handle).

Grip the handle on the right-hand side of the Multiplanar Accessory Housing Joint and turn until a clicking sound is heard. This indicates that the handle has locked into the accessory. Now turn the handle in a clockwise direction, until it firmly secures the accessory into the Multiplanar Accessory Housing Joint mechanism.

Grip the accessory and shake it back and forth. The accessory should be firmly inserted, and not be loose in any way.

Removing an accessory from the Multiplanar Accessory Housing Joint

Locate the top handle on the right side of the Multiplanar Accessory Housing Joint.

Give the handle an approximately ¼ turn in a counterclockwise direction.

Grip the handle, and pull it outward (further to the right), while maintaining a firm grip on it, then turn it gently in any direction. This will unlock the accessory from the housing mechanism as well as maintain the space in the slot at the end of the Multiplanar Accessory Housing Joint.

Grip and pull the accessory until it separates from the Multiplanar Accessory Housing Joint mechanism.

Prior to performing any testing on clients, ensure that the Multiplanar Accessory Housing Joint is securely attached to the upper or lower accessory arm, and that any attachment used is firmly secured to the accessory housing mechanism.

ER Shelves

The ER system comes with two shelves to be used during a variety of functional tests. Each of the two shelves has a different attachment mechanism.

One of the shelves has an end that is similar to the end of all other accessories. It is therefore referred to as the Accessory Shelf. This shelf is used as an accessory during functional tests and attaches directly

into the Multiplanar Accessory Housing Joint. It can be used to measure force during lifting, carrying or other simulated tasks using the shelf..

The second shelf has an attachment at its base and can be inserted directly into either the upper or lower accessory arm of the ER. This shelf is inserted into the accessory arms of the ER in the exact same manner that the Multiplanar Accessory Housing Joint is inserted into the ER arms. Since this shelf is not attached to the Multiplanar Accessory Housing Joint, it is unable to measure force. This shelf is referred to as the Independent Shelf.

The accessory ER shelf attaches to the accessory arm through the Multiplanar Accessory Housing Joint.

The independent ER shelf attaches directly to the upper or lower accessory arm.

Both shelves have a safety strip at one end. This strip acts as a stopper for objects or weights placed on the shelf during testing, preventing the object or weight from falling off.

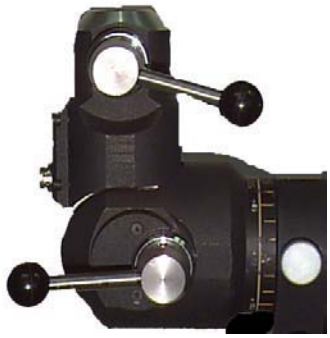
Attaching the Accessory ER shelf

Attach the Multiplanar Accessory Housing Joint to either the upper or lower accessory arm.

Locate the top handle (identified below by the arrow) on the right hand side of the Multiplanar Accessory Housing Joint.

Gently give the handle an approximately ¼ turn in a counterclockwise direction.

Pull the handle outward (further to the right) and twist it gently. This will create and maintain a space in the accessory housing mechanism.



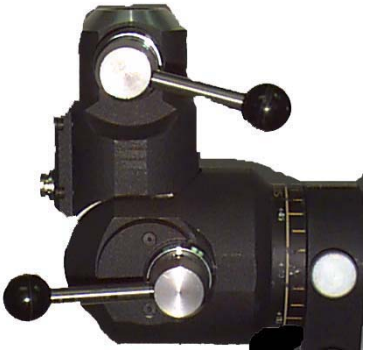
Lift the accessory ER shelf and observe its end. There is a rounded side and a flattened side on the end of the shelf. Insert the shelf with the flattened side toward the right side of the accessory housing

mechanism. The lip on the top of the shelf should be at the back to prevent the lifting crate from being pushed off the back of the shelf.

Twist the handle on the Multiplanar Accessory Housing Joint again until a clicking sound is heard. The shelf should be gripped with both hands and shaken gently to ensure that it is firmly secured within the accessory housing mechanism.

Removing the Accessory ER shelf

Locate the top handle on the right-hand side of the Multiplanar Accessory Housing Joint. Loosen the handle with a half turn in the counterclockwise direction. Pull the handle and twist a ¼ turn to release the pin from the shelf.



The shelf should be gripped and gently rocked it back and forth until it slides out of the accessory housing mechanism.

Attaching the Independent ER shelf

Identify the Accessory arm to which the ER shelf will be attached (upper or lower arm).Ensure that the Multiplanar Accessory Housing Joint is not attached to the desired arm.

Locate the short black handle on the right hand side of the accessory. Grip the handle and gently give it a ¼ turn in a counterclockwise direction. Locate the small silver pin adjacent to the short black handle. Grip the pin and pull it outward (further to the right). Twist the pin gently in either direction. Grip the independent ER shelf and slide its end into the opening of the accessory arm's end. Grip the short black handle and turn it clockwise until it locks. Grip the small round silver pin adjacent to the short handle and twist it gently until a clicking sound is heard.

Removing the Independent ER shelf

Locate the short handle on the right-hand side of the accessory. Turn the handle gently counter clockwise 1/8th of a rotation. Locate the small silver pin adjacent to the short black handle. Grip the small silver pin and pull it outward gently (further to the right). Twist the pin in any direction approximately ¼ turn. Grip the Independent ER shelf with both hands and gently rock it back and forth until it slides out of the accessory arm.

Horizontal Shelf Rotation

Whether the independent ER shelf or the accessory ER shelf is being used, the shelves can rotate in a horizontal plane parallel to the ground. Once the shelf is attached to an ER arm, it may be rotated to the left or right in increments of 45-degree angles. In order to rotate a shelf, follow these instructions:

Ensure that the shelf is firmly attached to an ER arm. Grip the shelf from its bottom and sides and pull upward until a clicking sound is heard or some give is felt in the shelf. Twist the shelf in the direction of desired rotation. A clicking sound will be heard at each 45-degree increment.

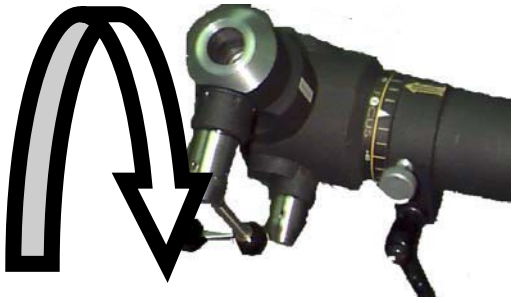
While the ER shelves can rotate 360 degrees in the horizontal plane, it is not recommended that testing be conducted with the shelf rotated 180 degrees. This places the safety strip at the front of the shelf, and may interfere with the safe placement of weights on the shelf during testing.

If any difficulty is experienced attaching the ER shelves, check the ends of the shelves to ensure that the Independent shelf is not attached to the Multiplanar Accessory Housing Joint, or that the Accessory shelf is attached directly to an ER arm.

Changing the location and orientation of ER accessories

Rotating the Multiplanar Accessory Housing Joint

The Multiplanar Accessory Housing Joint can be rotated in the sagittal and coronal planes. This allows you to create task simulations as individualized as your clients' needs.



Rotating the Multiplanar Accessory Housing Joint in the sagittal plane

Locate the handle furthest from you on the right side of the Multiplanar Accessory Housing Joint, near its hinge (The handle *closest* to you was used to insert and remove accessories).

Grip the handle and turn it in a counterclockwise direction, approximately ¼ turn. This will unlock the hinge portion of the Multiplanar Accessory Housing Joint.

While still gripping the handle, pull it outto the right.
While maintaining the handle in an unlocked position (do not let go of the handle), pull the Multiplanar Accessory Housing Joint forward or backward to reach the desired position. The joint will produce a clicking sound at increments of 22.5 degrees.

To identify the angular position of the Multiplanar Accessory Housing Joint, observe the ruler on its left side, opposite the location of the handle.

Once the Multiplanar Accessory Housing Joint is at the desired angle, release the handle back into the locked position and turn it in a clockwise direction until it is firmly secured.

Rotating the Multiplanar Accessory Housing Joint in the coronal plane

Once the Multiplanar Accessory Housing Joint is inserted into the appropriate ER arm, locate the short black handle at the end of the ER arm.

Turn the handle in a counterclockwise direction approximately ¼ rotation.

Locate the small silver pin adjacent to the short black handle.

Grip the pin and pull it out to the right.

While maintaining the pin in an outward position, twist it gently in any direction.

Grip the Multiplanar Accessory Housing Joint firmly and rotate it in the coronal plane to the desired angle. A ruler at the junction of the accessory arm and the Multiplanar Accessory Housing Joint indicates the angle of rotation. This ruler has markings at 2-degree increments and labels at 15-degree increments.

Once the Multiplanar Accessory Housing Joint has been rotated to the desired position, grip the small round silver pin and twist it gently until it returns to its locked position (tucked into the left). When you rotate the Multiplanar Accessory Housing Joint to angles of 90-degree increments (i.e. 90, 180, 270, and 360 degrees) the small silver pin will click into place to lock these angles into position. For all other angles, a click will not be heard, and the short black handle must be firmly secured to lock the Accessory Housing Joint in position.

Grip the short black handle and turn it in a counterclockwise direction until it is firmly tightened.

Prior to performing any testing, ensure that all handles are securely locked. When unlocking handles, only ¼ turn is necessary. Overturning will cause the handle to unscrew and fall off. When rotating the Multiplanar Accessory Housing Joint in the coronal plane, ensure that you do not pull out the Multiplanar Accessory Housing Joint or drop it.

Adjusting the height and orientation of the ER arms

The upper and lower arms of the ER can be moved up, down, and rotated in a horizontal plane parallel to the ER platform.

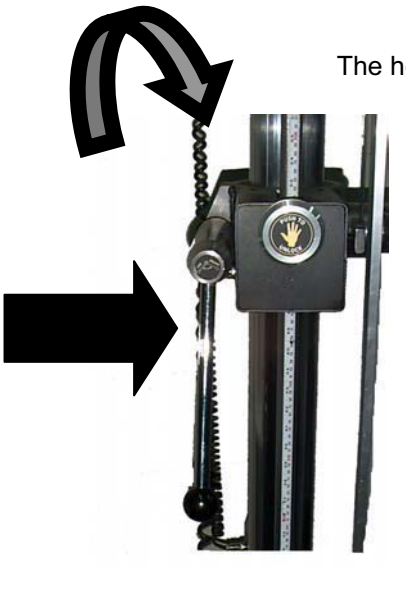
The arms can be used during functional tests in combination or individually. For example, when performing a dynamic lift capacity assessment, you may attach a shelf to the lower accessory arm and have a client lift an object from the floor to the lower shelf.

Alternatively, you may choose to attach both shelves, and have a client lift an object from one shelf to the other. The shelves can be used to simulate job-specific tasks facilitated by the ability to adjust the height and orientation of both ER arms.

The Multiplanar Accessory Housing Joint, the shelves and all of the accessories can be attached to the end of either of the ER arms.

Interchanging different ER accessories or attachments has been described in detail in the previous section on the Multiplanar Accessory Housing Joint.

Adjusting the height of the lower ER arm



The height of the lower ER arm is controlled by two mechanisms, which are both located on the left side of the ER stand (left is defined as your left when you are facing the ER).

If you follow the ER arm to its attachment on the stand, you will notice a long handle with a round black end (wide arrow). This long handle is a general locking and release mechanism for the lower ER arm.

If you turn the long handle clockwise you will be locking the lower ER arm and preventing any movement from occurring. If you turn the long handle counterclockwise you will be unlocking the lower ER arm, which allows movements to occur.

Immediately in front of the long handle is a round button with the words “push to unlock” and a picture of a hand on it (curved arrow). This button is a safety locking mechanism for the lower ER arm.

Raising or lowering the lower ER arm

Identify and grip the long handle at the end of the lower ER arm (where the arm meets the ER stand). This long handle is located on the left side of the ER stand when you are facing the ER.

Grip the handle and turn it in a counterclockwise direction. To lock or unlock the lower ER arm movements, it is only necessary to give the handle a ¼ turn.

Identify the round safety button at the end of the lower ER arm (this button has a symbol of a hand on it).

Push and hold down the safety button.

While holding down the safety button, raise or lower the ER arm to the desired position, then let go of the button.

Grip the long handle and turn it clockwise to securely lock the lower ER arm in its new position.

The round button, which reads "push to unlock", is primarily a safety mechanism that prevents the lower ER arm from moving once it has been unlocked with the long handle. When you press and hold this button (provided you have unlocked the ER arm using the long handle), you will be able to raise, or lower, the ER arm. If you let go of the safety button while raising or lowering the ER arm you will hear a grinding sound. This is like an emergency breaking system. Try not to let go of the safety button too often or the mechanism may wear out.

When turning the long handle clockwise, its movement will eventually be blocked, because it will be fully locked. However, when turning the long handle counterclockwise, the handle will continue to turn and eventually unwind, falling off the ER stand. This does not happen with proper, regular ER use, since under normal conditions, the handle only requires a slight turn (1/4 rotation) to efficiently unlock the lower arm.

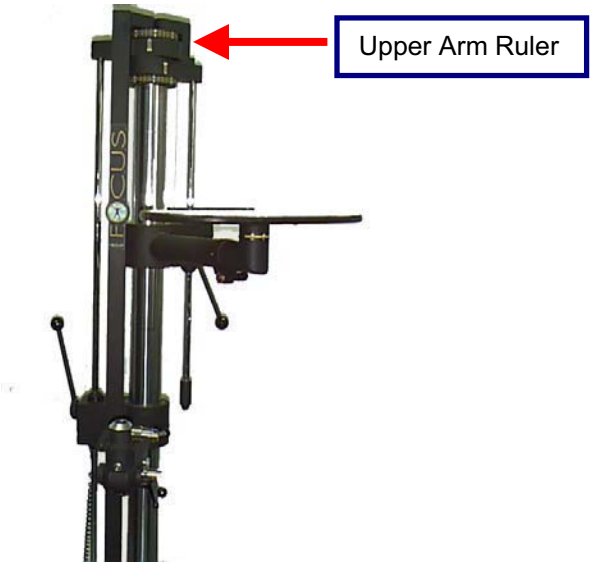
Identifying the orientation and position of ER arms and accessories

The ER features a series of graded rulers, which help determine the exact orientation and placement of the accessory arms and accessories.

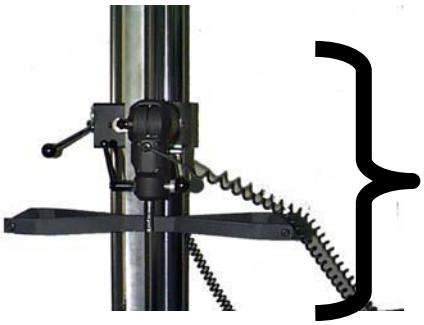
When you face the ER stand you will notice a vertical ruler on the left side, which indicates the height of the lower accessory arm.

On the right side is another vertical ruler, which indicates the height of the upper accessory arm. These heights are automatically input into the ER software when the interface system is launched.

Both rulers feature safety stoppers at the furthest ends of rotation of the arms to prevent injury when the assessor’s hand is placed in the vicinity of these rulers.



When you insert an accessory into the Multiplanar Accessory Housing Joint, the height of the accessory arm is recorded as the height of the accessory (from the platform), which is 7.25 inches higher than the actual accessory arm.



14.5 Inches

7.25
Inche

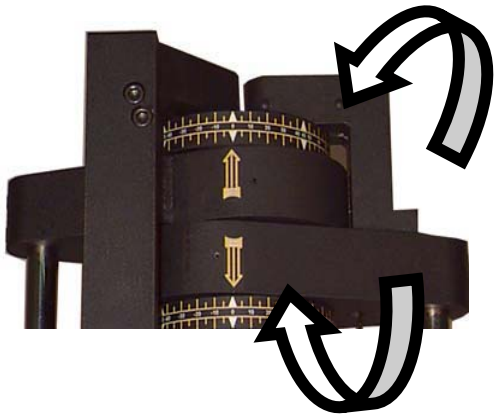
Accessory in the UP

If you place an accessory in the down position, the accessory will be an extra 14.5 inches lower than the reading on the vertical ruler (twice the height of the accessory Multiplanar Accessory Housing Joint).

Therefore, when using accessories in the down position, you must add 14.5 inches to the vertical height to achieve the desired test height.

For example, if you use the narrow handle in the down position to perform a static lift test, and your protocol requires a starting height of 6”, you would set the vertical height of the accessory arm to 20.5’ (=6”+14.5”).

In addition to the graded vertical rulers, there are two graded rulers at the top of the ER stand to measure rotation of the upper and lower arms. Each ruler provides measures in increments of 5 degrees, up to 110 degrees to the left and 110 degrees to the right.



The upper ruler indicates the angle of rotation of the lower arm.

The lower ruler indicates the angle of rotation of the upper arm.

