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ISOKINETIC STRENGTH

1. Background and rationale

In MOST we will assess concentric isokinetic strength of the knee extensor (quadriceps) and knee flexor (hamstring) muscles. (Concentric refers to contraction of the muscle as it shortens and eccentric to contractions of the muscle as it lengthens.) Standing up from a chair requires concentric contractions of the knee extensors and eccentric contractions of the hamstrings. Sitting down slowly requires eccentric contraction of the knee extensors and requires concentric contraction of the hamstring respectively. Both types of contractions are important to function. However, in MOST only concentric contraction will be tested because eccentric motions produced by active dynamometers are not considered to be like those seen during functional activities. Short and rapid eccentric motions are normally produced during daily and sporting activities; isokinetically, this is not seen as the isokinetic movements are usually long and through full range of motion.*

A Cybex 350 isokinetic dynamometer will be used to evaluate the concentric strength of the knee extensors and flexors. Isokinetic dynamometers test muscle performance as the participant applies force against a continuously moving mechanical arm. This is in contrast to isometric tests, which require application of force against an immovable mechanical arm or lever. The Cybex is capable of testing a variety of muscle groups while the mechanical arm is moving at a wide range of speeds. However, studies have found that muscle performance at one speed is highly correlated with performance at other speeds. We will test the performance of the right and left knee extensors and flexors at 60° per second.

2. Equipment and supplies

- Cybex 350 Isokinetic Test and Exercise System and HUMAC software version 4.3.2/CYBEX 300 for Windows98 Software Package
- Johnson anti-shear attachment
- Certified weights (two 2.5 lb, two 5 lb, one 10 lb, and two 25 lb) that have a hole in the center and fit on the T-bar for calibration
- Step stool with a handrail

* Chan, K M and Maffulli, N (1996) Principles and practice of isokinetics in sports medicine and rehabilitation. Williams & Wilkins, Hong Kong

2.1 Service and maintenance

The machines will come with a 12 month warranty and an extended maintenance contract purchased to cover the duration of the baseline exam. The Cybex 350 is a low maintenance machine. There are three areas which should be lubricated every 2 months with a dab of lithium grease (one on each seat back and one on each pedestal clamp). It is recommended that every 3 months the steel shaft of the dynamometer be wiped with a rubbing alcohol pad.

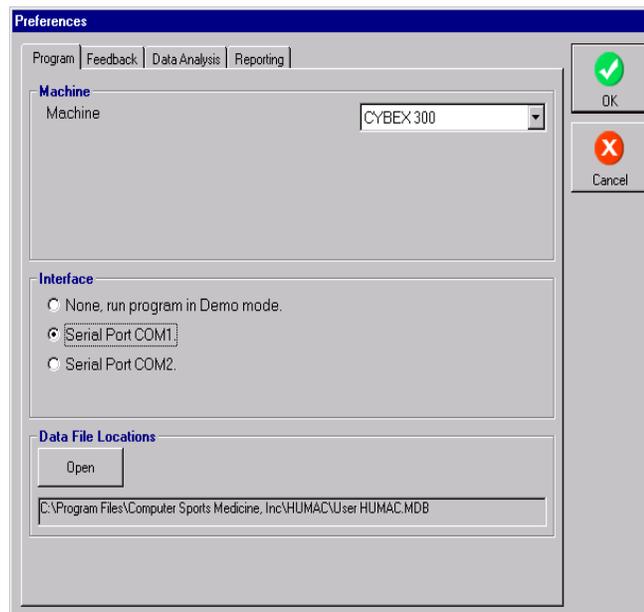
Any computer problems are covered by Dell's next day service. Repair of the dynamometer is covered under the Computer Sports Medicine, Inc. (CSMI) one-year warranty and extended service contract (48 hours after call in to CSMI).

Rob and Rich Potash: **Computer Sports Medicine, Inc.**
101 Tosca Drive
Stoughton, MA 02072-1505
Phone: 781-297-2034
Fax: 781-297-2039

The calibration and verification will be done weekly. Procedures for calibration and verification are addressed in section 2.3 and Appendix 1.

2.2 Preferences set during installation of software

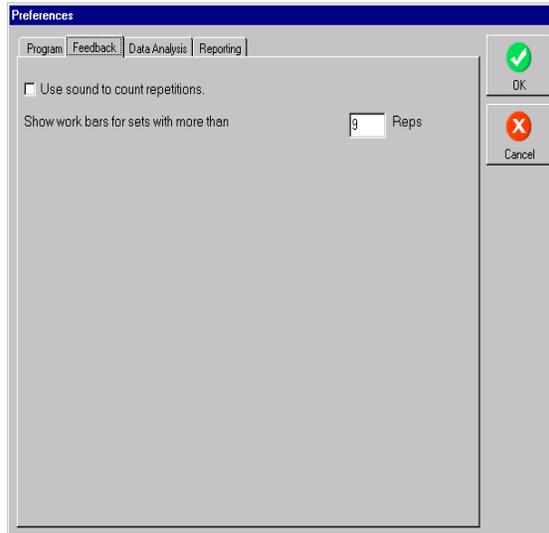
Preferences will be set by head technician or clinic coordinator using the file preference on the pull down window.



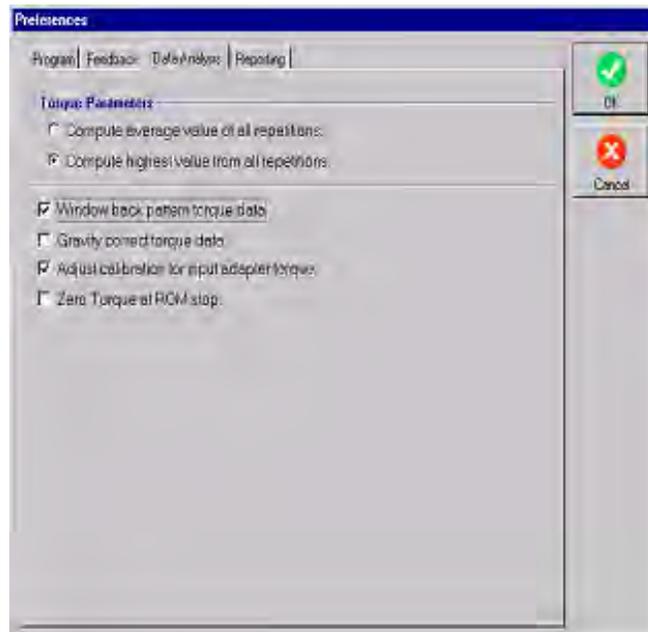
Tab 1 Program

Tab 2 Feedback – be sure there is no check mark next to "use sound to count repetitions."

Next to "Show bars for tests with more than" type in "9" by "Reps" (to show curve).

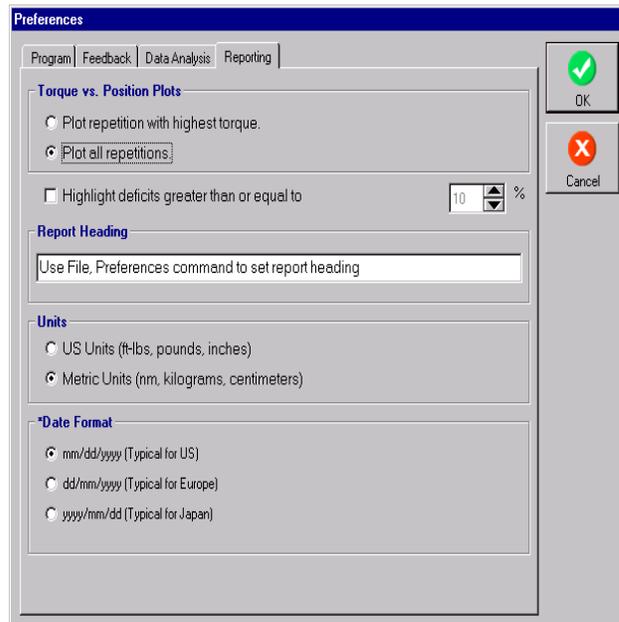


Tab 3 Data Analysis - check "Compute highest value from all repetitions," "Window back pattern torque data," and "Adjust calibration for input adapter torque." Make sure that the "Gravity correct torque data" is NOT checked.



Tab 4 Reporting - check "Plot all repetitions" and "Metric Units (nm, kilograms, centimeters)"

When the machine is turned on each day, preference setting should be checked. Notify the study coordinator if the preferences have been changed.