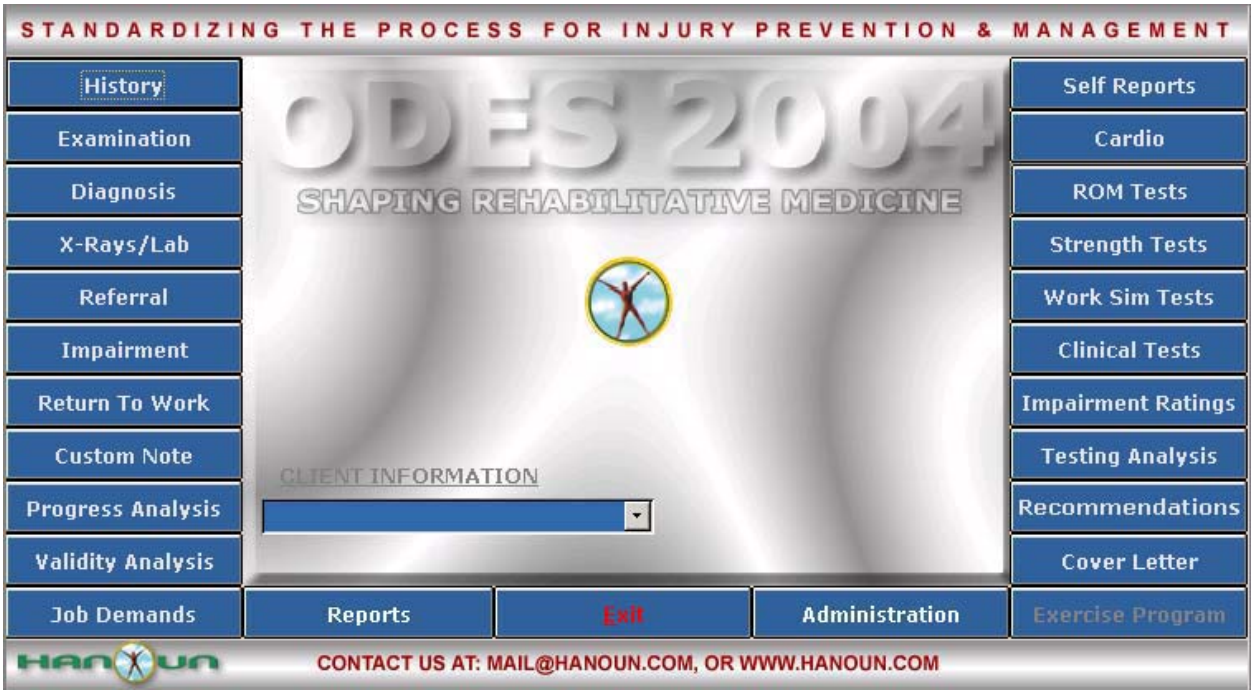
You now have the basic information necessary in preparation for performing functional tests and even designing your own protocols. The following section will demonstrate how to connect the ER to the Computer Diagnostic System, to achieve automatic data acquisition and analysis as well as automatic report generation. Please ensure that you thoroughly read and understand the following section prior to attempting to use the Computer Diagnostic Component. Many areas of difficulty in data acquisition arise from incorrect connections between the software and hardware components of the ER.

Isometric Strength Testing

The curved strength-testing pad is used to cushion contact surfaces on the client when assessing strength in various postures.

Using the accessory housing joint and accessory arms, the strength-testing pad can be positioned in various planes and angles. This allows the assessor complete versatility in the assessment of many joints and many ranges.

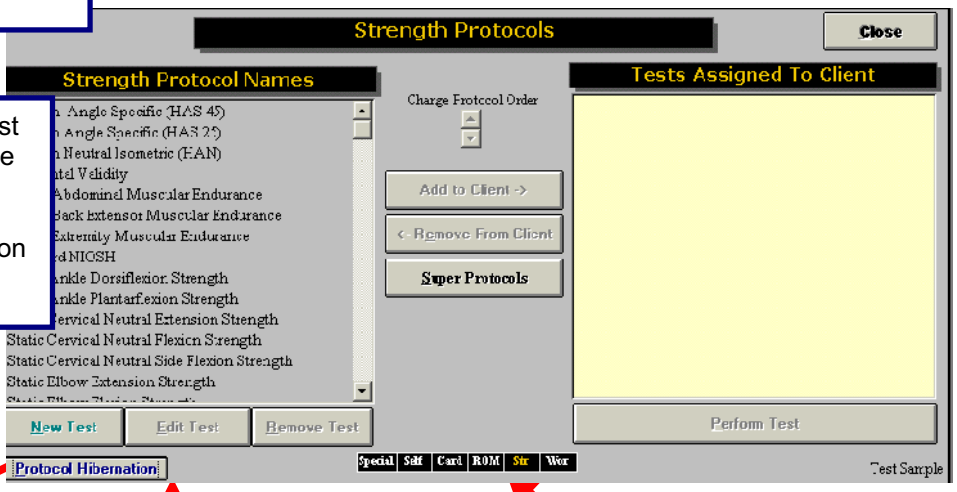
To complete a static strength test using the FOCUS, click Strength Test from the main menu of ODES.



This will bring you to the Strength Test page. From here, you have access to all of the pre-programmed strength tests. You can add tests to clients, create new custom isometric strength tests, edit tests and delete tests.

This is a list of all the tests found in the Strength Test menu.

Click this button to return to the ODES™ main



Select the test and click here to add it to a client, or double click on it.

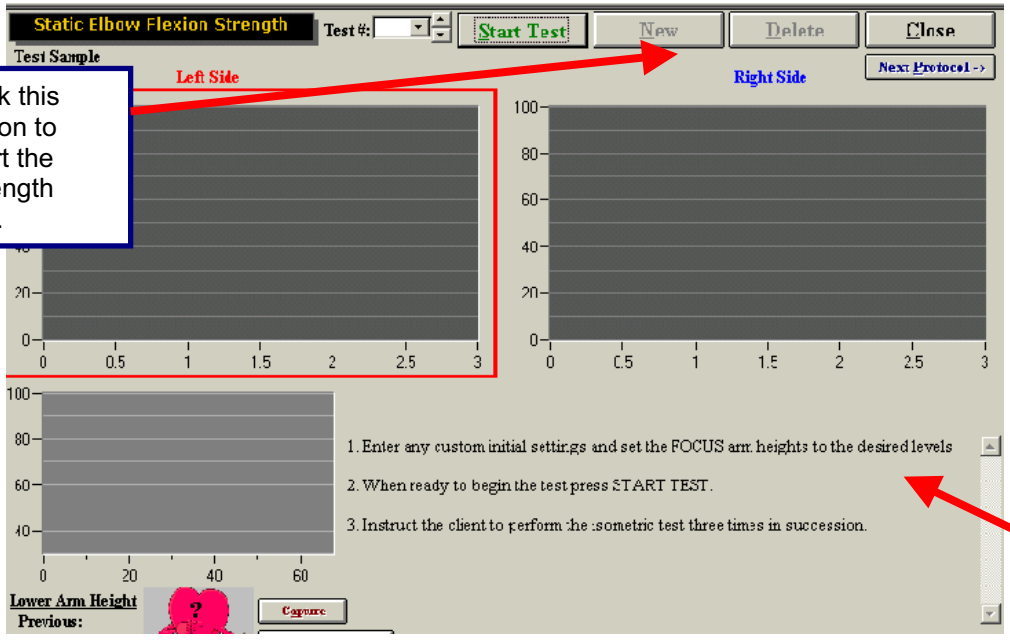
All of the tests that are assigned to the client will appear in this area.

In order to edit, create or remove tests, click on the appropriate button.

Protocol Hibernation puts unused protocols in storage without removing data

These are short cuts to return to any of the test menu pages in ODES™. The test menu that is in use will appear in yellow.

Once a test has been added to a client, and Perform Test has been clicked in the bottom right-hand corner of the page (you can also double-click on the test name), your test page will appear. Below is an example of what the typical test page looks like.

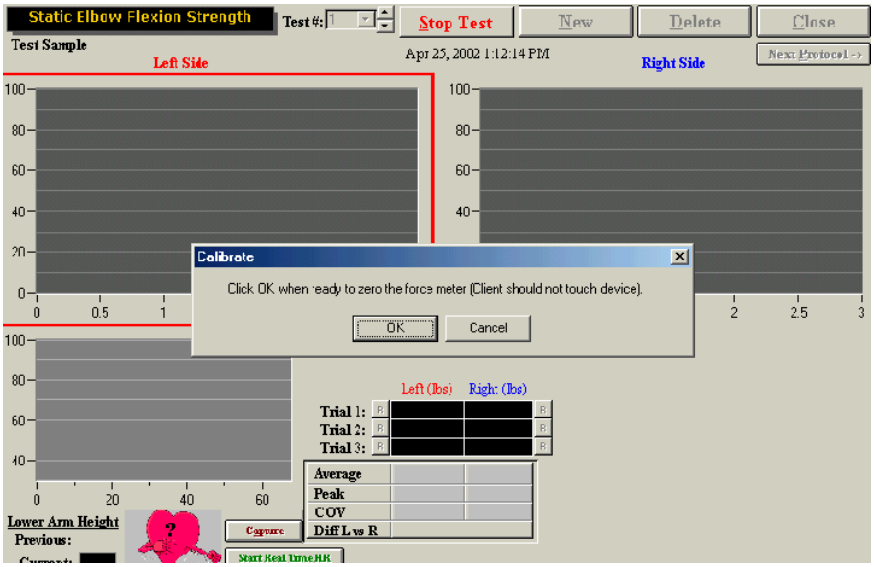


Click this button to Start the Strength test.

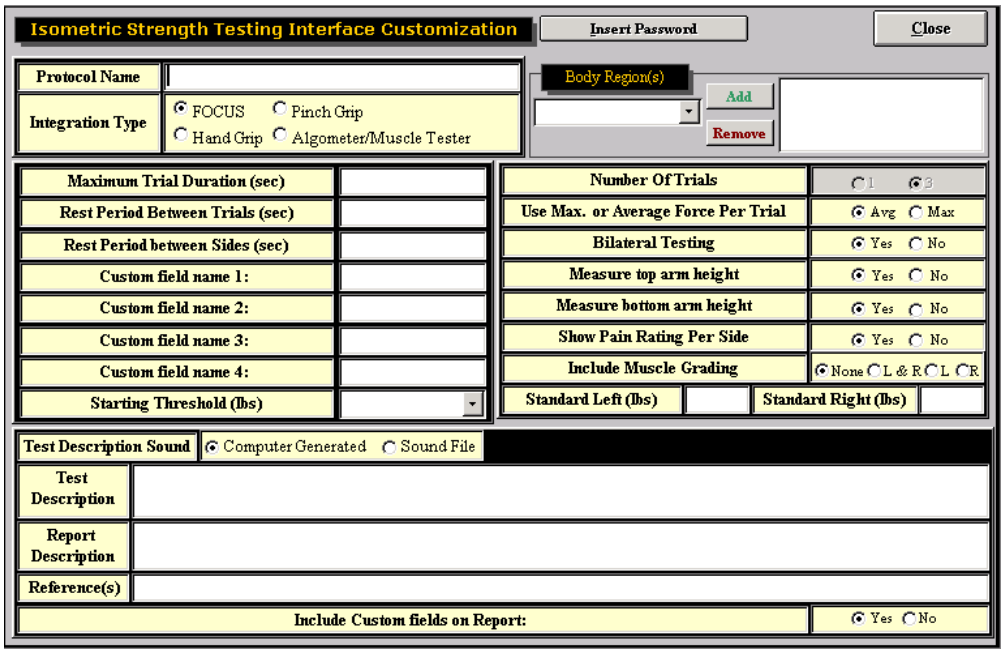
Click this button to return to the Strength menu.

Located in this area are the default or custom instructions for the corresponding test.

It should be noted that once the Start button is clicked, a message will appear stating that the force meter needs to be zeroed. This is seen in the diagram below. As there are many attachments for each load cell, ODES™ will account for the weight of the accessory attachment during each test. No force should be applied to the force meter.



To create a new strength protocol, click New Test and then click Integrated Isometric Strength Protocol.



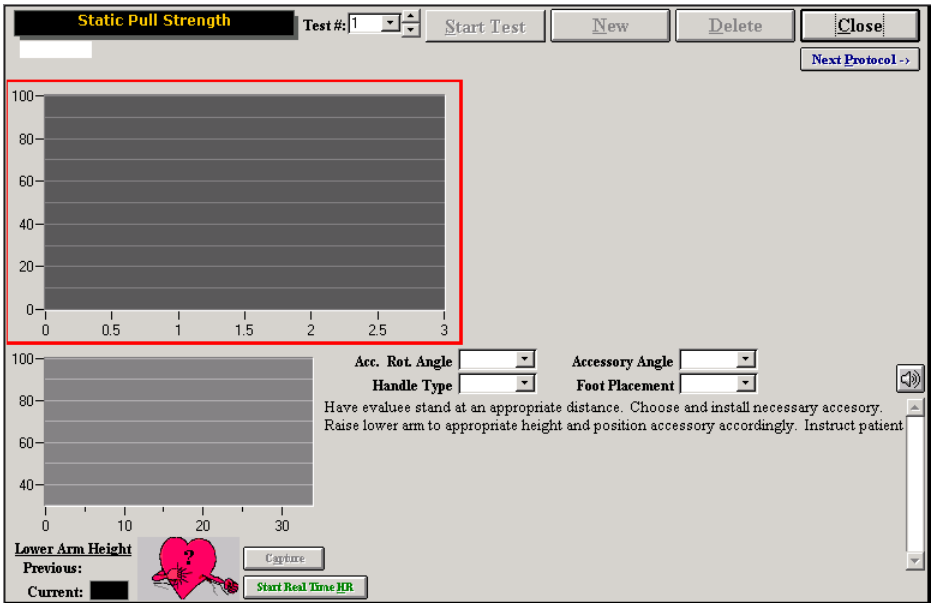
Enter in a protocol name and select the FOCUS for the Integration type. Generally for a strength test the trial duration is 3 to 5 seconds in length with the rest between trails set to 5 seconds to allow the client's energy stores to build up again. A rest period of 5 seconds usually gives the evaluator enough time to set the client up for testing on the other side. The Custom Fields allow for additional information to be

entered on the screen and included in the report. Select the rest of the parameters for the test. Once Close is clicked the test will be saved and can be assigned to clients.

Work Simulation Tests

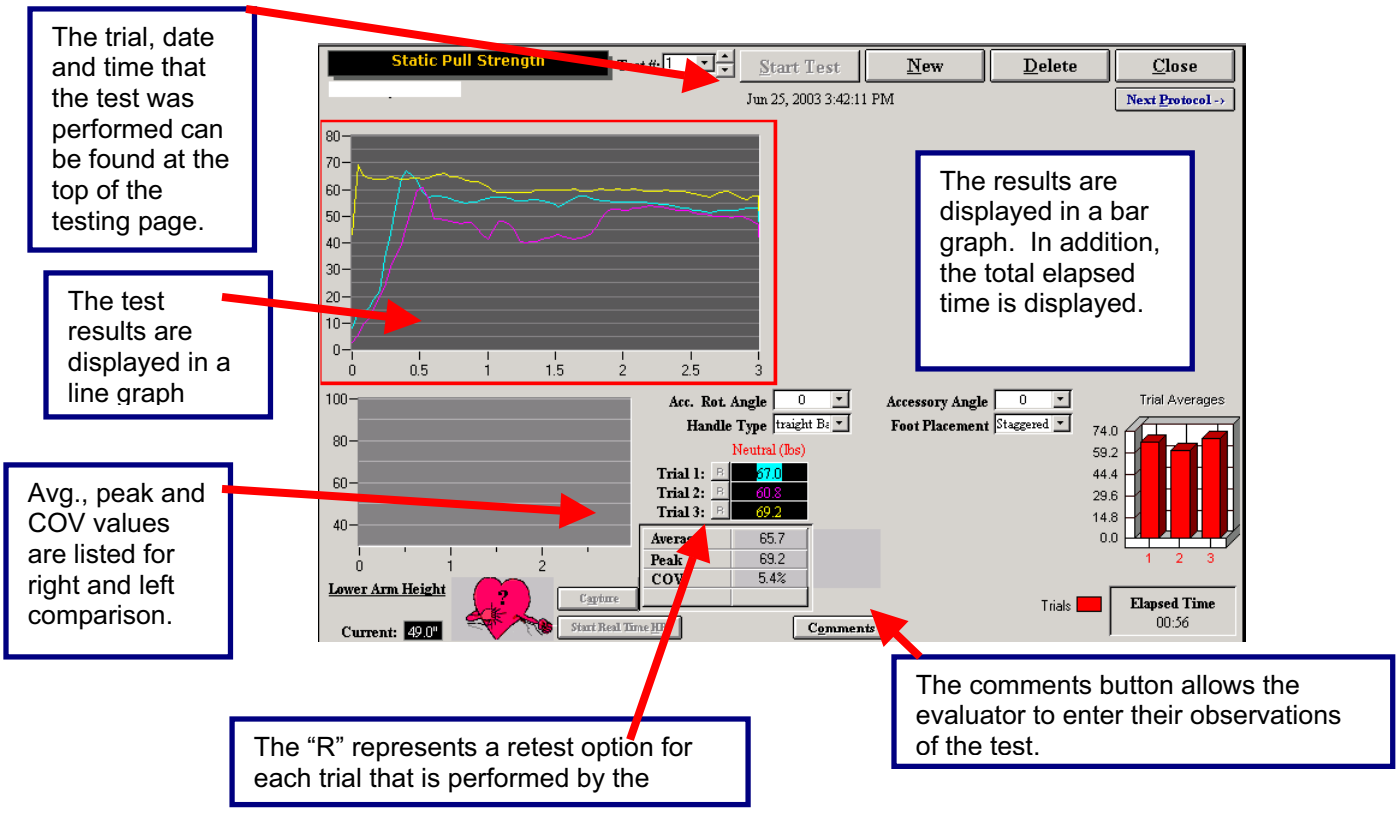
There are a number of different accessories that can be placed in a variety of positions to simulate various work tasks.

Some preprogrammed tests, such as Static Push and Pull Strength tests require these accessories to be placed in various positions and at various heights on the ER stand depending on the task being simulated.

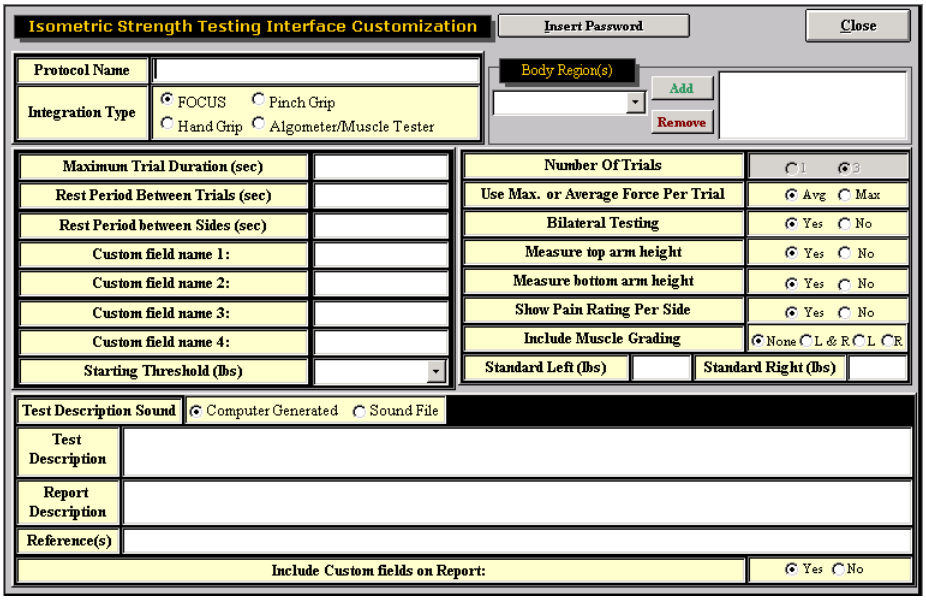


To allow the task to be replicated at a future date and to provide further details to the readers of the report, complete the custom fields on the page. Acc. Rot. Angle refers to the accessory rotation angle, which is the angle of the FOCUS in relation to the ER arm. The Accessory Angle refers to the angle of the handle to the FOCUS. The Handle type refers to the attachment in the FOCUS (i.e. straight bar, single handle etc). The Foot Placement refers to the placement of the client's feet (i.e. staggered, together etc) based on the task requirement (i.e. pushing a cart or push controls in a confined space).

Click Start Test to start the test. A pop-up window will remind you to ask the client to not touch the device so the FOCUS can calibrate itself with the handle attachment.



To create a new work simulation protocol, click New Test and then click Integrated Isometric Work Simulation Protocol.

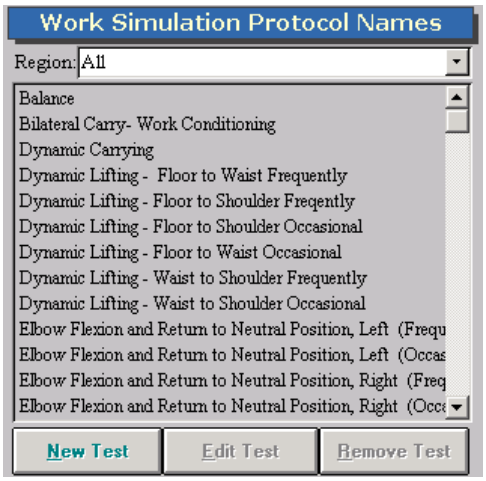


Enter in a protocol name and select the FOCUS for the Integration type. Set the parameters based on the specific job task you are trying to simulate. The Custom Fields allow for additional information to be

entered on the screen and included in the report. Select the rest of the parameters for the test. Once Close is clicked the test will be saved and can be assigned to clients.

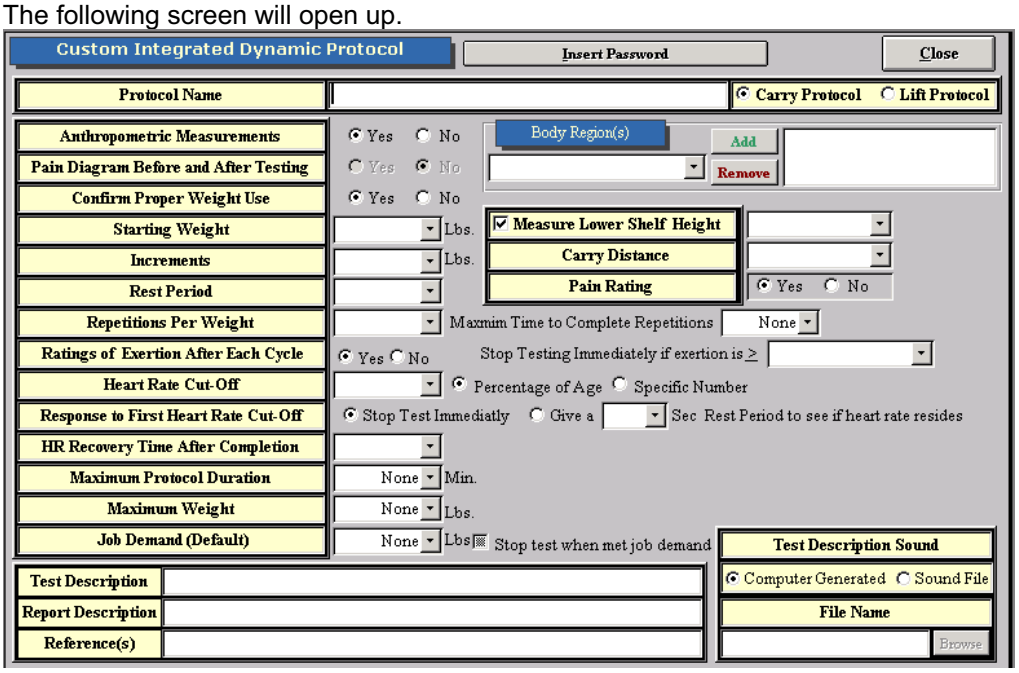
Integrated Dynamic Lifting and Carrying Tests

To create new lifting and carrying tests click on New under the Work Simulation section of the software.



Click on Integrated Dynamic Protocol.

The following screen will open up.



Insert a protocol name and select whether you would like the test to be a carrying or lifting test. The below example is for a carrying protocol. Select the lower height settings and enter in the distance required to

carry the object. If lifting is selected, the box to include the distance for carrying changes to Measure the Upper Shelf Height.

Select whether you would like the tests set up for anthropometric values or not. If anthropometric measurements are selected the option of knee, knuckle, waist, elbow, shoulder, and crown are available for selecting upper and lower shelf heights. If you do not wish to use anthropometric values click on No and enter in specific heights in inches.

Confirming Proper Weight use refers to whether you would like the FOCUS load cell to weigh the weight on the shelf or not. If No is selected the software will check to make sure a weight is applied to the shelf but will not be able to determine if that is the exact weight required. If Yes is selected the load cell will determine if the exact weight has been applied to the shelf. The evaluator must ensure that the client remove their handles from the object being lifted entirely for a couple seconds so the software has the opportunity to weigh the weight. You may wish to turn this function off if your client has difficulty understanding instructions. To do this highlight the test from the list on the left hand side of the screen under Work Sim and click on **Edit** and change it here.

Next select the starting weight and the increments of weight you will be increasing by for the lifting protocol. The EPIC Lifting crate provided with the system weighs 10 pounds. If other containers are used for lifting such as a tool box to measure unilateral lifting or carrying, weight the object first.

Include a rest period if the protocol you are using or if the job task you are simulating requires it. If Pain Rating is set to Yes, then two boxes will appear on the test screen for the evaluator to enter in pre and post pain ratings.

Include the repetitions per weight required before additional weight is added to the lifting container. Include a Maximum Time to Complete Repetitions if the lifting protocol specifies that or if the job task requires a certain amount of lifts to be completed in a specific time.

Rating of Exertions refers to the revised Borg scale that is used to determine the client's perception as to how heavy they feel the weight they are lifting is. It is a 10 point scale that ranges from 0=Like Nothing at All to 10= Too Heavy. You can the select to Stop Testing Immediately if exertion is ≥ and the various ratings for the scale are available from the drop down menu available. If this is selected in testing, once the client has selected the rating equal to or above the limit you selected (i.e. Extremely Heavy), the test will stop and you will be prompted with a screen asking if you to click Yes to accept the previous safe weight or No to accept the current weight.

A heart rate cutoff can be set so that you will be warned if the client's heart is too high. The cut-off can be set based on a percentage of age (Maximum Age Predicted Maximum Heart Rate = 220-Age). Generally this is set to 85% based on the American College of Sports Medicine Guidelines. If a physician for safety concerns sets a specific heart rate cut-off, click on Specific Number and enter the value under Heart Rate Cut-Off. Response to First Heart Rate Cut-Off allows you to set the software parameters if the heart rate goes above the cut-off values you have selected. You can either have the test stop immediately or select an appropriate amount of time to allow the heart rate to recover before continuing with the test. Based on the EPIC Lifting Protocol up to a two minute rest is provided to see if the heart rate will recover.

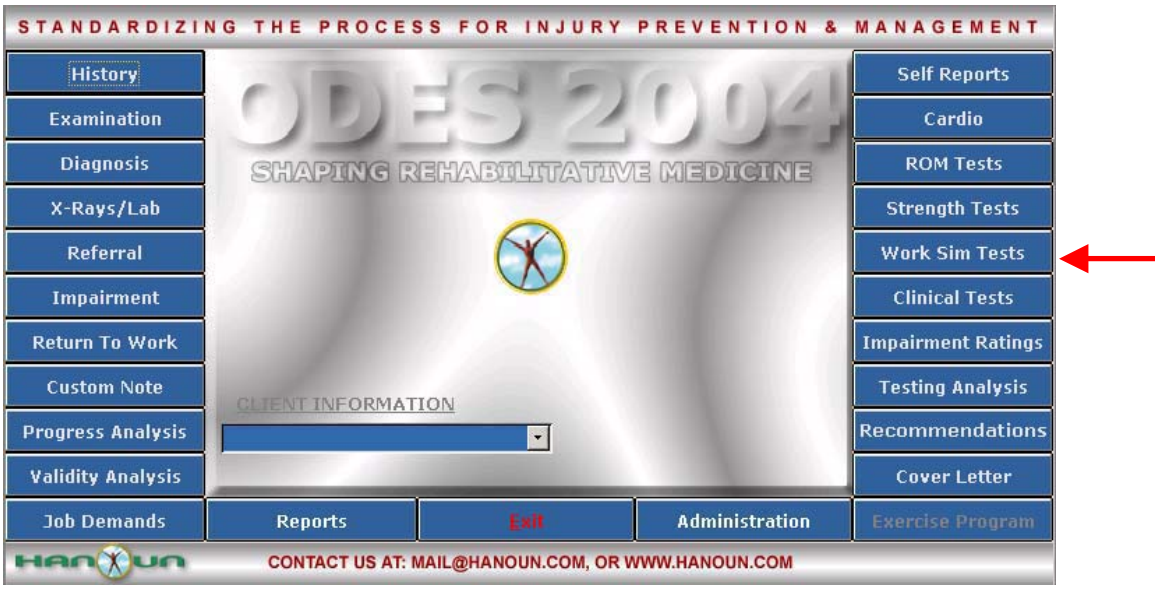
Select Heart Rate Recovery Time After Completion if you would like the software to measure the heart rate after the lifting test is completed to make sure the client recovered sufficiently before starting the next test. If this option is used you must wait for the entire time selected or click on Stop before clicking on Close or Next Protocol.

A Maximum Protocol Duration time, Maximum Weight to be lifted, or a predetermined Job Demand level can be programmed into the software so that the test will stop once those parameters are met.

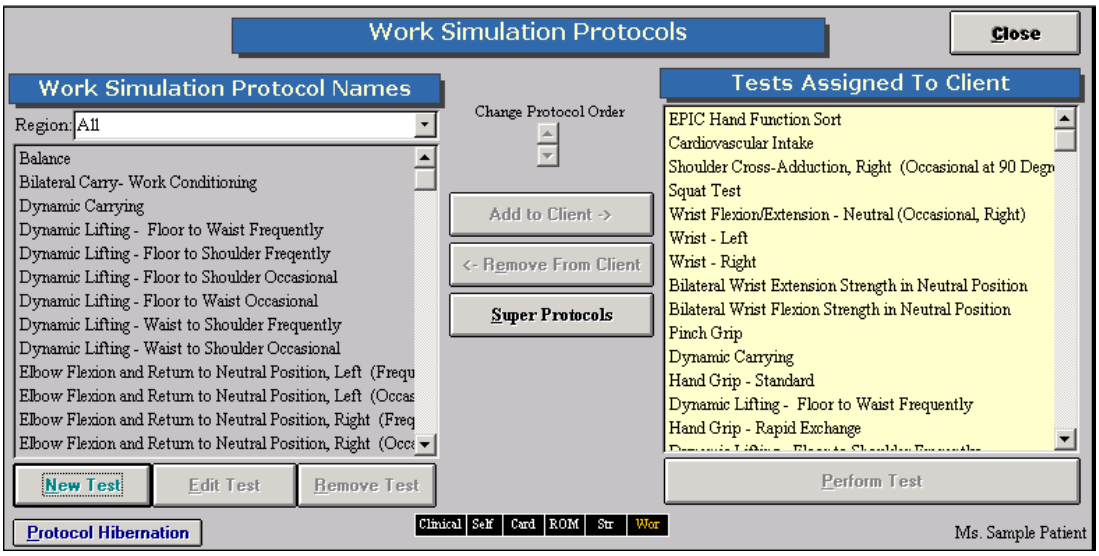
The ODES software has pre-programmed into it dynamic lifting and carrying tests:

Dynamic Lifting – Floor to Waist Occasional
Dynamic Lifting – Waist to Shoulder Occasional
Dynamic Lifting – Floor to Shoulder Occasional
Dynamic Lifting – Floor to Waist Frequent
Dynamic Lifting – Waist to Shoulder Frequent
Dynamic Lifting – Floor to Shoulder Frequent
Dynamic Carrying

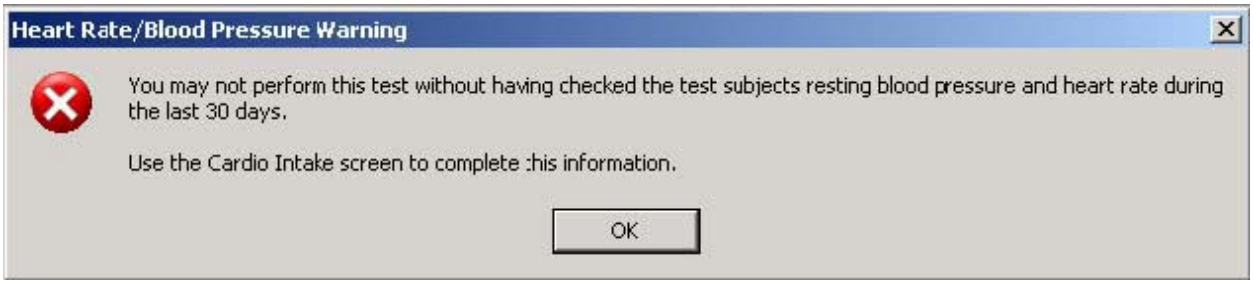
To use these protocols or any you programmed yourself click on Work Sim from the main menu of ODES.



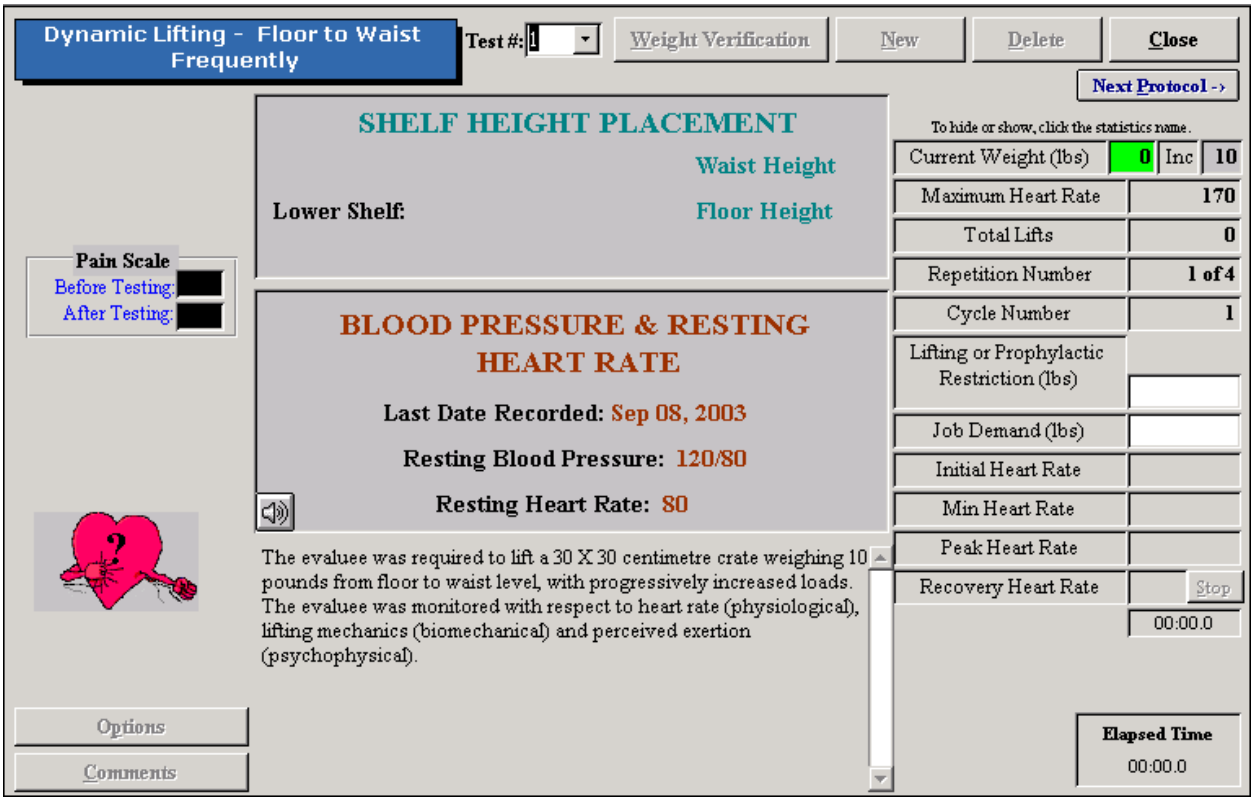
Select the protocol from the left hand side of the screen and add it to the client so it appears under Tests Assigned to Client.



Either double click on the test name or highlight it and click on Perform Test to go in to the test screen. The following screen will appear if the client's heart rate and blood pressure have not been measured and entered into Cardiovascular Intake. This must be done before you can continue with testing.