2.3 Calibration

See Appendix 1 for step by step calibration instructions. Each clinic will have certified weights for calibration. These should be followed once a week if daily calibrations at the beginning of the study showed that the calibration is accurate. A reading of 178-182 ft-lbs is acceptable. High or low values may indicate bouncing of weights during calibration while arm is moving. If out of range, repeat calibration once, making sure weights fall smoothly, followed by verification. If the calibration and verifications range is still not correct, call CSMI (781-297-2034).

3. Safety issues and exclusions

The quadriceps test using the Cybex is generally safe and well tolerated. However, injury may occur in participants with knee joint pathology or if the machine is operated incorrectly.

Participants should not be tested on the dynamometer if they have any of the following conditions (See data collection form for specific questions corresponding to each exclusion.):

Participant exclusions:

- Blood pressure, defined as >199 / 109 mm Hg
- History of cerebral aneurysm
- Cerebral bleeding within the past six months
- Back surgery within the previous 3-month period
- Myocardial infarction in previous 6-week period
- Cataract surgery within the previous 6-week period
- Untreated inguinal hernia
- Participant develops chest pain or dizziness while at the clinic or during test
- Thigh strap cannot be tightened because thigh is too large

Side-specific exclusions – test can be performed on unaffected side:

- Joint replacement surgery (hip/knee) within the previous 3-month period.
- Extreme knee pain that would make it uncomfortable to test that leg and would invalidate the examination result.
- Extreme pain in other lower extremity joints that would be aggravated by testing.
- Amputation, prosthetic device, cast or brace.

Stopping rules:

- If the participant develops chest pain or dizziness during the test, do not complete the test.
- Participant says they cannot continue with test due to knee or back pain. Test other side if possible.

4. Participant preparation

Ideally, this test should be performed after a short period of warm-up exercise. The 20-meter walk and chair stand tests are well suited to this purpose and should be performed just before the isokinetic strength test.

Ask the participant to remove their shoes. Seat participant so that you can test their left leg first (unless contraindicated). To test the left leg, seat the participant on the right-hand chair (your left as you face the two Cybex chairs).

See picture below.



5. Detailed measurement procedures

5.1 Record keeping

The Cybex 350 dynamometer has an automatic positioning feature that stores and recalls a participant's exact positioning and testing protocol from one examination to the next. It is important for longitudinal evaluations that the methods of strength testing and the participant positioning be consistent throughout the study.

In addition, participant identifiers and test data are entered into the HUMAC database via the keyboard (See Section 5.2.2, below). It is important to complete all of the required fields to allow the participant to be positively identified in the data sent to the Coordinating Center for analysis.

Data are also recorded on a data collection form as a backup to the computer storage of participant positioning and for a tracking record of isokinetic dynamometry testing performed on each participant. The following parameters are recorded:

- Chair Back Angle
- Chair Seat Fore/Aft Position
- Chair Back Translation
- Dynamometer Tilt
- Dynamometer Height
- Knee/Hip Adapter
- Inner Tube
- Outer Tube
- Whether test was performed and reason if not
- Number of trials completed
- Highest four torques (flexion and extension)

Important: A two page printout of the MOST test report should also be made immediately after the testing session and kept in the participant's record in case of computer failure (see Appendix 3).

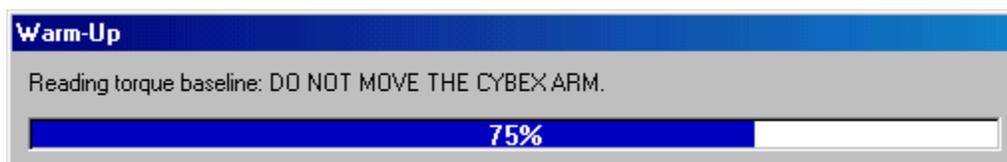
5.2 Administration

5.2.1 Determine contraindications

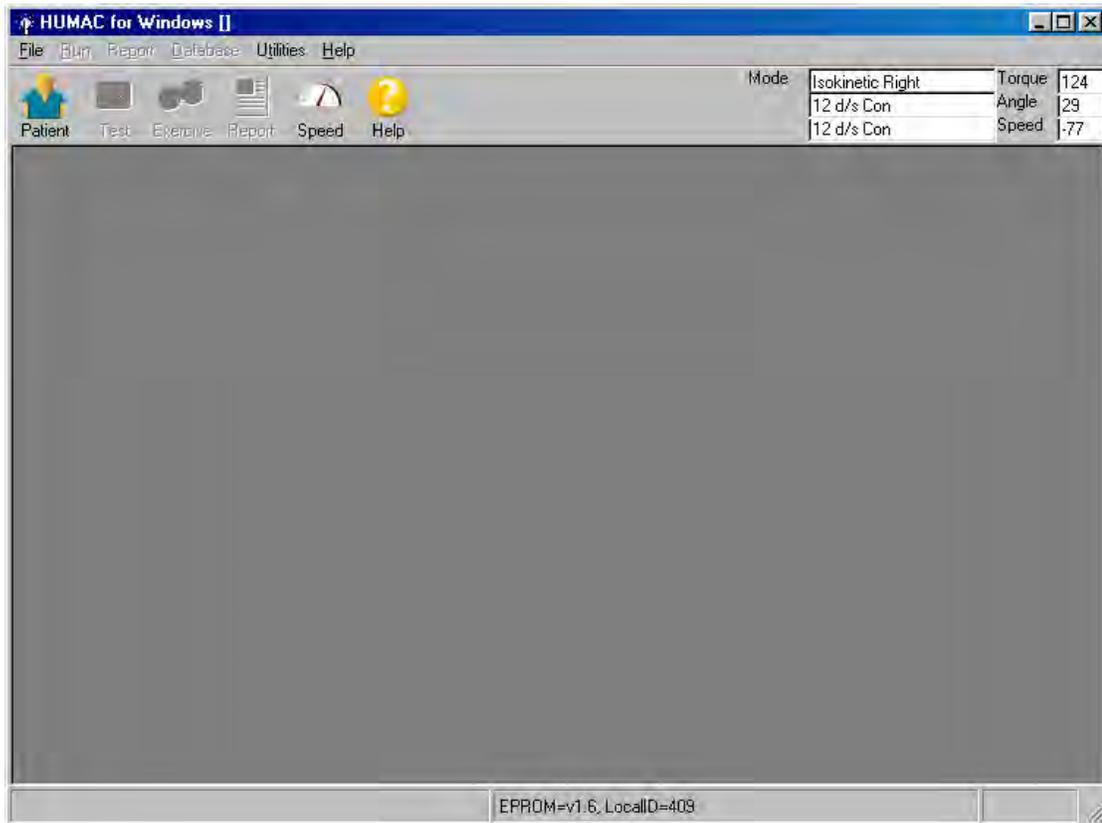
Use the questions and other criterion on the data collection form to determine if the participant is eligible for the test.

5.2.2 Getting started: HUMAC computer screen

Before opening the HUMAC program, make sure the dynamometer is turned on. The switch is behind the dynamometer. Double click on the HUMAC icon on your computer screen. When you begin, the HUMAC computer screen will look like this:



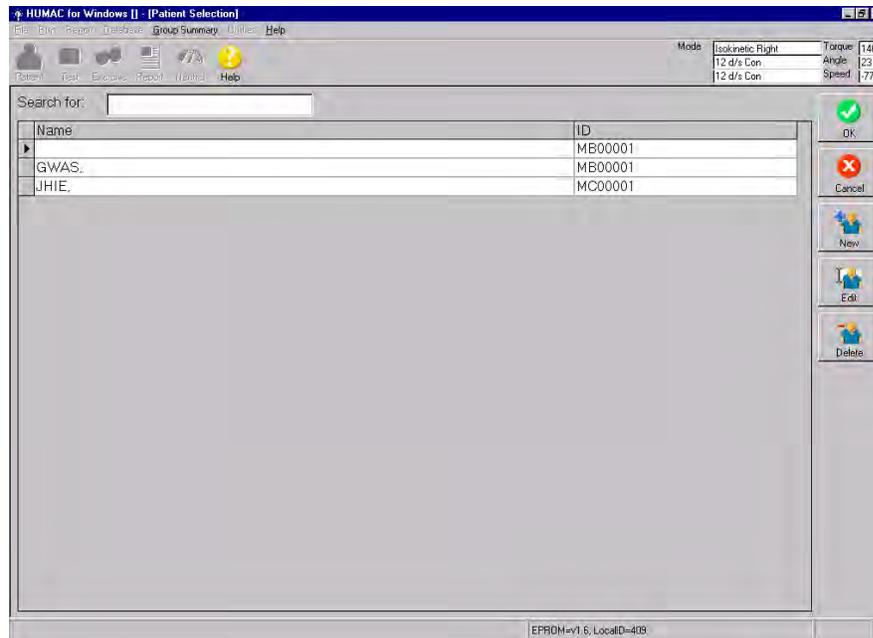
and then like this:



Click on “Patient” on upper left part of window.