If this has been done the following screen will appear.



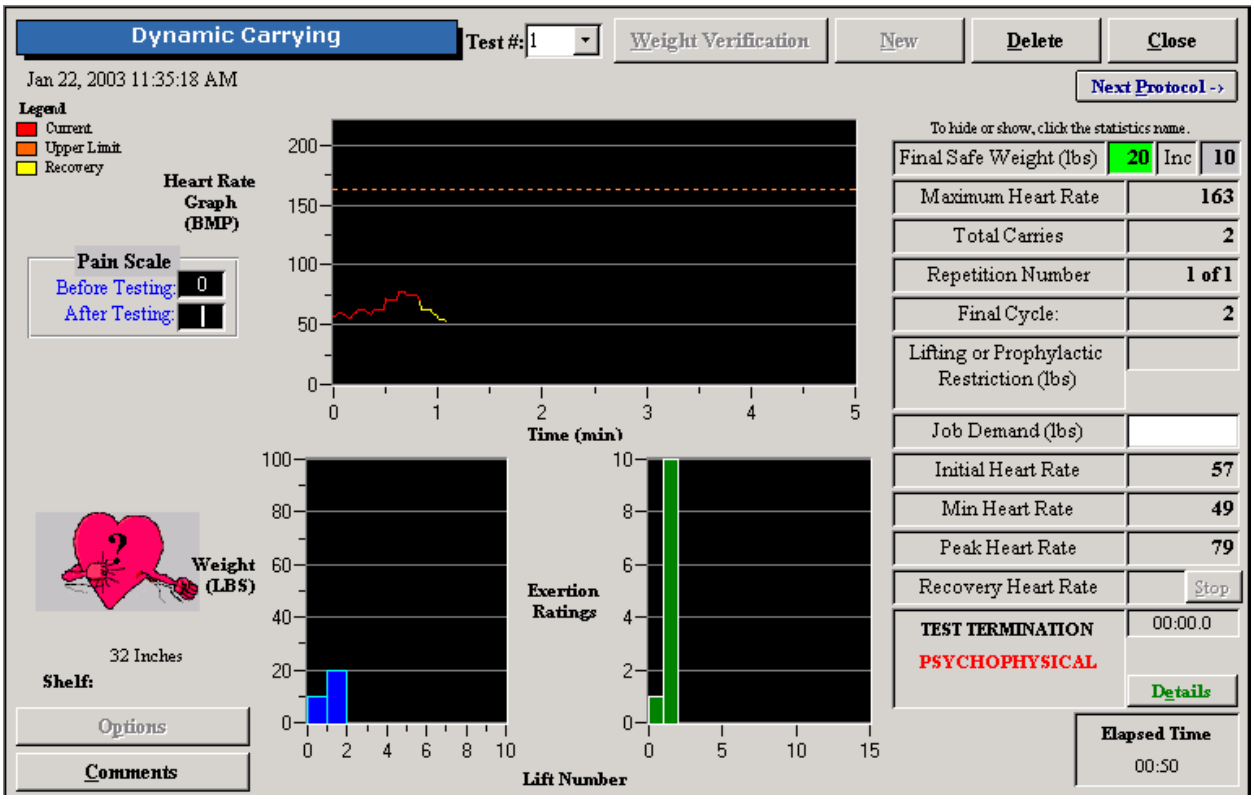
The first thing to do is to click on Weight Verification. You will be asked to take the shelf or any attachments off the FOCUS Load Cell and click OK. You will then be prompted to attach the shelf to the load cell and click OK. Make sure the shelf is in completely, the pin in place and tightened. Next you will be prompted to place 20 pounds on the shelf and then click OK twice. If more than one dynamic lifting or carrying protocol is being used for a particular client on the same day, this only needs to be done once. For the next dynamic test selected. Click on Weight Verification and click on the bottom OK to proceed with testing.

Once this has been completed you will be brought back to the testing screen and the Weight Verification button changes to the Start button. Make sure the client is wearing the heart rate monitor prior to starting the test. If you are measuring the heart rate manually, double click on the heart. Enter in the value and hit the enter key.

For the knuckle to shoulder occasional and frequent tests, the crate starts on the middle shelf with the load cell. Once Start has been clicked on, if the correct weight is in the crate (refer to the Current Weight box on the right hand side of the screen for more details), the computer will say continue. Once the weight is returned to the shelf it will count the repetition. For all the other sub-tests, the crate is placed on the lifting platform. Every time the client lifts the crate onto the load cell they must let go of the crate for a few seconds to allow the system to weigh the crate. Once the weight has been lifted to the load cell and taken off the computer will count the repetition.

Based on the parameters set up for the particular test (i.e. repetitions, ratings of exertion, etc) proceed with testing. The software will alert you when the testing will stop if ratings of exertion, heart rate, maximum protocol duration, maximum weight, or job demand level parameters have been met. To stop the test otherwise click on Stop and a screen will appear asking for you to select the reason for stopping the test (i.e. psychophysiological, biomechanical, etc).

Once the test has been completed the screen will look like the following.

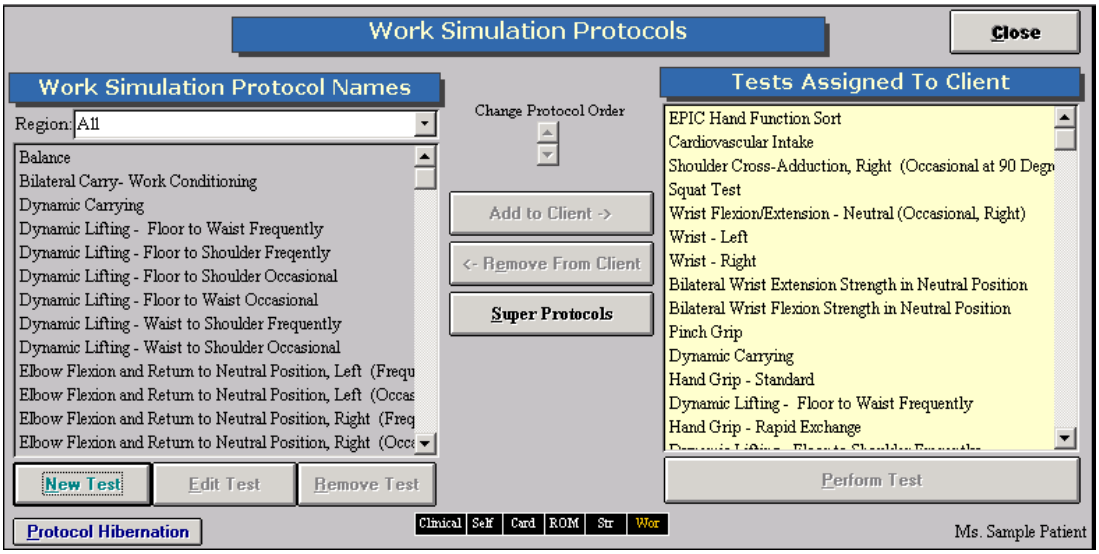


Click on Comments to add any additional comments regarding the test.

EPIC Lifting Capacity Protocol (Optional Upgrade)

To be able to complete this lifting protocol, the evaluator must attend an EPIC course and complete the certification process by EPIC. As well the clinic must obtain a site license from EPIC to ensure they are using the correct equipment. Please refer to your EPIC Training manual for more details on the specifics on completing the EPIC protocol.

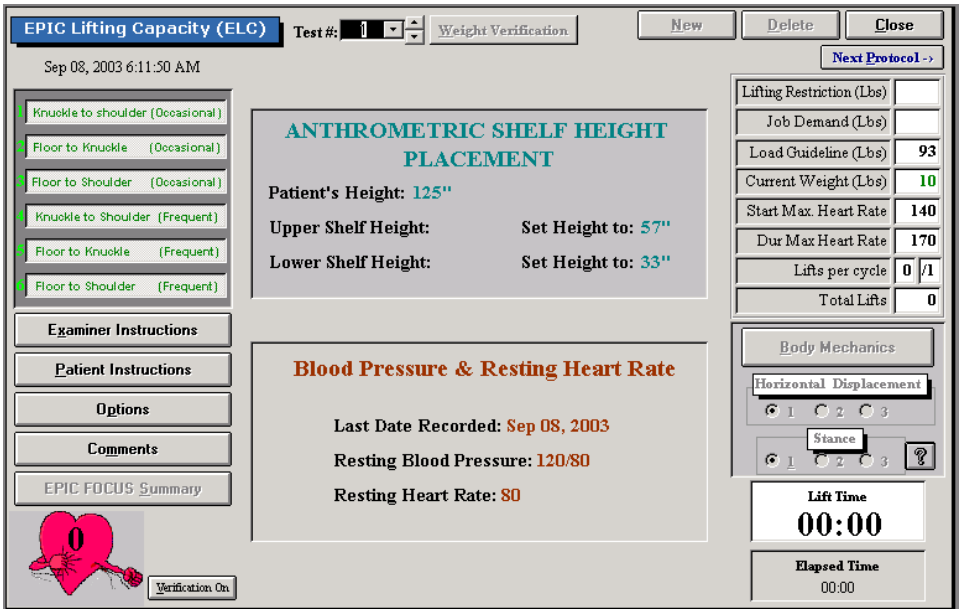
To use this component of the software, in the Work Sim section of the software, highlight the test on the left hand side of the screen and add it to the client.



Either double click on the test name or highlight it and click on Perform Test to go in to the test screen. The following screen will appear if the client's heart rate and blood pressure have not been measured and entered into Cardiovascular Intake. This must be done before you can continue with testing.

An additional warning screen will appear if the client's body mass index is high (this is based on the information you entered in the client's case information) and may have an impact on their body mechanics. This is to alert the evaluator to be cautious with testing.

The following is the test screen.



Determine which of the six subtests you would like to complete. Automatically all are selected when you open the test screen. Click on them to de-select particular sub-tests. If you de-select an occasional protocol, automatically the frequent protocol and possibly another occasional protocol will be de-selected based on the EPIC protocol.

Before completing weight verification set the shelf heights. The shelf heights are based on the height you entered in the client's case information. Next, click on **Weight Verification**. You will be asked to take the shelf or any attachments off the FOCUS Load Cell and click **OK**. You will then be prompted to attach the shelf to the load cell and click **OK**. Make sure the shelf is in completely, the pin in place and tightened. Next you will be prompted to place 20 pounds on the shelf and then click **OK** twice. If more than one dynamic lifting or carrying protocol is being used for a particular client on the same day, this only needs to be done once. If this has been done previously, click on **Weight Verification** and click on the bottom **OK** to proceed with testing.

Once this has been completed you will be brought back to the testing screen and the Weight Verification button changes to the Start button. Make sure the client is wearing the heart rate monitor prior to starting the test. If you are measuring the heart rate manually, click on **Options** and select capturing the heart rate manually. To enter in the heart rate manually, enter in the value and hit the enter key.

For the knuckle to shoulder occasional and frequent tests, the crate starts on the middle shelf with the load cell. Once **Start** has been clicked on, if the correct weight is in the crate (refer to the Current Weight box on the right hand side of the screen for more details), the computer will say continue. Once the weight is returned to the shelf it will count the repetition. For all the other sub-tests, the crate is placed on the lifting platform. Every time the client lifts the crate onto the load cell they must let go of the crate for a few seconds to allow the system to weigh the crate. Click on the **Verification On** button to turn this

feature off. Once the weight has been lifted to the load cell and taken off the computer will count the repetition.

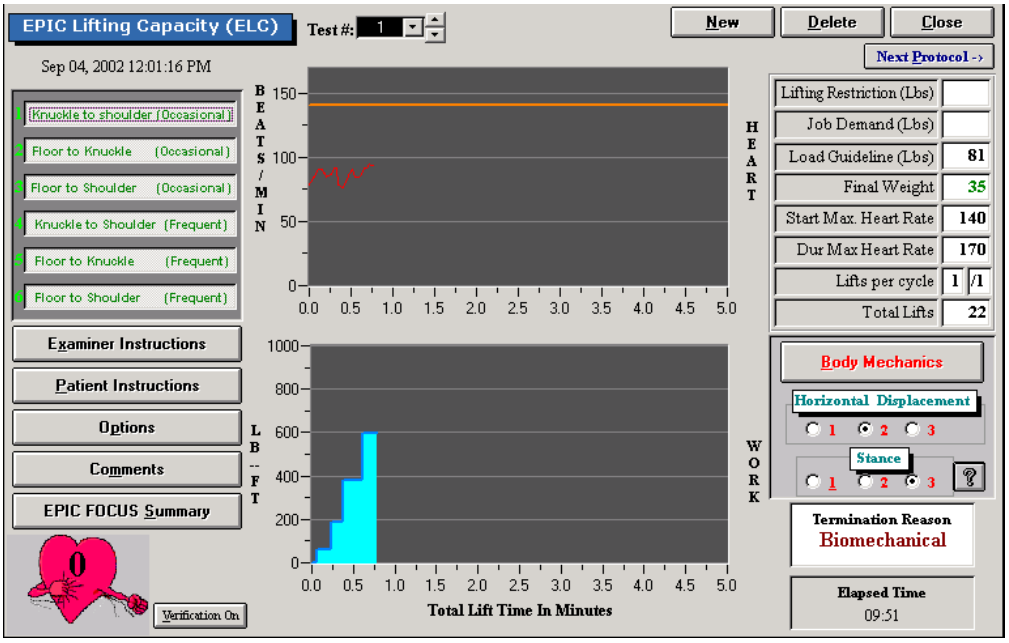
When the weight is lifted the required times a screen will appear prompting you to enter in the client' rate of perceived exertion, whether they can lift the weight 8 to 12 times per day, whether they can lift more weight, and the rating for their horizontal displacement and stance. Once that information is entered in, click on **Continue** and the test will either continue or stop based on the EPIC Lifting Protocol.

To stop the test otherwise click on **Stop** and a screen will appear asking for you to select the reason for stopping the test (i.e. psychophysiological, biomechanical, etc).

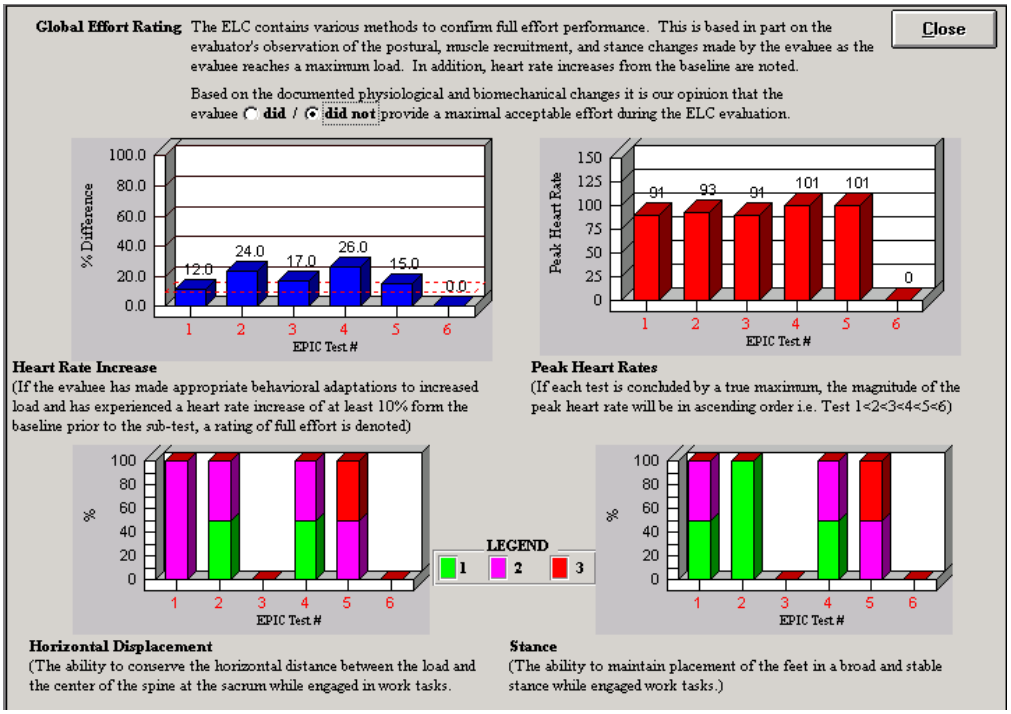
If the heart rate is too high the software will prompt you and two minutes will be allowed for the heart rate return to the protocol specific value.

If during testing you decide it is not appropriate to test all the tests you may click on **Start** and then on the left hand side of the screen click on the sub-test you don't want to test. Another screen will appear asking if you do not wish to use that sub-test. Click **Yes** to be taken to the next sub-test.

The following is how a completed sub-test will look.



Click on **EPIC FOCUS Summary** to see the information on the client's effort during testing.



Based on the EPIC protocol select whether the client did or did not provide a maximal acceptable effort during testing.

The Universal Task Master

The Universal Task Master (UTM) system allows the evaluator to measure both hands simultaneously while replicating the client's required task. The UTM allows for independent hand spread, supination/pronation positioning, and force measurement. The UTM also rotates in the saggital and coronal planes, allowing for extended versatility. The UTM is a powerful tool and the evaluator's imagination and ability to apply the numerous adjustments to replicate the task will be the only limitation in its use.

Identification of parts associated with the UTM

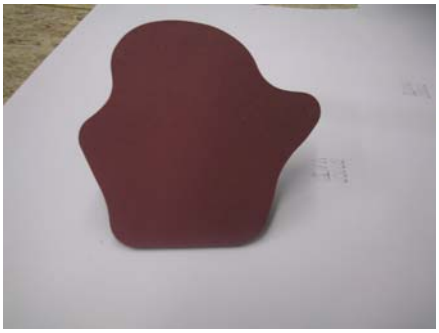
Please take the time to familiarize yourself with the name and appearance of each component before continuing through this manual or using the UTM.

UTM Serial Cable

Load Cells (2)

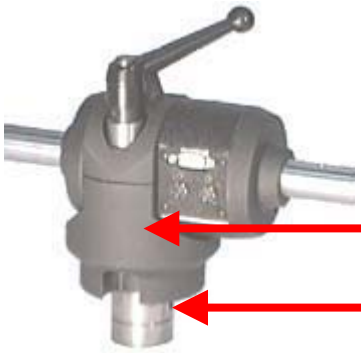
Force Scale Position Lock

6 UTM Handles
Two Single Handles
Two Palmar Handles
Two Box Lift Handles



UTM Handle Position Lock

UTM Center Housing, Bar, and F.O.C.U.S Arm Insert



Bar

Center Housing

F.O.C.U.S Arm Insert

Bar Position Locking Pin

UTM Bar Position Locking System

Bar Position Locking Handle

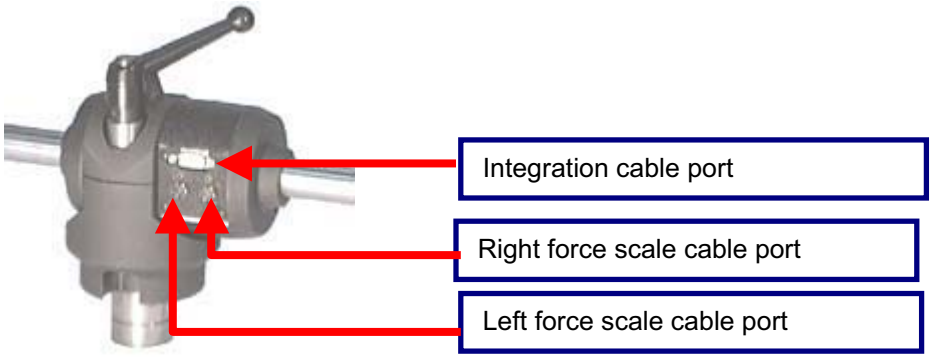
In order to rotate the bar, the locking handle will need to be loosened first (half turn counterclockwise). In order to lock the bar into position, tighten the locking handle (turn clockwise until tight).

Inserting the UTM into the F.O.C.U.S. Arm

Place the F.O.C.U.S arm insert of the UTM (seen above) into the arm of the ER Stand that is being used for the test (top or bottom arm).

Connecting the UTM to the Data Acquisition Box

First connect the gray UTM integration cable from the UTM to the '**TM**' port on the Data Acquisition Box. Then connect the black coil cable from the left force scale to the center of the UTM and the black coil cable from the right force scale to the center of the UTM.



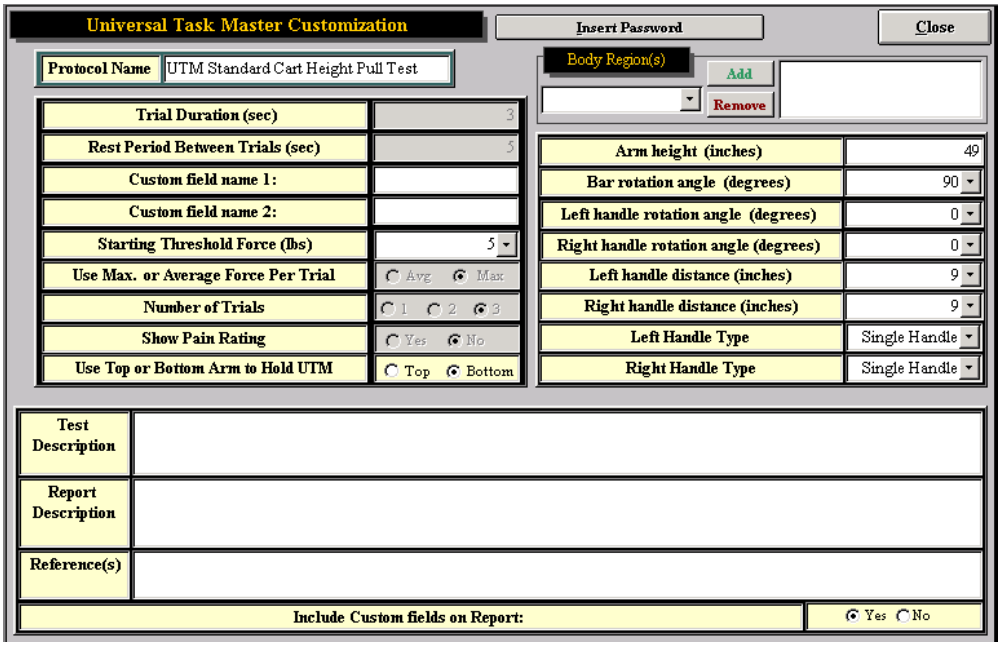
The black force scale cables should not cross at the center of the UTM.

Using the Universal Task Master

The software comes with two UTM tests already programmed:

UTM Standard Cart Pull Test
UTM Standard Cart Push Test

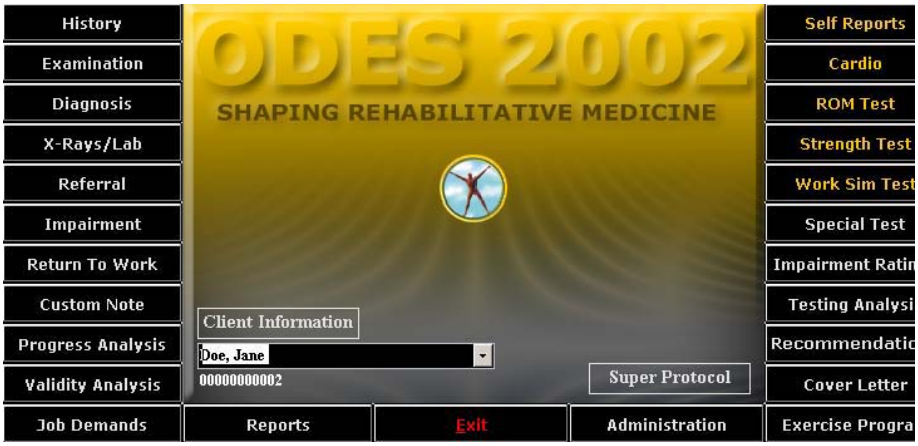
The parameters for these two tests have been set as follows:



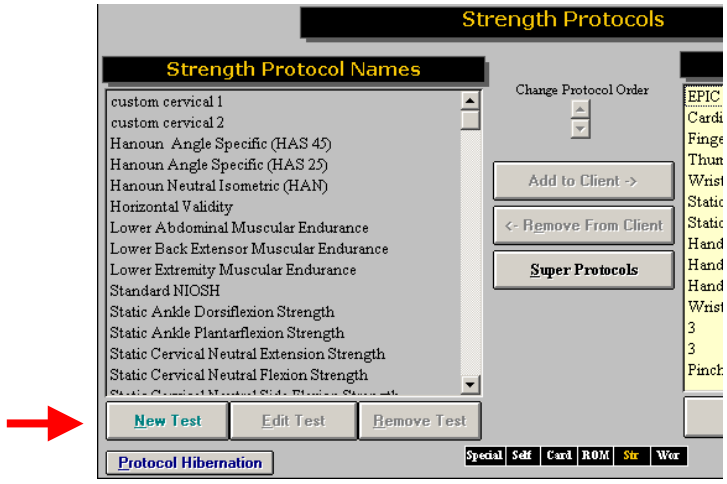
Designing a Custom Universal Task Master Test

The software allows for great flexibility in customizing strength and work simulation tests using the UTM tool. A new custom integrated UTM test may be created in either the **Strength Test** or the **Work Sim Test** functions of ODES.

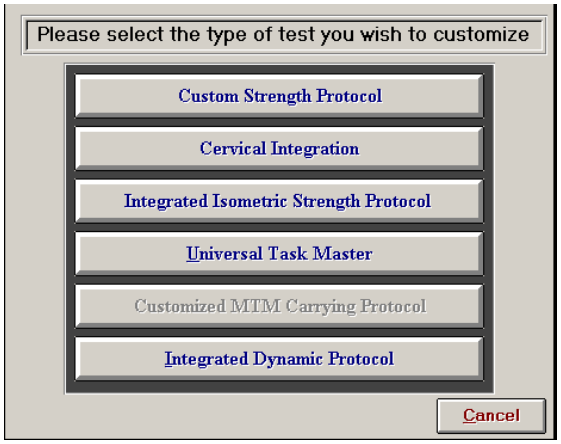
Enter either the **Work Sim Test** menu or the **Strength Test** menu, whichever applies to the test to be created, from the ODES main menu.



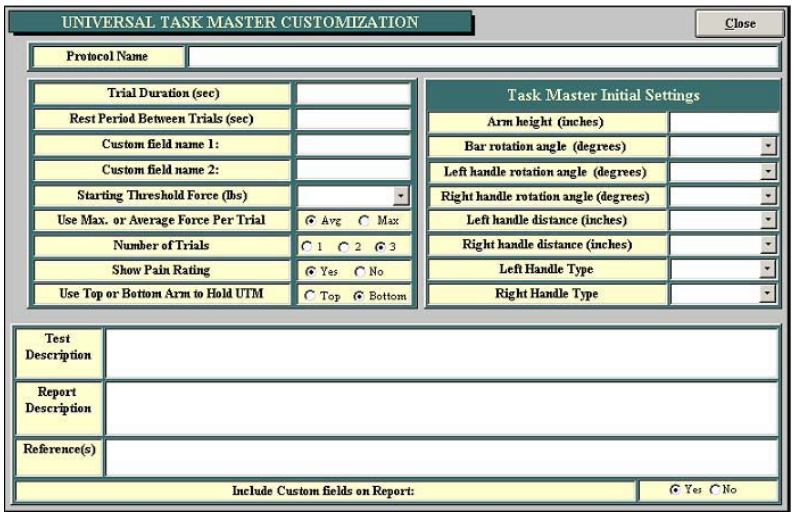
On the next page, click **New Test**.



On the next page, click **Universal Task Master** to customize a new test using the UTM.



The next page allows you to input information required to customize a test.



Important things to note:

- The starting threshold limit is the force required on at least one side to start the test.
- When choosing between average or maximum force per trial, please note that the average will disregard the first and last half-second of the trial and average out the samples in between; the maximum force will simply be the peak force applied during the trial.

Be sure that, when performing a customized test, the UTM is inserted into the arm of the ER Platform that was chosen when creating the test (top or bottom arm). For heights of less than 46 inches, the bottom arm is required. For heights greater than 60 inches, the top arm is required.

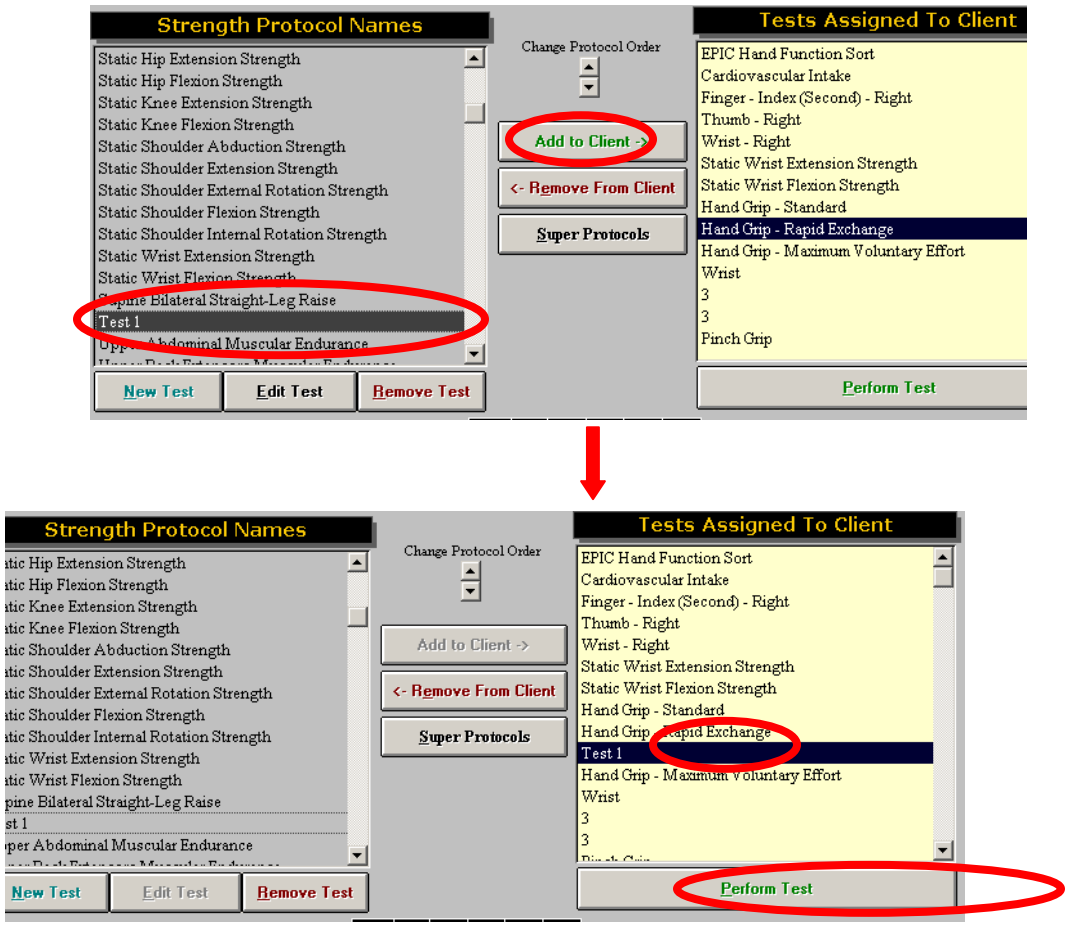
Suggestions on Designing / Performing Custom UTM Tests

The most important rule in designing / performing a test, whether using the UTM system or other components of ER Platform, is to try to replicate the position of the task as closely as possible.

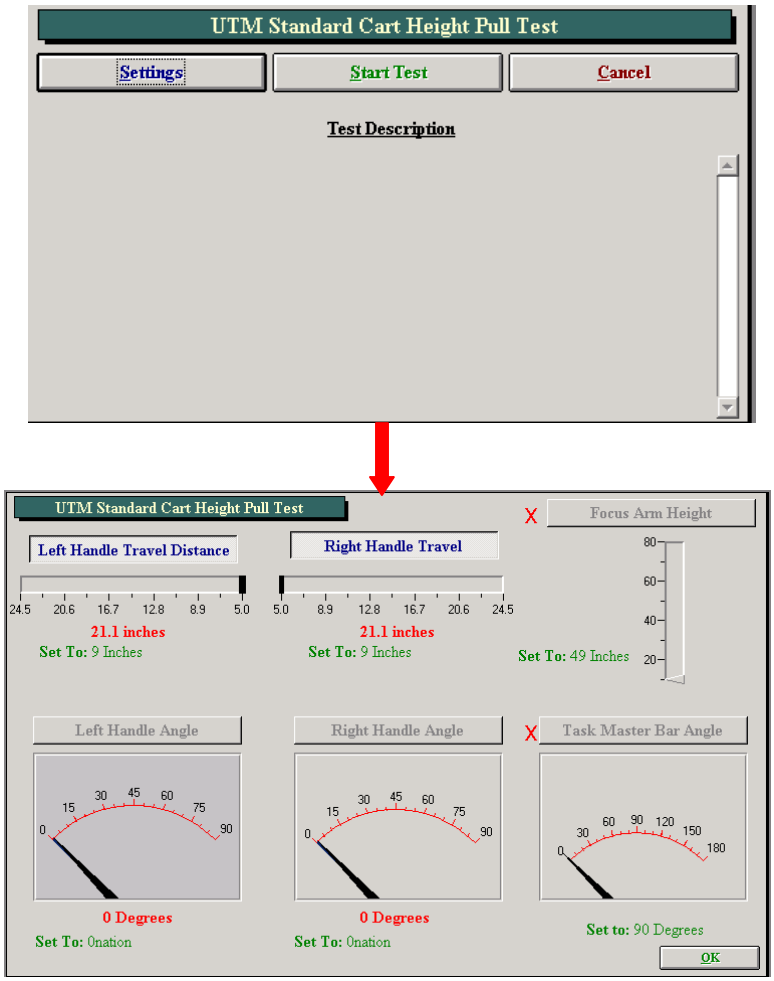
Replicating the job requirements will ensure an appropriate comparison of ability to demand, and will more accurately determine whether or not the individual can

Once all of the information has been entered, click **Close** to return to the previous page. The newly created test will now appear in the left column of the Strength Test or Work Sim Test page.

To perform this test, click on the test name to highlight it then click **Add to Client** in the middle of the page. This will add the test to the Tests Assigned to Client column. Now click on the test name in the Tests Assigned to Client column to highlight it again and click **Perform Test** at the bottom of the column. This will open up the test screen and allow the newly created test to be performed.