5.2.3 Test parameters

- a. The next screen will include a list of participants who have had tests.



- b. Choose "New" [follow-up visit, choose "Edit"] at right side of screen.
- c. Type in the [follow-up: review] information requested on the screen:
Enter the following participant information using the HUMAC software.
[If follow-up, make sure the following information shows up on the screen. Be sure to update MOST Staff ID number.]

Last, First, MI

Enter [review] participant's acrostic in the Last name field (leave the First and MI fields blank)

ID

Enter [review] MOST 7-digit ID#

Birth date

Do not record

Height:

Do not record

Weight:

Enter current body weight in kgs recorded from the scale. See Clinic Visit Workbook.

Sex:

Male or Female

Preferred Side:

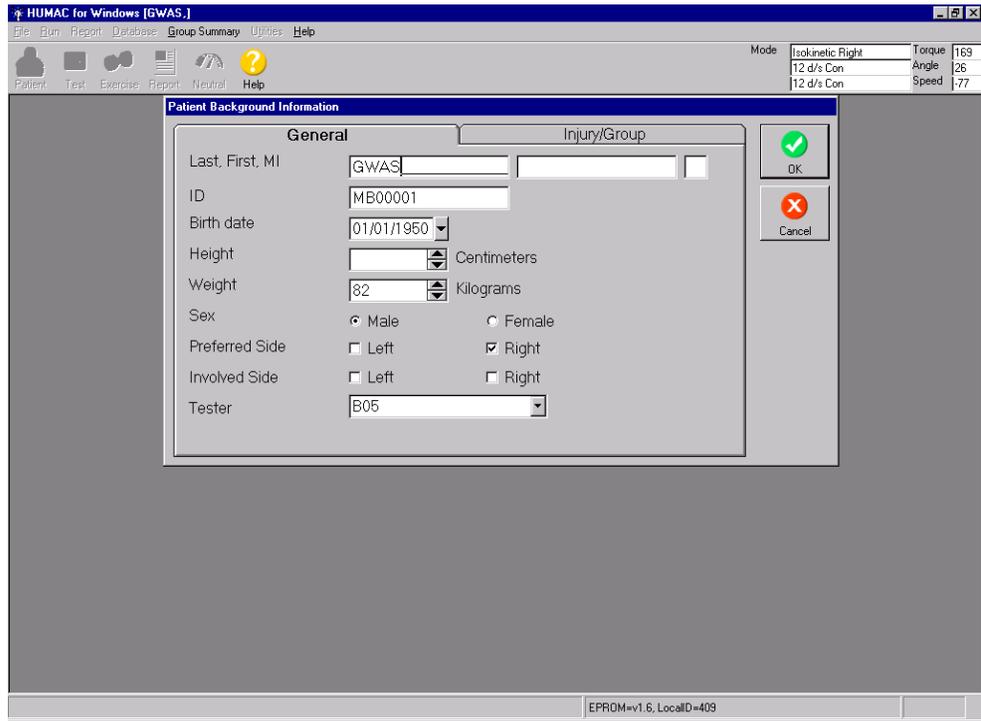
Right or Left (Ask, "Which foot do you or did you prefer to kick a ball with?" whichever foot they kick with is their preferred side. If they don't know, leave this blank).

Involved Side:

Do not record

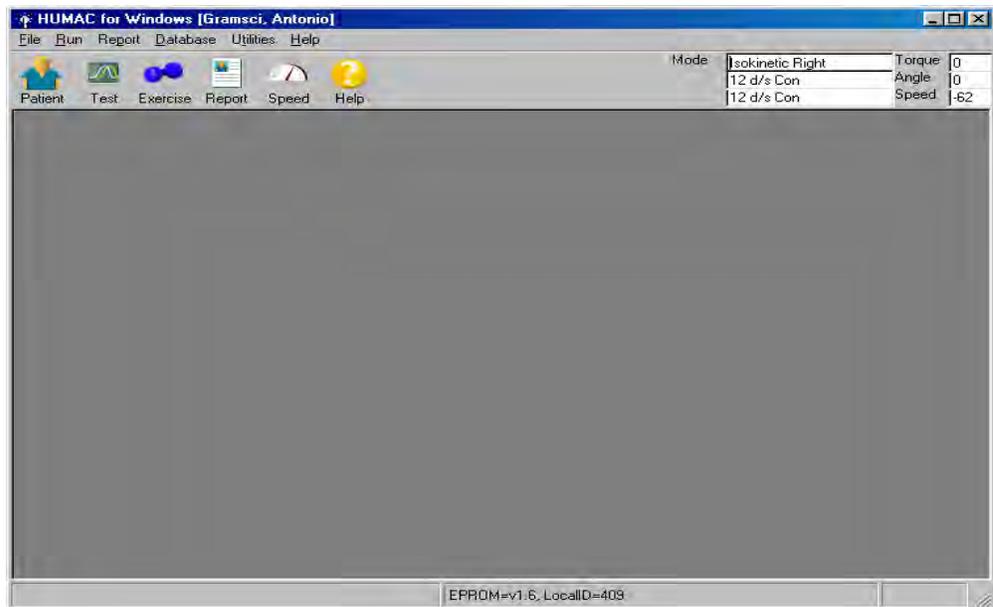
Tester

Enter MOST staff ID from the list

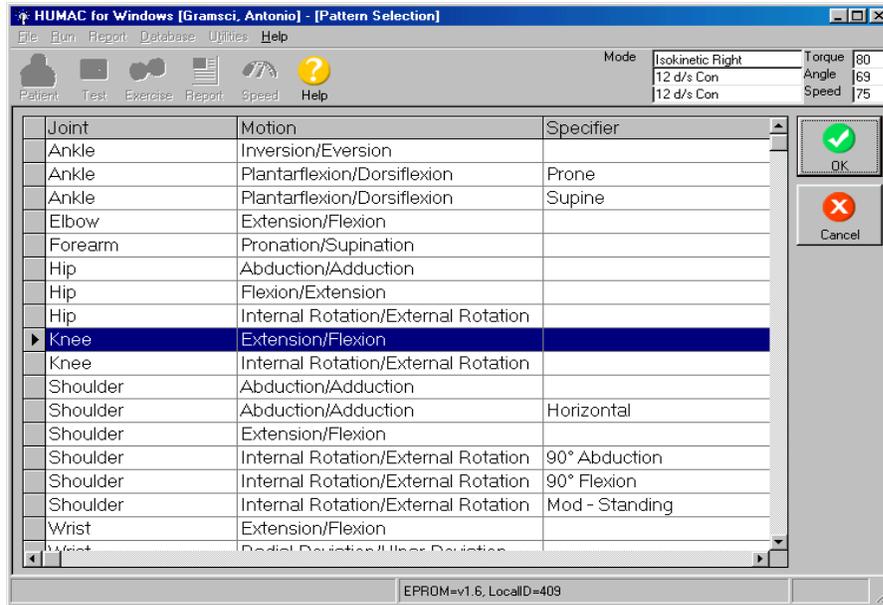


When finished, click “OK”

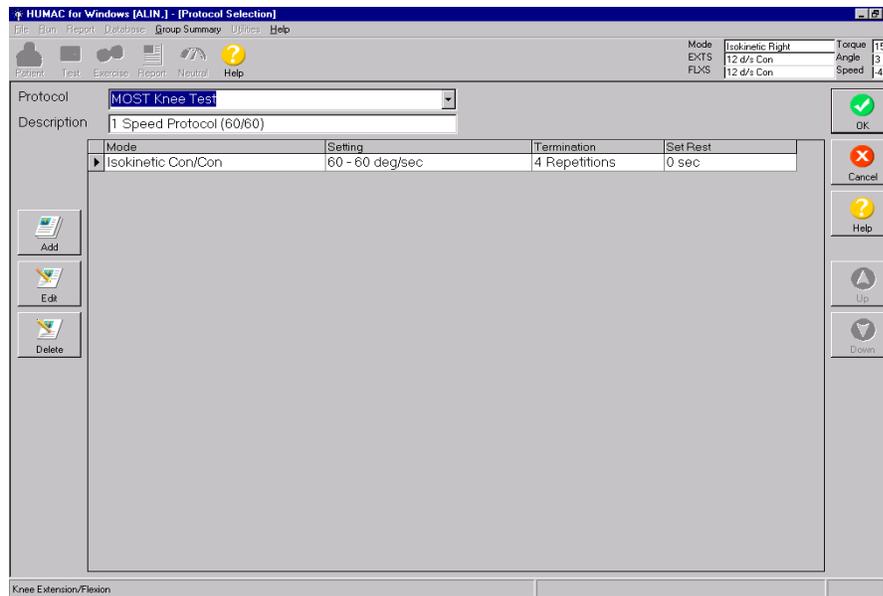
d. You will then be at the main screen, which will look like this:
Click on “Test”.