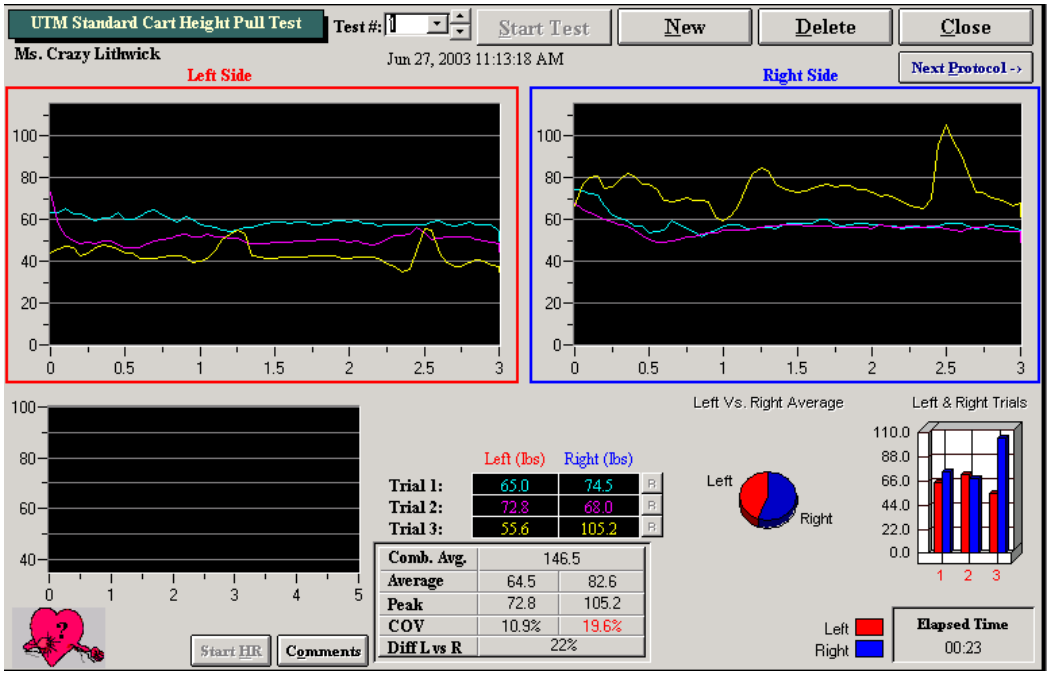


On the first page of the new test, click **Settings** . If a red 'X' is displayed next to an item, there is a problem reading that device or position. See the troubleshooting section of this manual.



Set up the UTM based on the settings selected when the test was created. Once the UTM settings are correct, click OK to go to the test screen. After clicking Start a window will pop up reminding you to make sure the client is not touching the UTM, so the device can zero itself. Click OK and the test will begin. During testing, you have the option of collecting real time heart rate information by clicking Start HR or by clicking Capture HR to add the data to the Heart Rate Report.

Once the test is completed the page will look like this:



Once testing is complete click on the R button to the right of a trial if you need to redo that trial. Click on Comments to add specific comments regarding the client's performance on the test.

To start a new test click New or to delete the current test data click Delete. To close this page, click Close or to go to a new test in sequence click Next Protocol.

Functional Range of Motion

The Functional Range of Motion (FROM) pegboard allows an evaluator to determine the positional tolerances of a client. The FROM system utilizes Methods Time Measurement (MTM), allowing the evaluator to extrapolate for occasional, frequent or constant demands.

What is Methods Time Measurement?

Methods Time Measurement (MTM) is the industrial engineering-based method for determining time-motion performance in conjunction with work-related activities. The MTM standard offers the means to determine an exact percentage score of performance against the most widely recognized criteria for the assessment of time-motion activities.

The assessment of time-motion is a vital concept to many manufacturing companies throughout the world. Without the means to assess time-motion on a standardized basis, it would be very difficult for assembly lines to run effectively. It would also make it likely that the frequency of repetitive stress injuries would increase significantly, as a specific means to determine whether or not a worker was being required to perform at a level exceeding their reasonable production would be unavailable, and guesswork would be the only substitute. The MTM standard score allows an industrial engineer to effectively design production processes to most effectively complete job demands, while taking into consideration and minimizing ergonomic risk factors. MTM employs the usage of time-motion units to calculate the required performance of functional activities. The breakdown of MTM units is as follows:

1 hour	=	100,000 tmu's (time-motion units)
1 minute	=	1,667 tmu's
1 second	=	27.8 tmu's

Is MTM applicable to Functional Testing and the evaluation of individuals with disabilities?

Time-motion activities have been used in association with the evaluation of individuals with disabilities. The MTM standard score has been the most commonly used time-motion standard to date as it provides the most accurate and reliable means of evaluating performance. Other functional evaluation systems that have employed the MTM standard include WEST, VALPAR, ERGOS and Lifestyle Enhancement Systems. With respect to the evaluation of individuals with disabilities, several papers have been published throughout the world by international associations of industrial/time-motion engineers. A copy of some of these papers has been included with this manual.

How is MTM used in Functional Testing?

In functional capacity evaluations, the MTM standard score allows the evaluator to determine the extent of a test subject's capacity for positional tolerances, and determine a specific productivity equivalency for the positional tolerance. Conventional positional tolerance protocols employed without a time-motion equivalency fail to take into consideration the fact that individuals must demonstrate functionality within the prescribed posture. For example, a test that asks the individual to reach overhead without the performance of a work-related activity will not be able to discern whether or not the individual is capable of performing gross manual or fine finger dexterity activities, elements crucial to overhead work. The question is not whether the individual can reach overhead, but rather if the individual is capable of performing functional activities in an overhead position. MTM also employs time-motion units to produce a standardized and reproducible method for performance of the function making the precise repetition of the function's performance and instructions very important. Variations in the performance of the function can have an impact upon the test subject's results. In tests employing the MTM standard score, a deviation in performance will usually lower the competitive level score of the test subject. The level of

employability of the test subject may also be classified using the results of the MTM-based tests . The classifications and the associated ranges for the tests are as follows:

Exceeding Above Competitive	Above 140%
Above Competitive	101-140%
Competitive	80-100%
Entry Level	70-79%
Below Competitive	0-69%

Does MTM replace the Functional Capacities Evaluator?

The use of MTM standard scores is not intended to replace the functional capacities evaluator. It creates a standardized yet flexible basis for the administration of positional tolerance tests and the performance of time-motion activities, as well as providing a scoring basis that is objective and ensures the reproducibility of the test results. However, the observations of a skilled evaluator are still the most essential part of positional tolerance functional tests. In some situations the individual may demonstrate the ability to assume and maintain a specific posture (e.g., kneeling, crouching, etc.), but the ability to perform at a pace commensurate with industry time-motion standards may be limited. In functional capacity evaluations such limitations must be addressed to ensure the reliability and validity of the test process. Even if the test subject did not require a modification in the required posture, the skilled evaluator will still note that while the position was assumed and maintained, the performance was limited by other physiological and/or psychological factors. Those performance limitations may include, but are not restricted to the following: pain resulting in decreased functionality; inability to perform at a satisfactory level within the full functional range of the physical demand; limitations in other bodily functional areas (e.g., slowed performance in the kneeling posture due to physical limitations in handling/fingering); severely limited cognitive processing capabilities, etc. The keen eye of the skilled evaluator is critical in recording observed deviations from the norm and providing an interpretation for variations in performance.

How does the MTM standard apply to the BTE Functional Range of Motion System?

The Functional Range of Motion (FROM) System has sixteen protocols for the evaluation of positional tolerances during the performance of functional activities. Eight of the positional tolerance protocols are designed for measurements in the occasional work category, while the other eight are designed for measurements in the frequent category.

The number of cycles necessary to complete the occasional work demand protocols is set to most closely approximate a 5 minute timed tolerance test period. The number of cycles necessary to complete the frequent work demand protocols is set to most closely approximate a 20 minute timed tolerance test period.

Separate protocols are employed in each positional tolerance for the occasional and frequent work demand categories as the common practice of extrapolating a limited time period performance to the frequent work demand capacity has been shown to be flawed. Tests that only require an individual to assume a position for a period not exceeding five minutes cannot accurately measure a worker's capacity for endurance.

A test subject that achieves a score in the competitive range (80-100) in the frequent demand protocol for a specific positional tolerance has demonstrated the capacity for acceptable performance over the course of an eight hour day. It will also hold true that the test subject has successfully demonstrated the capacity for acceptable performance with regard to the occasional work demand. A test subject achieving a score above 100 has demonstrated the capacity for acceptable performance at or exceeding an eight hour day equivalency.

How are the MTM test results applied to the evaluation of the patient/worker's abilities?

Many large manufacturing concerns employ industrial engineers that have derived time-motion standards for the employer's work site. If an accurate analysis of the work determines that the employee must perform kneeling activities on an occasional basis, but the work flow is at a rate equivalent to a 95 MTM standard, then the evaluator has the means to determine if the worker is capable of returning to the job and the specific demands of the workplace. Although 80 to 100 MTM is considered to be in the competitive range, an employer with a specific MTM standard will want the worker at or above that standard – a 95 MTM score in the example given.

For employers not using time-motion standards, the ability to quantify a worker's capabilities within internationally recognized time-motion standards provides a firmer basis for assessing performance than a test where the subject is asked merely to assume a given position.

Is the method by which the test subject performs the process really that important?

The method by which the test subject performs a process is very important to the analysis of the demonstrated ability of that individual. Time-motion standards are set assuming the specific tasks and task elements will be performed in the most practical and efficient manner possible. For example, the upper level reach protocol of the FROM system requires the worker to remove a peg from the unit with one hand, transfer it to the opposite hand, and then place the peg into the corresponding hole in the next panel. The process allows the worker to initiate removal of the next peg while the prior one is still being placed in its proper location.

However, if the test subject were to use only one hand to transfer the first peg from one panel to the other, the MTM score would reflect a significant negative influence. Specifically, the test subject would lose the advantage of having both hands work in concert. Conversely, if the test subject were to use both hands to pull two pegs out simultaneously and then move them into the appropriate holes on the corresponding panel, the test result would likely produce a higher MTM score.

When should the process be modified, and how should this be reported?

Some individuals, due to impairment, may require modifications to the testing process. In such cases, use the comments section of the specific test to record any variance required to accommodate the worker's ability to perform the test. Any decrement from the norm in the test score should also be explained.

For example, an individual with residual effects from a closed head injury may have difficulties specifically related to one-sided weaknesses/deficits. Although the individual may be able to kneel without difficulty during the course of the test, the transfer of the peg from one hand to the other, as well as the placement of the peg into the hole using the impacted extremity, may be problematic. In a situation such as this one, it would be important to record the observation of the deficit, but also to indicate the test subject demonstrated the ability to kneel without limitations to the lower extremities. The deficit should also be explained as being a possible performance limitation that could affect the ability to perform activities in the position if manual dexterity activities are required.

Should I be observing and reporting anything other than the positional tolerances in the time-motion test process?

Although the primary positional tolerance is the specific focus of a time-motion test using the FROM system, there are several secondary observations that can have a significant bearing upon a functional capacity evaluation. For instance, observations related to the upper level reach activity include, but are not limited to, the following:
the ability to work with the cervical spine in extension
the ability to work with both upper extremities through a range (chest level to full extension reach) of motion
the ability to perform simple repetitive activities without unnecessary breaks
the ability to coordinate right and left side activities into one process

the possibility of tremor associated with overhead work affecting proprioception activities

Obviously, some of the most unique observations will be in the area of work conducive and non-conducive behaviors. Pain related behaviors and the consistency of the report to the impairment are critical to an appropriate evaluation of the test subject.

Distraction plays an important role in the FROM system's test protocols, in order to facilitate the client's performance of the activity without focusing on the pain. Many individuals, when asked to perform a task, will focus on the completion of that task. However, if an individual is not given a specific task to perform in the associated positional tolerance, they will focus on their physical state instead, and the subjective pain report will tend to be exaggerated. This corresponds with anecdotal reports of individuals who feel much better after returning to work, after being in a self-limiting and restrictive environment such as the couch during an extended course of recovery.

Some individuals are also quite competitive, and once put to a task will perform at a level that would exceed an evaluator's opinion of the functional capacity of the test subject absent a time-motion/task test.

Contraindications to Testing

If the test subject's initial heart rate exceeds 70% of the age-predictive maximum heart rate (220 minus Test Subject's Age). If the test subject has a reported history of prior lower extremity or heart/cardiovascular problems, it may be necessary to obtain a release for this type of testing.

Reason for Conclusion

1. The test subject concludes the test and reports an inability to proceed due to discomfort that makes continuation of the test impractical.
2. The test subject's heart rate exceeds 85% of the age-predictive maximum heart rate.
3. The evaluator concludes the test as the test subject appears to be unable to continue the test due to physical limitations.
4. The test is successfully completed

Accessing the FROM Tests

In order to access the FROM tests, a client must first be selected, or entered.

Once a client has been selected, click Work Sim Test on the ODES main page.

The following FROM Protocols are available in ODES:

F.R.O.M. Stooping with 36" Displacement – Occ

PREREQUISITES
The test requires the placement of the 28" high work surface table in front of the BTE Functional Range of Motion System. The test subject is allowed the opportunity to lean against the table while placing the pins in the proper holes. The test subject is also advised that he/she may return to an erect posture subsequent to the completion of a test cycle.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 2 - Zone B to the corresponding row of holes in Panel 3 - Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Stooping with 36" Displacement – Freq

PREREQUISITES
The test requires the placement of the 28" high work surface table in front of the BTE Functional Range of Motion System. The test subject is allowed the opportunity to lean against the table while placing the pins in the proper holes. The test subject is also advised that he/she may return to an erect posture subsequent to the completion of a test cycle. The test subject is also advised that a ten second rest period is provided after the completion of each five cycles until the test is completed.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 2 - Zone B to the corresponding row of holes in Panel 3 - Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed.

F.R.O.M. Stooping – Occ

PREREQUISITES
The test subject is advised that he/she may return to an erect posture subsequent to the completion of a test cycle.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 2 - Row 2 - Zone C through Panel 2 - Row 1 - Zone B to the corresponding row of holes in Panel 3. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Stooping – Freq

PREREQUISITES
The test subject is advised that he/she may return to an erect posture subsequent to the completion of a test cycle. The test subject is also advised that a ten second rest period is provided after the completion of each five cycles until the test is completed.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 2 - Row 2 - Zone C through Panel 2 - Row 1 - Zone B to the corresponding row of holes in Panel 3. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed.

F.R.O.M. Upper Level Reach – Occ

PREREQUISITES
The test subject is asked to stand next to the side panel of the BTE Functional Range of Motion System and raise his/her right arm with fingers extended to the highest level of the test apparatus while remaining with both feet flat on the floor. The highest row reached with the distal tip of the middle finger exceeding the top of the peg hole will be the highest row used during the evaluation. If the fingertip does not exceed the top of the peg hole, the next highest row is used. The height of the top row used must be recorded in the comments section.

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 to the corresponding row of holes in Panel 2. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Upper Level Reach – Freq

PREREQUISITES
The test subject is asked to stand next to the side panel of the BTE Functional Range of Motion System and raise his/her right arm with fingers extended to the highest level of the test apparatus while remaining with both feet flat on the floor. The highest row reached with the distal tip of the middle finger exceeding the top of the peg hole will be the highest row used during the evaluation. If the fingertip does not exceed the top of the peg hole, the next highest row is used. The height of the top row used must be recorded in the comments section.

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 to the corresponding row of holes in Panel 2. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed. A rest period of ten seconds is allowed between each set of five cycles.

F.R.O.M. Crouching Reach – Occ

PREREQUISITES
The test subject is advised that he/she must remain in the crouching/squatting position and may touch only one knee down to the ground after the completion of a cycle. The knee must return to the crouch/squat position prior to the transfer of any pegs for the next cycle.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 1 - Zone C to the corresponding row of holes in Panel 2 - Zone C. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Crouching Reach – Freq

PREREQUISITES
The test subject is advised that he/she must remain in the crouching/squatting position and may touch only one knee down to the ground after the completion of a cycle. The knee must return to the crouch/squat position prior to the transfer of any pegs for the next cycle. The test subject is also advised that a ten second rest period is provided after the completion of each five cycles.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 1 - Zone C to the corresponding row of holes in Panel 2 - Zone C. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed.

F.R.O.M. Axial Rotation – Occ

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 - Zone B to Panel 6 - Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Axial Rotation – Freq

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 - Zone B to Panel 6 - Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest-level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed. After each five cycles the test subject is allowed a ten-second rest period.

F.R.O.M. Kneeling – Occ

PREREQUISITES
The test subject is allowed the opportunity to wear knee pads if desired. The test subject is also advised that he/she must remain in the kneeling position during the course of the test until it is completed.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 1 - Zone C to the corresponding row of holes in Panel 2 - Zone C. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of five cycles are completed.

F.R.O.M. Kneeling – Freq

PREREQUISITES
The test subject is allowed the opportunity to wear kneepads if desired. The test subject is also advised that he/she must remain in the kneeling position during the course of the test for the completion of five cycles before a ten-second rest is allowed out of the kneeling position. The rest period is allowed out of the kneeling position after every five cycles until the test is completed.

PROCESS
The test subject is instructed to move the five rows of pegs from Panel 1 - Zone C to the corresponding row of holes in Panel 2 - Zone C. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of twenty cycles are completed.

F.R.O.M. Kneeling to Standing and Back – Occ

PREREQUISITES
The test subject is allowed the opportunity to wear kneepads if desired.

PROCESS
The evaluator sets up one row of pegs in each of the lowest rows (yellow) in Panel 2 - Zone B and Panel 2 - Zone C. The test subject is instructed to move a row of pegs from Panel 2 - Zone C at the lowest row to the next highest row directly above the row from which the activity started. The pegs will be moved to the corresponding hole directly above. Two of the pegs must be moved with one hand and the third peg must be moved with the opposite hand. The test subject must perform all activity in Zone C in a kneeling posture while all activity performed in Zone B must be done in a standing posture. Once the pegs have reached the top row in Zone B a test cycle has been completed. The test subject then proceeds to move the pegs downward, one row at a time employing the same process. Upon reaching the lowest row of holes in Zone C another cycle has been completed. The test is concluded when a total of seven cycles are completed. This means the person will complete the test in a standing posture.

F.R.O.M. Kneeling to Standing and Back – Freq

PREREQUISITES
The test subject is allowed the opportunity to wear kneepads if desired.

PROCESS
The evaluator sets up one row of pegs in each of the lowest rows (yellow) in Panel 2 - Zone B and Panel 2 - Zone C. The test subject is instructed to move a row of pegs from Panel 2 - Zone C at the lowest row to the next highest row directly above the row from which the activity started. The pegs will be moved to the corresponding hole directly above. Two of the pegs must be moved with one hand and the third peg must be moved with the opposite hand. The test subject must perform all activity in Zone C in a kneeling posture while all activity performed in Zone B must be done in a standing posture. Once the pegs have reached the top row in Zone B a test cycle has been completed. The test subject then proceeds to move

the pegs downward, one row at a time employing the same process. Upon reaching the lowest row of holes in Zone C another cycle has been completed. The test is concluded when a total of twenty eight cycles are completed. A ten second rest period is provided after the completion of each seven cycles until the test is completed.