- e. The next screen that will appear allows you to choose which test to do: Highlight Knee Extension/Knee Flexion and click “OK.”



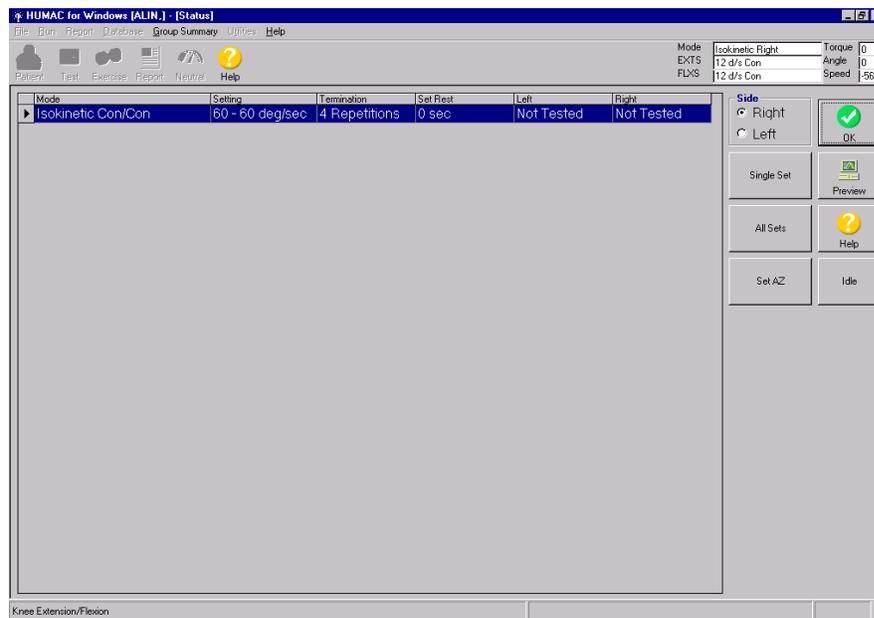
- f. The next screen that will appear is for selecting the Speed Protocol:



Choose the protocol. See example above: choose “MOST Knee Test”.

The screen will display the preset protocol. Click “OK” or hit spacebar.

g. The next screen that will come up will be the “Test Status” screen.



Click in the bubble that corresponds to the side being tested. Then choose “**Single Set**” by clicking on button.

5.2.4 Positioning the participant on the Cybex

Note for follow-up exams: The settings that were entered for the baseline exam should be used for the follow-up exam unless the participant has experienced some significant change in body size or anatomy that results in those settings now being inaccurate. Important! After the settings have been set and the participant is sitting in the chair, if you think that the chair seat should be set differently, or any other setting just doesn't seem right, see if you think that the participant can do the measurement without discomfort as it is, even though the setup doesn't look perfect to you. It is preferable that the baseline settings are used. However, if any setting has to be adjusted for participant safety or comfort, or is obviously so far wrong that it is most likely the setting was incorrectly recorded at the previous visit, make the adjustment and record the new setting on the data collection form. Note that even if you use the exact settings that were used at baseline, you should still record the settings on the data collection form.

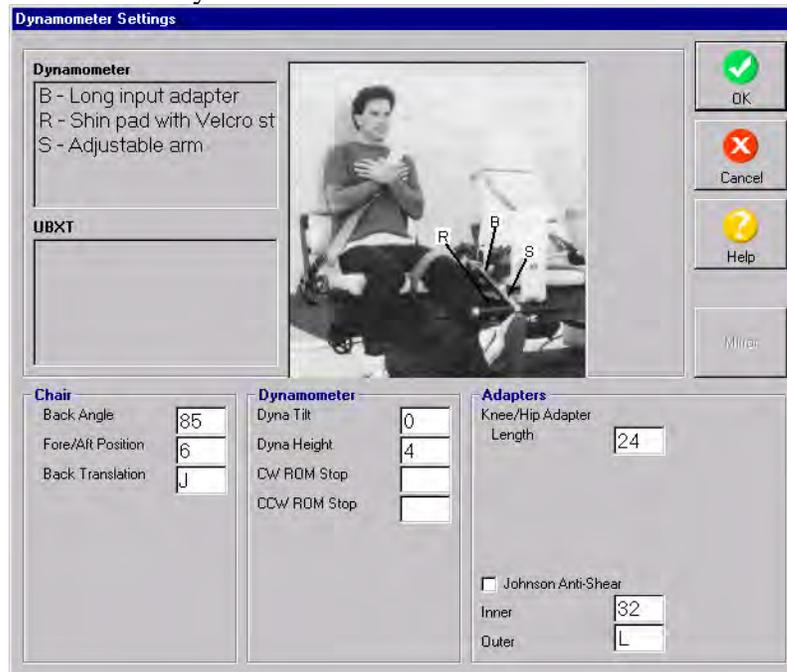
5.2.4.1 Johnson anti-shear accessory fitting

Position participant in the chair and set the dynamometer settings. To adjust the Johnson anti-shear accessory, place the lower pad of the anti-shear device above the ankle and place the upper pad just below the knee. These settings correspond to the inner tube (range 27-41) and outer tube (range A-K) settings of the Johnson anti-shear accessory. See Appendix 2 for instructions.

5.2.4.2 Setup parameters to be entered on computer

After Pressing Single Set Button the following two screens will appear, Dynamometer Settings and Set Anatomical Zero

The Dynamometer Settings screen will allow entry of the dynamometer settings as the participant is positioned on the Cybex.



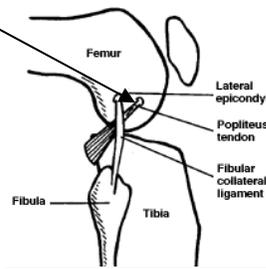
This screen requires entry of the:

FIXED PARAMETERS	VARIABLE PARAMETERS
<p><u>Chair:</u> Back angle 85°</p> <p><u>Dynamometer:</u> Dyna Tilt 0</p> <p>CW ROM Stop leave blank</p> <p>CCW ROM Stop leave blank</p>	<p><u>Chair:</u> Chair Seat Fore/Aft Position (range 0-8)</p> <p>Back Translation (range is A-P).</p> <p><u>Dynamometer:</u> Dyna Height (range 0-10)</p> <p><u>Adapters:</u> Knee/Hip Adapter Length (range 15-38) Johnson Anti-Shear (check box) Inner (range 27-41) Outer (range A-K)</p>

Be sure to record all of the above parameters on the data collection form.

Script: “To begin, the device will be adjusted to fit your body. (*Examiner adjusts seating and straps.*) This strap will be tight, as it should be for testing, however if it hurts please let me know.”

- Check that the seat angle is set to 85°
- Ask participant to sit up straight with hips square and backs of knees touching front of seat. Make sure that their shoes are removed.
- Adjust seat back (back translation) to participant.
- Ask participant to move heel back to the cushion under the seat.
- Adjust the fore/aft chair position so that the participant's knee axis corresponds to the dynamometer axis. The axis of the dynamometer should line-up with the lateral epicondyle. (Lateral epicondyle)



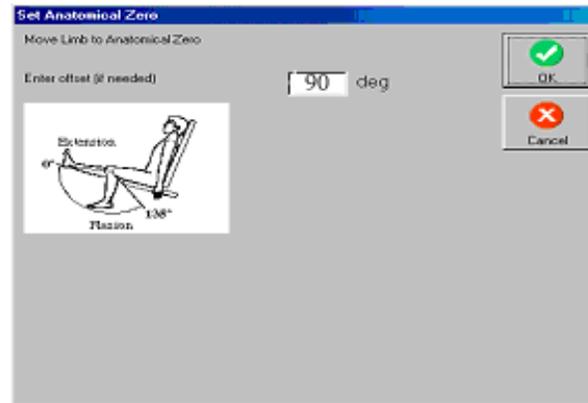
Lateral epicondyle(outside) of knee

- Adjust dynamometer height by loosening the large handle underneath the dynamometer; push the dynamometer up or down to center the dynamometer axis along the participant's knee axis. Tighten the handle. Record the dynamometer height.
- Have the participant place the nontesting leg behind the contra limb stabilizer.
- Use Johnson Anti-Shear accessory to position and stabilize participant's knee. See Appendix 2 for instructions. Note: The Knee/Hip Adapter Length setting (Figure 21 in Appendix 2), the Inner tube setting, and the Outer tube setting (Figures 14 and 15 in Appendix 2) should be recorded.
- Be sure all positioning parameters are recorded both on screen and on the data collection form in the Clinic Visit Workbook.
- Tighten ankle strap. Fasten thigh strap as far above the knee as possible, if not able to fasten, participant is not tested on that side. Fasten shoulder belt snugly. If participant is uncomfortable, a small pillow can be place between the shoulder belt and the chest.
- Click “OK” on the patient set up screen.