F.R.O.M. Standing Position – Occ

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 - Zone B to Panel 4 Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of four cycles are completed.

F.R.O.M. Standing Position – Freq

PROCESS
The test subject is instructed to move five rows of pegs from Panel 1 - Zone B to Panel 4 - Zone B. The transfer process requires the test subject to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. The test subject commences with the highest level row and then proceeds in order to the lowest level row. Once the fifteen pegs have been moved, the process is completed in reverse order until all fifteen pegs are restored to their original position. This constitutes the completion of one cycle. The test is concluded when a total of sixteen cycles are completed. The test subject is advised that a ten second rest period is provided after the completion of each four cycles.

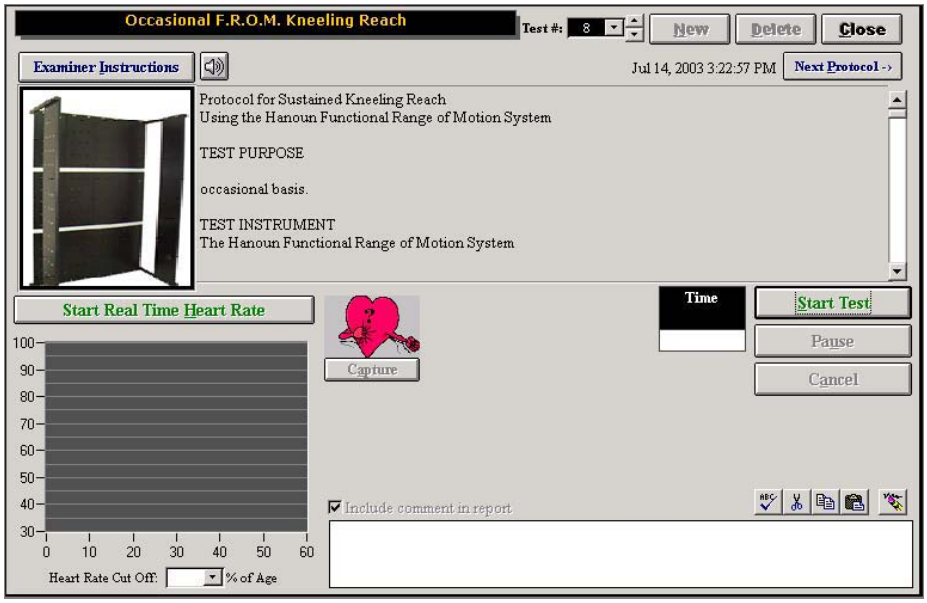
F.R.O.M. Multi-Level Axial Rotation Reach - Occ

PROCESS
The test subject is instructed to move five rows of pegs from Panel 6 – Zone A (Height Adjusted) to Panel 5 – Zone B. The five rows of pegs in Panel 5 – Zone B are then transferred directly across to Panel 6 – Zone B. Then, the five rows of pegs in Panel 6 – Zone B are transferred to the five rows in Panel 5 – Zone A (Height Adjusted). Finally, the five rows of pegs in Panel 5 – Zone A are transferred to the same rows in Panel 6 – Zone A. This completes one cycle. A total of two cycles are completed for this test. The transfer process requires the test subject, when going from left to right, to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. When going from right to left, the transfer process is reversed. The test subject commences with the lowest level row and then proceeds in order to the highest-level row.

F.R.O.M. Multi-Level Axial Rotation Reach - Freq

PROCESS
The test subject is instructed to move five rows of pegs from Panel 6 – Zone A (Height Adjusted) to Panel 5 – Zone B. The five rows of pegs in Panel 5 – Zone B are then transferred directly across to Panel 6 – Zone B. Then, the five rows of pegs in Panel 6 – Zone B are transferred to the five rows in Panel 5 – Zone A (Height Adjusted). Finally, the five rows of pegs in Panel 5 – Zone A are transferred to the same rows in Panel 6 – Zone A. This completes one cycle. A total of two cycles are completed for this test. The transfer process requires the test subject, when going from left to right, to take the peg out of the hole with the left hand, transfer it to the right hand while the peg is out of the hole, and then place the peg into the corresponding hole with the right hand. When going from right to left, the transfer process is reversed. The test subject commences with the lowest level row and then proceeds in order to the highest-level row. The test subject is advised that a ten second-rest period is provided after the completion of each two cycles.

Once a test has been added to a client, and Perform test has been selected in the bottom right hand corner of the page (you can also double click the test name), your test page will appear. Below is an example of what the typical test page should look like.

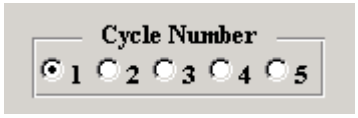


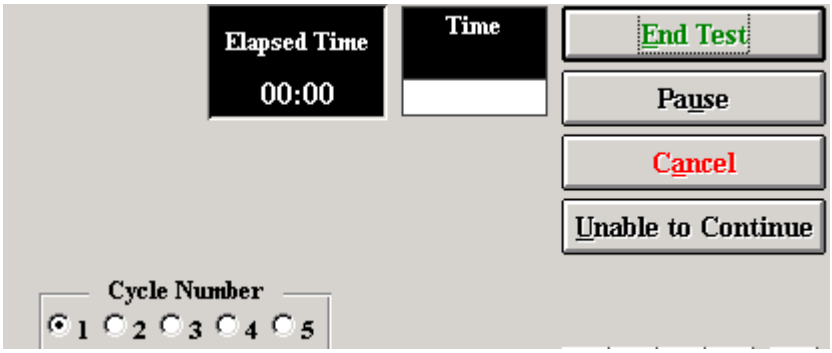
The client should be instructed in the proper technique prior to starting the test. The instructions need to emphasize that the client is required to work as quickly as possible. It is recommended that two rows of the protocol be completed, prior to starting the actual test, to make sure that the instructions were understood. Click Examiner Instructions to switch to Patient Instructions. Click on the speaker button to have the instructions read aloud by the computer.

Click Start Test to start the test. Click Start Real Time Heart Rate to start recording the heart rate. Click Capture to record the heart rate in the heart rate report. Click Close to return to the Work Sim menu

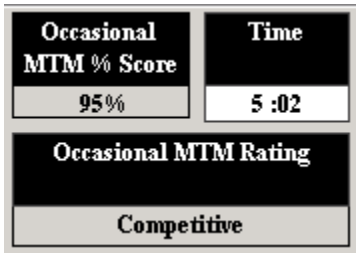
The FROM protocol, once started, will provide the evaluator with a counter to track the number of cycles the client has completed. The counter can be activated by either clicking on the numbered radio button (as shown below) or by right clicking the mouse anywhere on the page.

Click Pause if the client did not understand the instructions and then Resume to continue with the test when ready.





The test will end once you indicate (using the counter) that the final cycle is complete, or if you click End Test or Unable to Continue. If the client is unable to continue the time will still be displayed but an MTM rating will not be calculated, as the task was not completed.



BTE Digital Radio Frequency Heart Rate Monitor

The BTE Digital Radio Frequency Heart Rate Monitor is fully integrated with the Data Acquisition Box. The use of the Heart Rate Monitor provides the ability to monitor a client's heart rate. Unlike other heart rate monitors, the BTE Heart Rate Monitor allows for constant monitoring during the work simulation tests while remaining fully integrated with the computer. The range of the BTE Heart Rate Monitor has been tested to be accurate for up to **30-50** feet.

This equipment contains an RF module, which has been previously tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to FCC Rules. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the users authority to operate this equipment.

ATTENTION
The Hanoun Digital Radio Frequency Heart Rate Monitor is a fitness-monitoring device solely intended to monitor a client's heart rate during physical testing. It is not a medical device and should not be used in any way to diagnose a client's health or to prescribe treatment.

Radio frequency allows for non-interruption of signal, therefore:
Clothing does not interfere
Radio signal does not require line-of-sight
Movement in front of the receiver does not block the signal

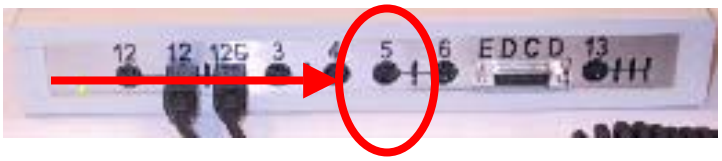
Components

BTE Digital Radio Frequency Transmitter
BTE Digital Radio Frequency Receiver
Polar Belt and Two Straps
Two extra 9 Volt batteries and a battery charger

Connecting the Heart Rate Receiver to the Data Acquisition Box

The BTE Heart Rate Monitor is designed to be readily attached to the Data Acquisition Box. Please follow the instructions below:

Step 1: Attach the cable of the Receiver to Port 12.



Step 2: Place the Receiver in the Heart Rate Monitor holder on the BTE Computer Station.

Placement for the BTE Digital Radio Frequency Heart Rate Monitor

Step 1: Place the black strap underneath your client's chest and directly against their skin. See diagram as depicted below.

For optimal signal, the use of electrode conductor gel or water on the heart rate monitor chest strap is recommended.

For alternative placements, please see the troubleshooting section of this manual. Please note that the Hanoun Heart Rate Monitor does not operate like a Polar Heart Rate Monitor. The transmitter does not store the values, so the readings are more accurate and updated constantly. As a result, if the heart rate is fluctuating too much, the heart rate monitor may not be able to pick up a constant value and a "?" will appear. The heart rate must be steady in order for the device

Many physiological characteristics also play a role in obtaining a heart rate and can differ from individual to individual; for example, obesity, skin conductivity and body hair composition.

Body Positioning:

Back of the Client:

Place the transmitter on the back of the client, at beltline level. This is the optimal position, as it prevents the transmitter getting in the client's way during the testing procedures. First, attach the transmitter to the belt strap that is supplied with the system. Next, place the strap around the client's waist so that the transmitter is positioned on their lower back.

Operation of Monitor

When attaching the battery to your transmitter and depressing the on/off switch, the *red light* on the front surface of the transmitter should light up indicating that the battery is good.

The rechargeable batteries need to be charged for a minimum of 12 hours before use. The batteries are not charged when you first receive your system. After charging them they will be good for up to 4 hours of testing in the Heart Rate Monitor. If you are having difficulties capturing the client's heart rate, try to use a regular 9-volt battery. It is recommended you replace your rechargeable batteries every year.

Please note that if either of the two wires which run from the battery to the Heart Rate Transmitter break, you will be responsible for their repair, as this is not covered by the warranty. If it is hard to detach the battery, use a flat object (such as a dull knife) to act like a wedge between the metal battery terminal and the large metal battery connector.

On/Off Switch

Located on the top of the Transmitter is the on/off switch. Prior to monitoring the client's heart rate, depress the switch to the 'on' position. The light will flash in time with the client's heart rate.

When finished with the device, turn the on/off switch to the off position in order to preserve the life of the battery.

Heart Rate Receiver Testing

The Receiving unit performs a self-diagnostic on a continuous basis, indicated by the ***red light*** on the back of the unit.

1 When the unit is attached to the Data Acquisition Box the red light will be illuminated to indicate that it is receiving power.

Recommended Care and Maintenance Schedule

The following outlines the recommended maintenance schedule for your Hanoun System. A maintenance log should be kept for the equipment.

It is recommended that if your computer is going to be used for other applications than ODES or if the computer is connected to a network or the Internet, anti-virus software be installed.

After each Client

- Clean handles with an antibacterial wipe or rubbing alcohol (70% Alcohol) for sanitary reasons.

Daily

- Verify the equipment to be used to ensure it is measuring accurately. If verification fails, re-calibrate the equipment.
- Make sure Handgrip is stored on the computer management stand with the end with the cord in the top hook.
- Store all equipment so that the weight of the tool is not on the cord.
- Turn off the data acquisition box and computer at the end of the day.
- Back up your database (have a backup disk for each day of the week)

Weekly

- Calibrate and verify all tools.
- Back up your database (have a back up disk for each week of the month)

Monthly

- Clean the ER Column with a mild glass (15-20% Alcohol) or degreasing cleaner with a lint free cloth.
- Re-lube the column with lightweight general lubrication oil using a lint free cloth.
- Check all wires to ensure they are secure and in good condition.
- Compact and Repair the ODES database. Refer to ODES section of manual.
- Clear hard drive of unnecessary files by going to Start │Programs │Accessories │System Tools │ Disk Cleanup. Select the C Drive and select the files you wish to delete.
- Run the defragmenter program to ensure optimum computer performance. To do this go to Start │Programs │Accessories │System Tools │ Disk Defragmenter.

Quarterly

- Remove all handles from the ER arms, FOCUS load cell and UTM and apply a white grease to them.
- Check all the bolts on the EPIC crate and lifting shelves to make sure they are secure

Yearly

- Make sure the ER Platform is still level and make adjustments as appropriate.

Upon request circuit diagrams, parts lists, descriptions and other information required to repair parts may be provided to a qualified technical person.

Transporting the Equipment

The following is required for shipping/transporting the BTE Evaluation and Rehabilitation System or components to ensure its safe arrival at its final destination:

1) Package the computer monitor, CPU, printer, and speakers in the original packaging you received them in. If you no longer have the original packaging material, it is recommended you take the equipment to a postal center to have it packaged properly.
2) All the electrical tools (hand grip, pinch grip, algometer, inclinometer, goniometer, heart rate monitor, data acquisition box, and FOCUS load cell) need to be packaged well in bubble wrap.
3) The Computer Management Stand must have the brakes on the wheels locked. If parts of the equipment (i.e. the computer and electrical tools) are being placed on the computer management stand during shipping, the stand must be bolted to a skid. Shrink-wrap can be used to prevent the load from shifting during transportation.
4) The arms must be taken off the ER Platform and packaged in bubble wrap or the original packaging they came in.
5) The handles for the FOCUS and UTM can be packaged in bubble wrap.
6) The Universal Task Master (UTM) needs to be packaged in bubble wrap. The white cable that attaches the UTM to the data acquisition box.
7) The shelves must be lowered as far as they can so as to prevent the counter weight from moving during shipping and the cable from breaking. Remove all the cables from the arms.
8) The post will need to be removed from the base of the platform. There are four screws that can be removed using an Allen key. The post needs to be in a horizontal position for shipping.
9) The base of the platform can be shipped either flat or on its side.

It is recommended when packaging the base and the platform that a couple of strong people are available due to the weight of the machine.

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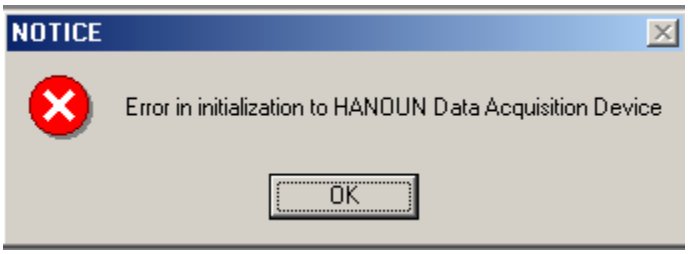
Trouble Shooting

Data Acquisition Box

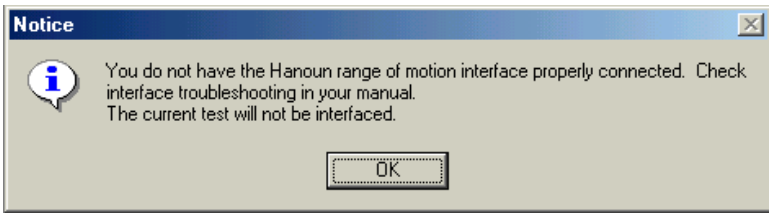
"Error in initialization to BTE Data Acquisition Device":

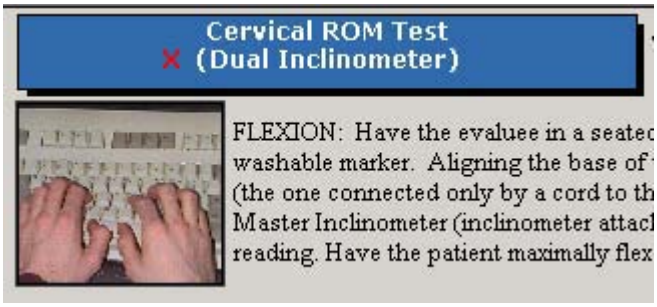


Click Auto in Administration | Environment Settings
Is the light on in the back of the box (red)? If so, turn box off for 30 seconds, then go to Administration | Environment Settings, turn the box on and click Auto. If the red light still does not go off, unplug all the tools, turn off the Data Acquisition Box and turn it back on. Click on Auto and add one tool at a time and then click Auto. If a tool is plugged in a the above error is seen, this tool is shorting out the Data Acquisition Box. Call BTE Customer Service for repair.
Is the light on in the front of the box? If not, make sure the box is on and connected properly. Try alternative power outlet if light still does not go on.
Is the tool connected tightly into the port on the front of the Data Acquisition Box?
Is the serial cord connected tightly to COM port and to the DAC box?
Is there Palm Pilot or another Personal Device Assistant software loaded on the computer? A HotSync icon (see below) in the bottom right hand corner of the screen is usually visible. Also check for the software under Start │Programs. If so, close the icon (it blocks the COM port) by right clicking your mouse over it and select Exit.

Turn off the box, unplug all attachments from the front of the box, unplug the power supply from the box, get out of ODES, shut down computer for 1 min. Turn the computer back on, get into ODES, plug the power supply for the box in, turn the box on and click Auto in Administration | Environment Settings.
Check you printer setting under Start │Settings │Printers to see which port they are printing to. If it is set to COM1 it is blocking the serial port for the Data Acquisition Box. Change the port to LPT or USB depending on where you plug the printer into the computer.
Check the status of your computer's COM port by going to Start │Settings │Control Panel │System │Hardware │Device Manager. Double click on Ports and then double click on the COM port. The status of the COM port will be outlined in there. If it is not working properly following the troubleshooting tips there.