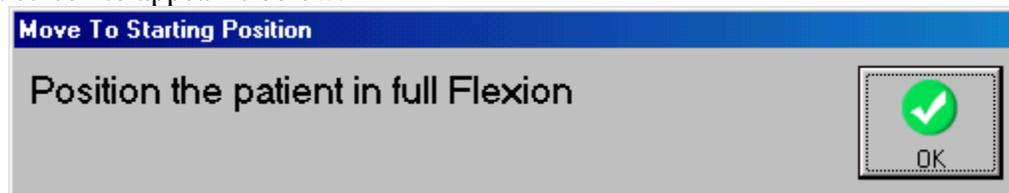
5.2.5 Set anatomical zero with participant's leg in full flexion

Position participant in full flexion

The participant's leg should be flexed to about 90 degrees. When the "Set Anatomical Zero" screen comes up, enter "90" and click "OK."



The next screen to appear is below:



5.2.6 Explanation, demonstration and practice trials

The participant should now be ready to begin testing. The examiner has chosen one speed, knee extension/flexion conc/conc at 60 degrees per second. See section 5.2.3.e

Explain the test procedure to the participant and have them perform the practice trial on the first side to be tested. Have the participant push and pull the resistance arm at 50% effort for the 3 practice trials. Encourage them with each push and pull.

Script: "During this test you will start with your leg bent at a right angle and then kick up, pushing as hard and fast as you can, and then pull your leg back down, again as hard and fast as you can. You will continue to push up and pull down again, repeating this several times all in one smooth motion. (*Examiner demonstrates leg motion.*) First we'll do 3 repetitions for practice so you get the feel of it. Then you will do 4 repetitions for the actual test.

For the three practice repetitions, start pushing and pulling at 50% effort. After you get the hang of it, there will be a short rest of about 5 seconds, and then you will do the four repetitions of the real test. For that, push and pull as hard and as fast as you can.

You should hold onto the handles firmly with both hands during testing. Do not hold your breath during the test. I will tell you when to begin and end the test. If you experience any pain, tell me and we will adjust or stop the machine.

Do you have any questions?

OK. Now let's do three practice pushes and pulls. *Ready, begin.* Push. Pull. Push. Pull. Push. Pull. Great. Good effort."

(If the participant complains of pain during the practice, ask: "Does it hurt enough that you want to stop?").

If the participant complains of pain during the practice trials, determine how severe the pain is and whether testing should continue. If necessary, discontinue testing that leg and go on to test the other leg.

5.2.7 Isokinetic test at 60° per second

Once the participant has practiced and is comfortable with the testing procedure, tell them they are now ready for the actual testing. Encourage the participant to 'push, pull, push, pull, push, pull' as hard as they can on all four contractions. That concludes one set.

Script: "OK. Now we're ready for the actual test. This time you will do four repetitions. Remember that it is important for you to push and pull as hard as you can on each repetition.

Are you ready for the four pushes and pulls? *Begin.* Push! Pull! Push! Pull! Push! Pull! Push! Pull! Push! Pull! Great. Good effort. After you rest a moment we'll test the other side."
The feedback screen will look like this:



After the test, ask the participant:

Script

“Did you have any knee pain during this test?”

If “Yes,” ask:

“Was it mild moderate, or severe?”

“Did this pain prevent you from pushing and pulling as hard as you can?”

Record answers on the data collection form.

Reposition the participant to test the other leg using the same procedure: 3 practice trials at 50% effort and 4 test trials at 100% effort.

Click on “OK” and return to Preview Humac Report.



Highlight the test that was just performed.

Choose *MOST and click on the Preview icon.

The MOST Report will appear on the screen. See Appendix 3 to view the complete report.

Use File, Preferences command to set report heading
MOST Knee Extension/Flexion Protocol (Page 1 of 2)

MOST ID: MB00001 ACROSTIC: GWAS Date: 1/15/03
Birth date: 1/1/50 Weight: 81 Kilograms Sex: True
Pref Side: Right Tester: B05

Protocol: 1 Speed Protocol (60/60)
Isokinetic Con/Con
Speed 60/60 Repetitions 4

Manual Position Setting

Chair Back Angle:	85
Chair Back Translation:	M
Chair Seat Fore/Aft Position:	6
Dynamometer Tilt:	0
Dynamometer Height:	3
CW ROM Stop:	-
CCW ROM Stop:	-
Straight Input Adapter:	22
Upper Tube:	31
Lower Tube:	J

RIGHT SIDE

MAX GET: 155	Extensors		Flexors	
Repetition	Peak Torque	Angle at Peak	Peak Torque	Angle at Peak
0	360.15	45.9	35.12	69.3
1	355.14	38.4	33.22	69.3
2	350.39	38.4	31.32	69.3
3	345.64	38.4	29.56	69.3
Coef Var	0.02	0.09	0.1	0.

Ready

Record the four maximum Peak Torques (Repetition 0, 1, 2 and 3) for both extension and flexion of both the left and right side on the data collection form.

Print the two-page MOST Report and place in participant's study record. (See section 5.2.8 for printing instructions.)

5.2.8 Results print out, data transfer, data backup

a. Print final results

To print the MOST report, go to the Humac Preview Report screen and highlight *MOST on the pull down report menu. Click on the "Preview" button. Print the two page report using the arrow button in the upper left hand corner to move from one report page to the other.

b. Back-up

Operators will back-up daily to CD-RW. See Appendix 6 HUMAC Back-up Procedures. A back-up CD-RW will be sent to the Coordinating Center every other month.

6. Alert values/Reporting to participants

There are no alert values. When the testing is completed, thank the participant.

7. Quality assurance

7.1 Training and certification

The Cybex vendor, CSMI, provided on-site training at one or both field centers, covering basic machine operation and the fundamentals of testing, as well as study-specific procedures. Operators should practice on other staff members and themselves until reliable measurements are achieved. It is especially useful to practice on volunteers who are not knowledgeable about what to expect. Training should include:

- observe measurement by experienced examiner
- read manufacturer's user's guide and MOST OM with goal of understanding
 - the proper use of equipment
 - the proper calibration and adjustment of equipment
 - exclusions and safety considerations
 - detailed testing procedures
- practice on colleagues and "naive" volunteers
- attend training session

7.2 Certification requirements

- Complete training requirements
- Recite exclusion criteria
- Demonstrate calibration and adjustment of Cybex
- Perform test on two volunteers under the observation of clinic QC officer or designated Cybex expert.

7.3 Quality assurance checklist

- Know frequency of calibration and verification
- Exclusion questions asked from data collection form
- Blood pressure form checked to determine if testing contraindicated
- Recite two stopping rules
- Participant background information correctly entered on computer screen (baseline)
- Participant information correctly edited and entered on computer screen (followup)
- Correct test pattern and protocol entered on computer screen
- Identify warm-up exercises
- Locates femoral lateral epicondyle
- Participant positioning correctly determined
- Positioning parameters correctly entered on screen and data collection form
- Correct placement of Johnson anti-shear device
- Correct instructions given while demonstrating procedure

- Correct instructions given for 3 practice trials
- Correct instructions given for 4 test trials
- Standard level of encouragement (motivation and feedback) offered to participant
- Key points from script stated and clearly delivered
- Results for extension and flexion correctly recorded on data form
- Two page MOST report printed and placed in participant's file
- Reviews form for completeness
- Form correctly filled out

8. Data collection form**Baseline:****Exclusion Criteria**

- ① Is the participant's blood pressure greater than 199 mm Hg (systolic) or greater than 109 mm Hg (diastolic)?

(Examiner Note: Refer to Blood Pressure form, page 2.)

Yes No Don't know/Refused

Do NOT test.
Go to Question #12 on page 11
and Question #15 on page 12.

Script: "First I need to ask you a few questions to see if you should do this test."

- ② Has a doctor ever told you that you had an aneurysm in the brain?

Yes No Don't know/Refused

Do NOT test.
Go to Question #12 on page 11
and Question #15 on page 12.

- ③ Has a doctor told you that you had a cerebral hemorrhage (bleeding in the brain) in the last six months?

Yes No Don't know/Refused

Do NOT test.
Go to Question #12 on page 11
and Question #15 on page 12.

- ④ Have you had either of your knees replaced in the past 3 months?

Yes No Don't know/Refused

Which knee was replaced?

Right

Left

Both knees

If no other exclusions
test left leg.

If no other exclusions
test right leg.

Do NOT test.
Go to Question #12 on page 11
and Question #15 on page 12.

⑤ Have you had either of your hips replaced in the past 3 months?

Yes No Don't know/Refused

Which hip was replaced?		
<input type="radio"/> Right	<input type="radio"/> Left	<input type="radio"/> Both hips
If no other exclusions test left leg.	If no other exclusions test right leg.	Do NOT test. Go to Question #12 on page 11 and Question #15 on page 12.

⑥ Within the past 3 months, have you had back surgery?

Yes No Don't know/Refused

Do NOT test. Go to Question #12 on page 11 and Question #15 on page 12.

⑦ Within the past 6 weeks, have you had a heart attack?

Yes No Don't know/Refused

Do NOT test. Go to Question #12 on page 11 and Question #15 on page 12.

⑧ Within the past 6 weeks, have you had cataract surgery?

Yes No Don't know/Refused

Do NOT test. Go to Question #12 on page 11 and Question #15 on page 12.

⑨ Do you have a hernia in your groin that has not been operated on?

Yes No Don't know/Refused

Do NOT test. Go to Question #12 on page 11 and Question #15 on page 12.

⑩ Manual Positioning Settings

- | | | | |
|--|---|---------------------------------------|---|
| a. Chair Back Angle | <input type="text" value="8"/> <input type="text" value="5"/> ° | e. Dynamometer Height
(range 0-10) | <input type="text"/> |
| b. Chair Seat Fore/Aft Position
(range 0-8) | <input type="text"/> | f. Knee/Hip Adapter
(range 15-38) | <input type="text"/> <input type="text"/> |
| c. Chair Back Translation
(range A-P) | <input type="text"/> | g. Inner Tube
(range 27-41) | <input type="text"/> <input type="text"/> |
| d. Dynamometer Tilt | <input type="text" value="0"/> ° | h. Outer Tube
(range A-K) | <input type="text"/> |

⑪ Record MaxGET for left leg.

⑫ Was the flexion/extension test performed on the left leg?

Yes

No

a. Was the entire set completed?
 Yes No

How many extension/flexion sets were completed?

b. What were the highest four torques?

Flexion	Extension
<input type="text"/> <input type="text"/> <input type="text"/> Nm	<input type="text"/> <input type="text"/> <input type="text"/> Nm
<input type="text"/> <input type="text"/> <input type="text"/> Nm	<input type="text"/> <input type="text"/> <input type="text"/> Nm
<input type="text"/> <input type="text"/> <input type="text"/> Nm	<input type="text"/> <input type="text"/> <input type="text"/> Nm
<input type="text"/> <input type="text"/> <input type="text"/> Nm	<input type="text"/> <input type="text"/> <input type="text"/> Nm

Why wasn't the test done?
(Examiner Note: Mark all that apply.)

Participant excluded based on eligibility criteria

Participant refused

Stopped test due to participant discomfort or exclusion

Other **(Please specify:** _____
 _____)

13 "Did you have any knee pain during this test?"

- Yes No

a. Was it mild, moderate, or severe?

- Mild
 Moderate
 Severe
 Don't know

b. Did this pain prevent you from pushing or pulling as hard as you can?

- Yes
 No
 Don't know

14 Record MaxGET for right leg.

15 Was the flexion/extension test performed on the right leg?

- Yes No

a. Was the entire set completed?

- Yes No

How many extension/flexion sets were completed?

b. What were the highest four torques?

Flexion			Extension		
<input type="text"/>	<input type="text"/>	<input type="text"/> Nm	<input type="text"/>	<input type="text"/>	<input type="text"/> Nm
<input type="text"/>	<input type="text"/>	<input type="text"/> Nm	<input type="text"/>	<input type="text"/>	<input type="text"/> Nm
<input type="text"/>	<input type="text"/>	<input type="text"/> Nm	<input type="text"/>	<input type="text"/>	<input type="text"/> Nm
<input type="text"/>	<input type="text"/>	<input type="text"/> Nm	<input type="text"/>	<input type="text"/>	<input type="text"/> Nm

Why wasn't the test done?

(Examiner Note: Mark all that apply.)

- Participant excluded based on eligibility criteria
 Participant refused
 Stopped test due to participant discomfort or exclusion
 Other **(Please specify: _____)**

⑩ "Did you have any knee pain during this test?"

Yes No

a. Was it mild, moderate, or severe?

- Mild
- Moderate
- Severe
- Don't know

b. Did this pain prevent you from pushing or pulling as hard as you can?

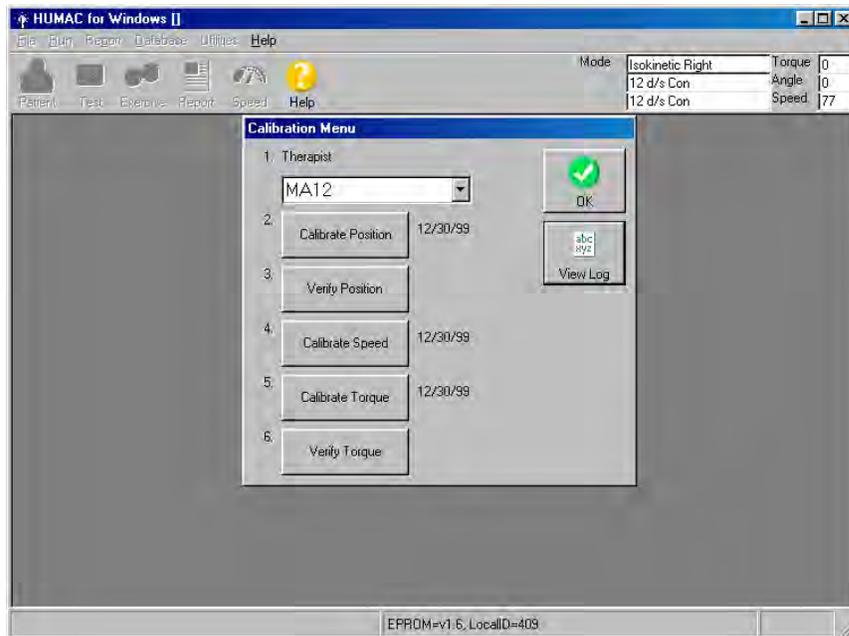
- Yes
 - No
 - Don't know
-

Appendix 1 Cybex Calibration Procedure

To begin the HUMAC calibration procedure, see menu at top of screen:



Pull down "Calibration" from the Utilities menu.
Type in the Staff ID# in the space labeled "Therapist." You'll have to edit the Therapist list.



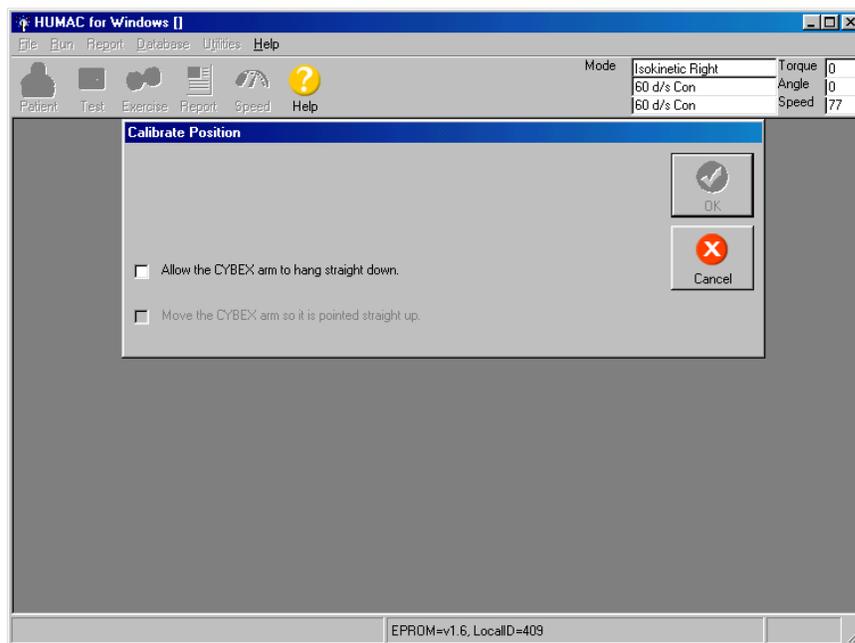
The HUMAC Calibration menu allows you to calibrate and verify the CYBEX Position, Speed, and Torque.