Inclinometer and Goniometer



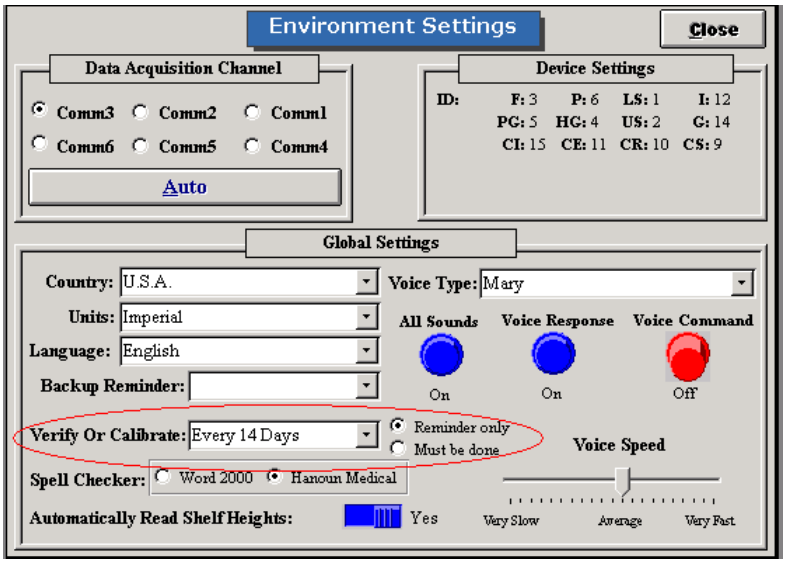


If the interface system cannot be launched when using the BTE Dual Inclinometers, ensure that:
The cords are properly connected (into the Data Acquisition Box and between the Master and the Remote)
The Range of Motion test that is selected in ODES is designed for use with either the Inclinometers or the Goniometer, or is non-integrated. Check the top left corner of the test page to determine which tool the software is looking for.
If you receive this message upon entering a range of motion testing page, you may not have the Data Acquisition Box set up properly, or the device may not be attached correctly. Upon entering the testing screen, you will notice a red 'X' beside the testing tool. This indicates a lack of communication between the tool and the Data Acquisition Box.
Ensure that the tool is in the correct port.

Hand Grip, Pinch Grip, Algometer, and FOCUS

“No Testing can be done until this device has been calibrated or verified”:

Has the tools been calibrated and verified? If not, calibrate and verify.
Is the Calibration/Verification reminder set to “must be done” or “reminder” in Administration | Environment Settings? If on “must be done”, calibration must occur prior to performing a test. If set to “reminder” tests can be performed without a new calibration.



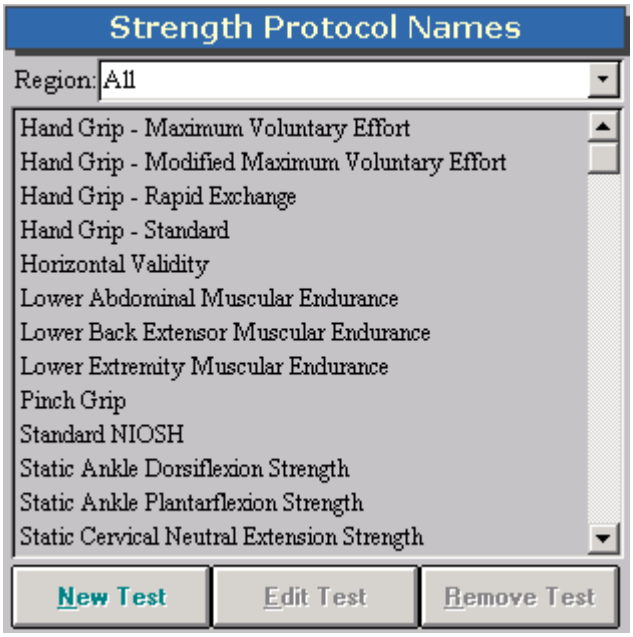
The voice is not beginning the count down on your screen. You cannot perform any test (no prompts).

Go into Administration │Environment Settings. Make sure that Voice Response is on. Try to switch the voice type to see if there are any problems with the speech software. If an error occurs you will need to re-load the SAPI51 file located on the ODES CD under the Speech folder.

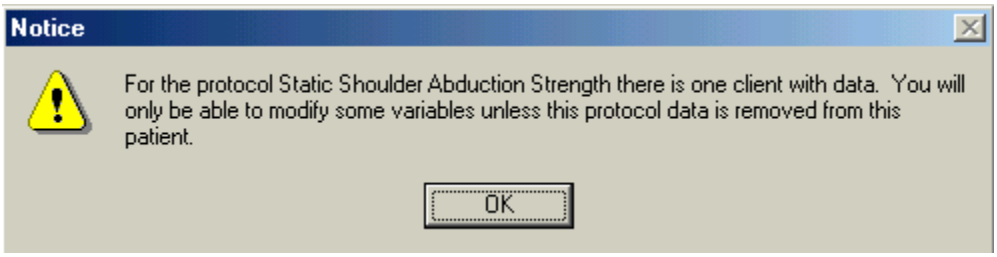
Cannot start the strength test that has been selected

Are your voices installed properly?

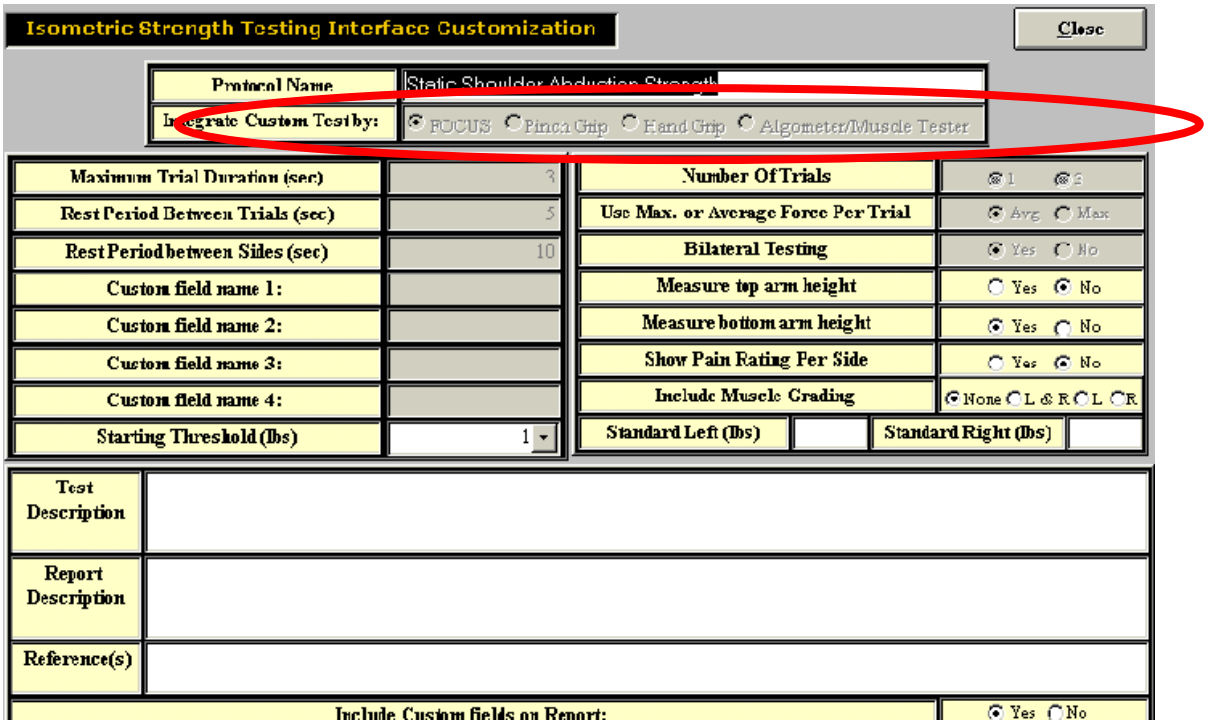
Do you have the correct tool selected? Only one strength tool can be associated with a protocol. You have to create a duplicate test to utilize both the FOCUS and Algometer for a given protocol. To check if the correct tool is selected, highlight the test from the Strength Protocol Screen.



Click Edit Test and see which tool is selected. NOTE: If you have previously done testing with this protocol, you will receive a warning prior to entering the Edit Test screen. This will alert you that any changes made to the protocol may affect data obtained previously for other clients.



Edit Test Screen: If you have performed this test with a tool already, the 'Integrate Custom Test By' section will be deactivated to prevent you from changing tools. This is why you have to create a duplicate copy of the test to utilize a different testing device.



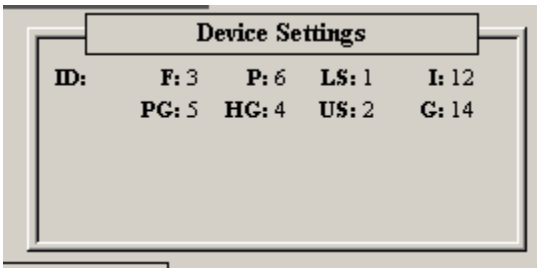
If the wrong tool is selected, create a new test using the same values (just a different name)
If the correct tool is selected, ensure that your DAC box is set up successfully.

If you still cannot perform the test, contact our customer service department at (800) 461-6888 X2.

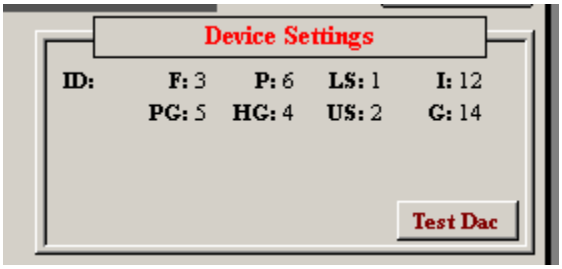
Evaluator/CIRES Systems:

Ensure that your device settings are both set to PORT 6 in Administration | Environmental Settings. This will ensure that the Algometer will work in both the strength testing screens and in the superficial tenderness testing screens.

To check device settings, go to Administration | Environment Settings from the ODES main menu. The device settings are listed in the upper right-hand corner of the screen.



The ‘F’ and ‘P’ values should both say ‘6’. If they don’t (as shown above), double click on the word Device Settings. Device Settings should now be in red.



You are now able to modify the number located beside ‘F’ to ‘6’. To do this, click on the number 3 until it reads 6. You have now set the Algometer to read in only port 6 for both strength and fibromyalgia tests. Ensure that the Algometer is plugged into port 6.

Troubleshooting the Multiplanar Accessory Housing Joint

If you have problems inserting or removing the Multiplanar Accessory Housing Joint from one of the ER arms, try the following:

Locate the small round silver pin on the right side of the upper or lower accessory arm (this pin is located at the end of each arm). Try pulling the pin outward (further to the right), and then twist it slightly in any direction. This will create space in the opening of the accessory arms’ end.
Locate the short black handle on the right side of the upper or lower accessory arm. This handle is located at the end of each accessory arm. Turn the handle in a counterclockwise direction. This will loosen the opening in the accessory arm.

These steps should loosen the openings in the ends of the accessory arms, and create space for the insertion or removal of the Multiplanar Accessory Housing Joint.

If you have problems securing the Multiplanar Accessory Housing Joint to one of the ER arms, try the following:

Locate the small round silver pin on the right side of the upper or lower accessory arm. This pin is located at the end of each arm. Ensure that the pin is in the locked position (tucked into the far left). If it is not, twist it slightly in any direction, until you hear a click. This will tighten the space in the opening of the accessory arm’s end and secure the Multiplanar Accessory Housing Joint.

Troubleshooting: Accessory Attachment and Removal

If an accessory cannot be inserted into the Accessory Housing Joint, try the following:

Locate the handle on the top of the Accessory Housing Joint. This handle is on the right side of the Multiplanar Accessory Housing Joint. Make sure that the handle is set to the unlocked position. In order to be in the unlocked position, the handle must be given a ¼ turn in a counter-clockwise direction, and then pulled outward. The handle can be maintained in the unlocked position by twisting it gently in either direction.
Select the accessory to be attached. Be sure that the flattened end of the accessory is being inserted into the housing mechanism facing to the right.
Grip the handle and twist it gently until a click is heard.

If an accessory cannot be removed from the accessory housing mechanism, try the following:

Locate the top handle of the Multiplanar Accessory Housing Joint.
Pull the handle and twist it gently in any direction.

Grip the accessory and pull it out of the Accessory Housing mechanism. You may need to gently rotate the accessory and pull it upward in order to remove it.
Locate the short black handle on the right side of the upper or lower accessory arm. This handle is located at the end of each accessory arm. Turn the handle in a clockwise direction. This will tighten the opening in the accessory arm, and secure the Multiplanar Accessory Housing Joint.

These steps should tighten the openings at the ends of the accessory arms, and create a tighter fit around the cylinder of the Multiplanar Accessory Housing Joint.

Troubleshooting: Multiplanar Accessory Housing Joint Rotation

If you cannot rotate the Multiplanar Accessory Housing Joint in the sagittal plane, try the following:

Ensure that you are using the correct handle. There are two handles on the Multiplanar Accessory Housing Joint. The handle furthest from you when you are facing the ER, on your right-hand side, is the one to adjust for sagittal rotation.
Ensure that you turn the handle counterclockwise approximately ¼ rotation.
Ensure that you pull the handle outward and hold it in this position while rotating the Multiplanar Accessory Housing Joint.

If you cannot rotate the Multiplanar Accessory Housing Joint in the coronal plane try the following:

Ensure that the short black handle is properly unlocked by turning it counterclockwise approximately ¼ rotation.
Ensure that the small round pin is properly unlocked by pulling it outward (further to the right) and twisting is gently in any direction.
Grip the Multiplanar Accessory Housing Joint and gently shake it to ensure that it is not stuck in a particular position.

If the load cell does not appear to be accurate after you have calibrated it, check the following:

Was the Multiplanar Accessory Housing Joint properly connected to one of the ER accessory arms?
Did you calibrate the load cell with NO ATTACHMENTS on the Multiplanar Accessory Housing Joint?
Was the Multiplanar Accessory Housing Joint properly connected to the Data Acquisition Box?
Was the computer properly connected to the Data Acquisition Box?
Was the main power supply of the Data Acquisition Box properly connected?
Was the main power switch of the Data Acquisition Box turned to the ON position?

I feel the ER shelf height readings are not correct

Ensure the cable connections are correct and are tight at either end.
Check that it is plugged into the correct port.
Re-calibrate the shelves.
Check the DAC Box troubleshooting section.
If you are still having difficulty, re-route the cord from the DAC Box directly to the shelf (i.e. single cord connection rather than a two-cord connection through the junction box at the base of either shelf ruler).
BE AWARE that the shelf height reading refers to the arm with the shelf / accessory attached and in the up position. If horizontal then you must subtract 7.25 inches and if down you must subtract 14.5 inches from the shelf height reading.

Universal Task Master

When I go into a UTM test, I get a message that says “Click OK to Calibrate” but I just calibrated my UTM.

ODES and the UTM perform a self-calibration each time you use the UTM load cells. Since you calibrate your UTM system without any accessories attached, the computer needs to first measure the accessory prior to commencing a test. This will re-zero the load cell to include the accessory. Once you click OK, you may proceed with the test.

One of the UTM load cell readings is not correct.

Ensure the cable connections are tight at the UTM center.
Ensure the cable connections are tight at the Data Acquisition Box.
Re-calibrate the load cell.
Check the Data Acquisition Box troubleshooting section.

The UTM handle rotation readings are not correct.

Ensure the cable connection is tight at the UTM center.
Ensure the cable connections are tight at the Data Acquisition Box.
Re-calibrate the handle rotation.
Check the Data Acquisition Box troubleshooting section.

The UTM force scale distance readings are not correct.

Ensure the cable connection is tight at the UTM center.
Ensure the cable connections are tight at the Data Acquisition Box.
Re-calibrate the force scale distances.
Check the Data Acquisition Box troubleshooting section.

Cannot select Start Test for one of the UTM tests.

Ensure the cable connection is tight at the UTM center.
Ensure the cable connections are tight at the Data Acquisition Box.
Re-calibrate the UTM.
Check the Data Acquisition Box troubleshooting section.
Exit the screen and re-enter the test.

Cannot see the Universal Task Master calibration icon in the Utilities menu.

The Universal Task Master option is not installed on your computer. Call the Customer Service Department at BTE Medical.

Cannot select the Universal Task Master icon when I try to create a new strength test or work simulation test.

The Universal Task Master option is not installed on your computer. Call the technical support department at BTE Medical.

Heart Rate Monitor

Why am I not getting a reading with my Transmitter?

Is the red light on the back of the Transmitter flashing?
Is the receiver plugged into PORT 12 on the DAC box?
Under Help | About do you see HR=117? If not call BTE to unlock your Heart Rate Monitor.
Does the Transmitter battery need to be recharged?
Have you tested the Transmitter on a different subject?
Are you using a 9-volt battery? Have you tried a non-rechargeable one?

BTE Training Programs

BTE Medical Inc provides superior training to complement its leading technology. Introductory and advanced courses are available.

ER Level One

This two day training course is for any individual who will be using the BTE functional testing technology. Training will cover the use of each individual tool, basic principles of functional evaluations, how to use the protocol grid and evaluations handbook, testing analysis, report writing and more.

ER Level Two

This one-day course covers advanced applications of the use of the BTE software and technology. The course is developed ideally for those evaluators who have completed the ER Level One course, are familiar with the system, and have completed a minimum of 20 functional tests. The course will include several cases studies to improve the evaluator's evaluation, analysis, and report writing skills.

E.P.I.C. Lifting Capacity

The ELC is the only peer reviewed and published lift capacity protocol, which measures all three domains of function (biomechanical, physiological and psychophysiological). This one-day course is designed to prepare healthcare professionals and technicians to provide standardized, reliable, valid and defensible evaluations with the ELC evaluation. Information on course dates is provided to those who are interested.

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