- Position calibration
- Position verification
- Speed calibration
- Torque calibration
- Torque verification

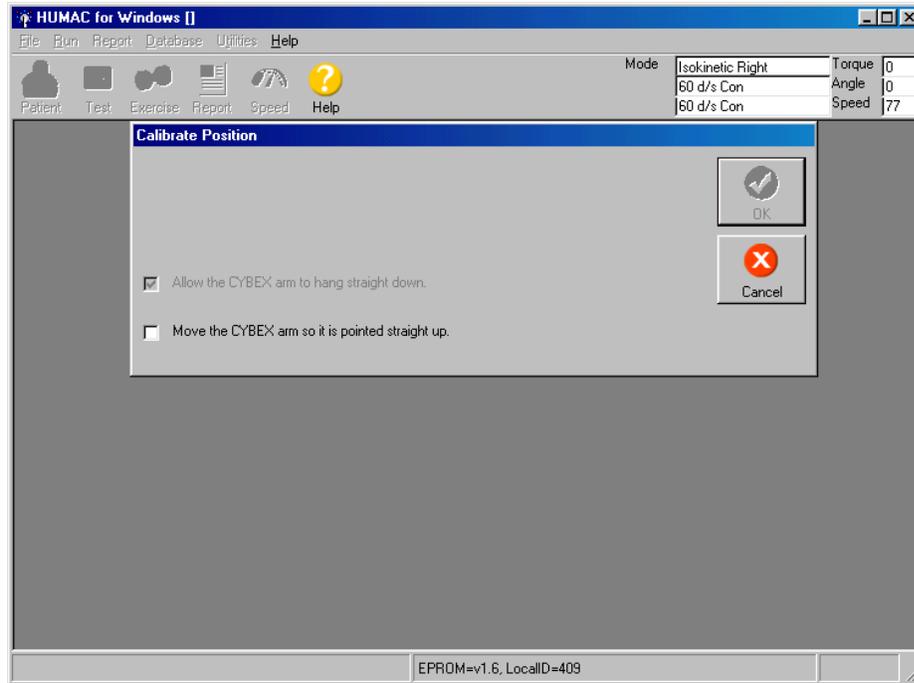
Position Calibration

The Position Channel Calibration procedure assures the HUMAC correctly converts the signal from the CYBEX position transducer to the correct degree values for the reports.

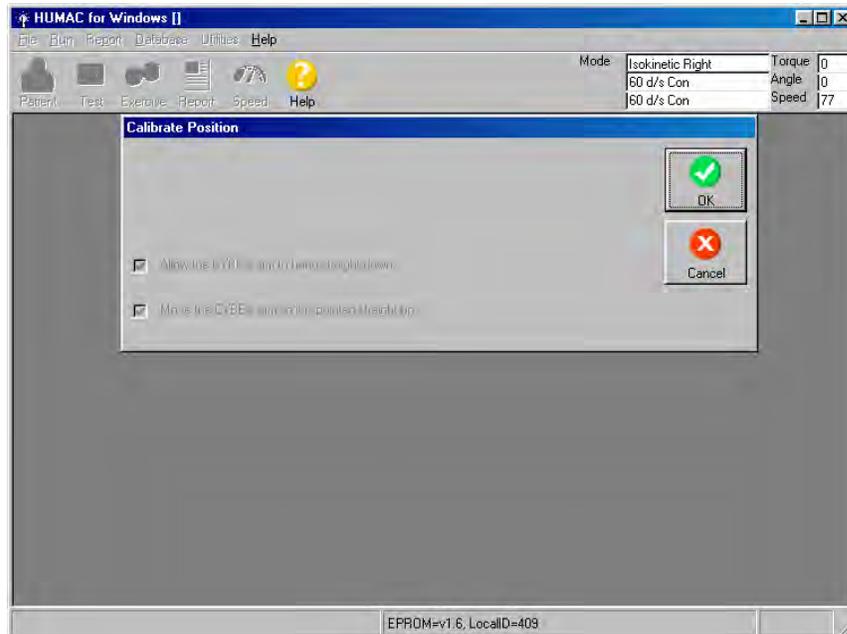
To calibrate position, click on item #2: Calibrate Position



Follow the instructions: "Allow the CYBEX arm to hang straight down." and click.

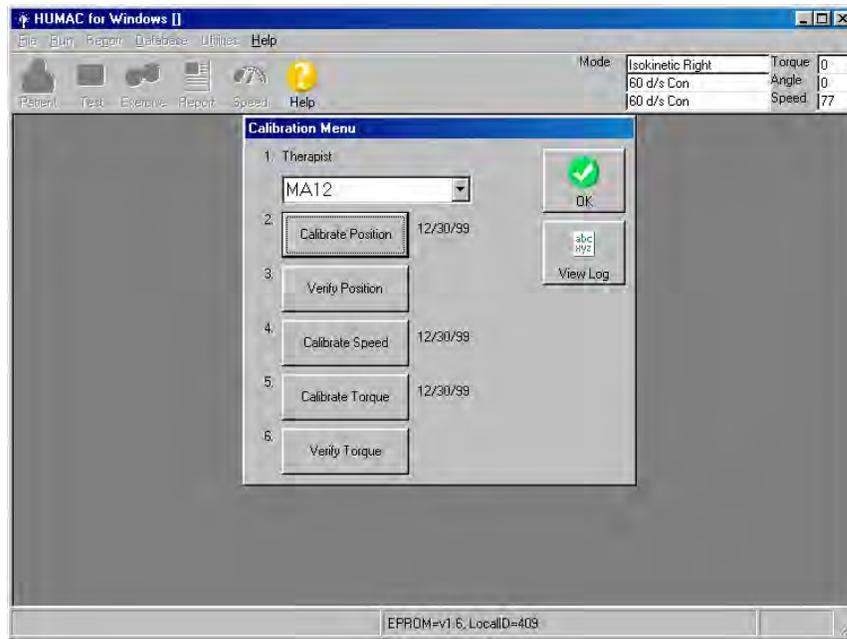


Move the CYBEX arm so it is pointed straight up – click



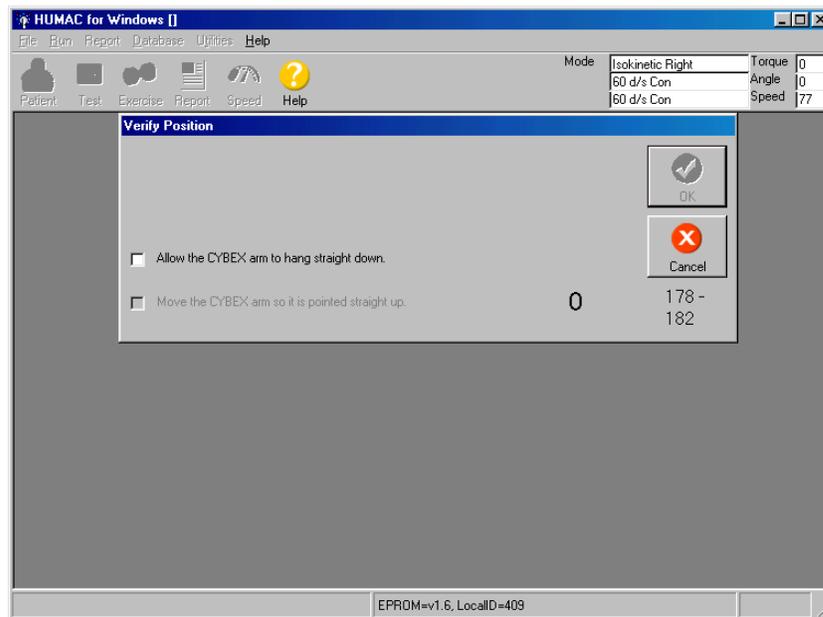
Then click "OK."

You will then be back at the original screen. You are now ready to Verify Position. Click on Verify Position.

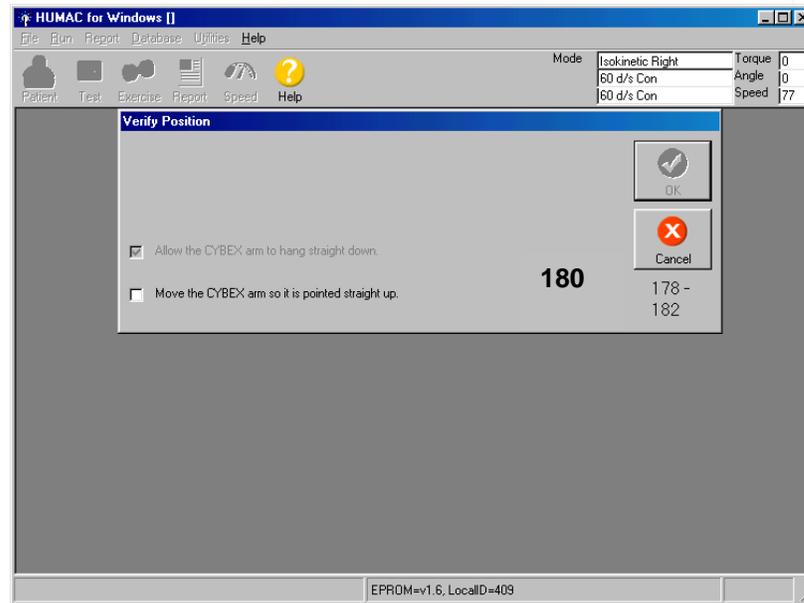


Position Verification

The Position Channel Verification checks the calibration results.



Follow instructions on the screen. Allow the CYBEX arm to hang straight down – then click.

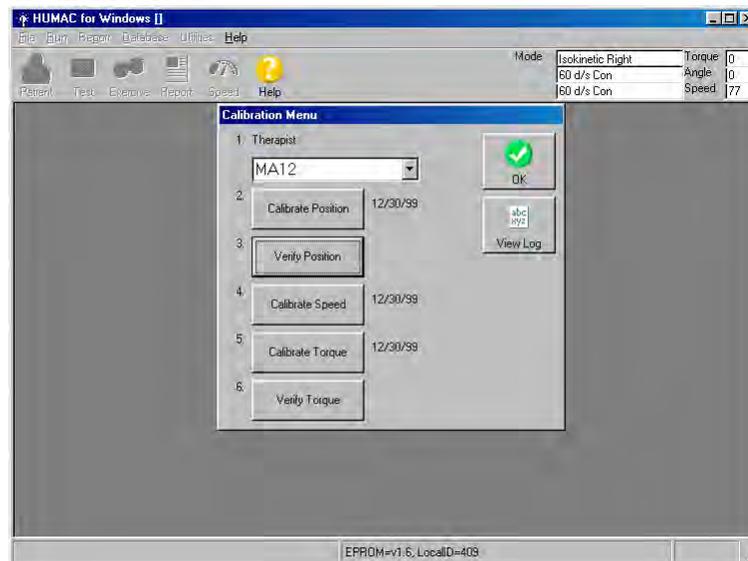


Move the CYBEX arm so it is pointed straight up – then click.

When the arm is pointed straight up, the position value displayed on the right of the screen should be 180 degrees.

Click OK or hit spacebar

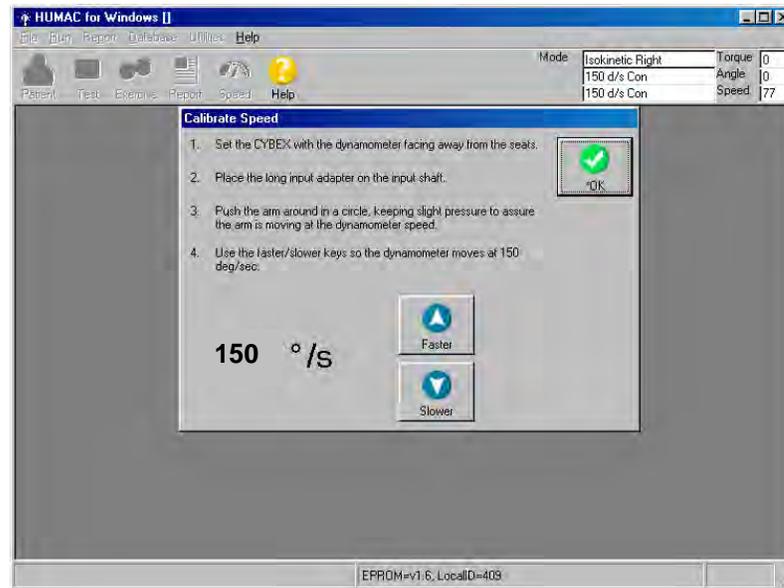
Again, you'll be at the main screen.



Choose Calibrate Speed

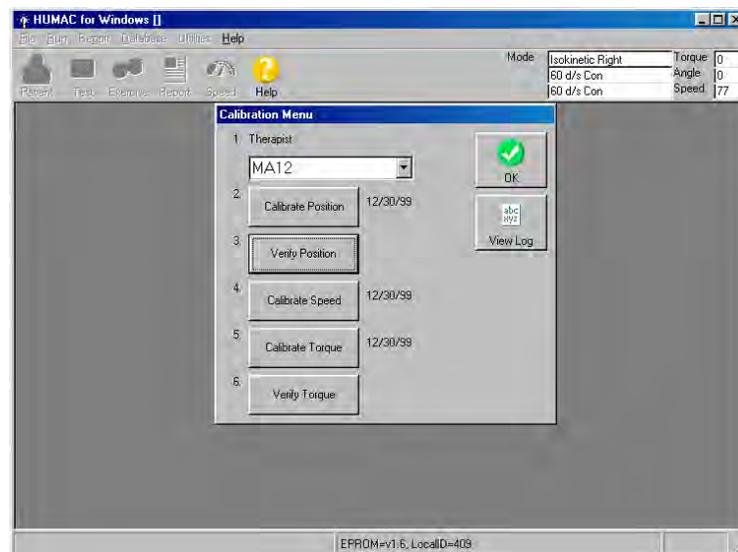
Speed Calibration

The Speed Calibration procedure assures the HUMAC sets the speed of the CYBEX accurately.



follow the instructions on the screen. Click on Faster or Slower to get to the correct speed, which is 150 deg/sec.
Click OK or hit spacebar

Again, you'll be at the main screen:

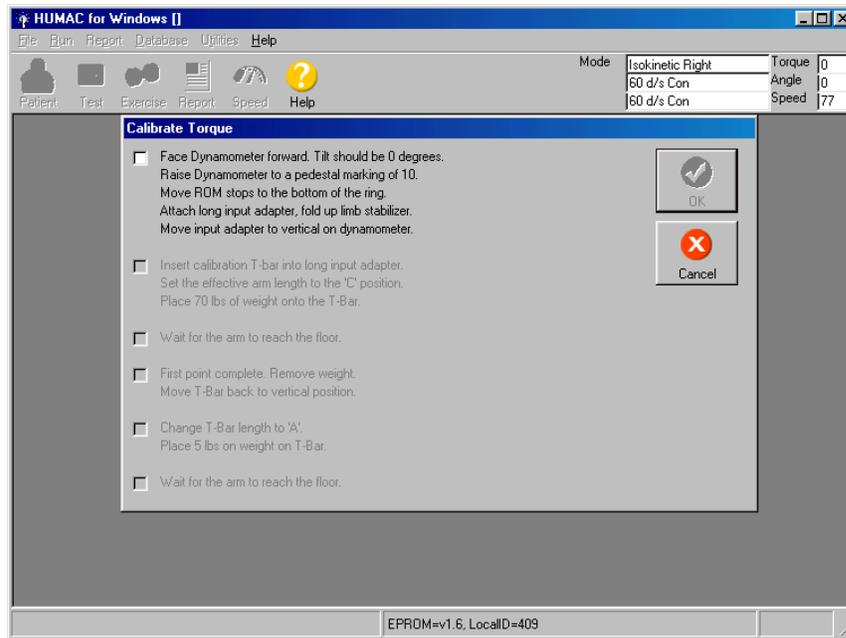


1. Position the dynamometer with the shaft facing away from the CYBEX and the ROM blocks removed so you can rotate the arm in a full circle.
2. Place the long input adapter on the CYBEX.
3. The HUMAC will send a command to set the CYBEX speed to 150 deg/sec. Push the arm around a circle being sure to keep pressure against the arm so it is moving at the set speed.
4. Use the Faster and Slower keys to adjust the HUMAC speed command so the displayed speed is 150 deg/sec as you push the arm.

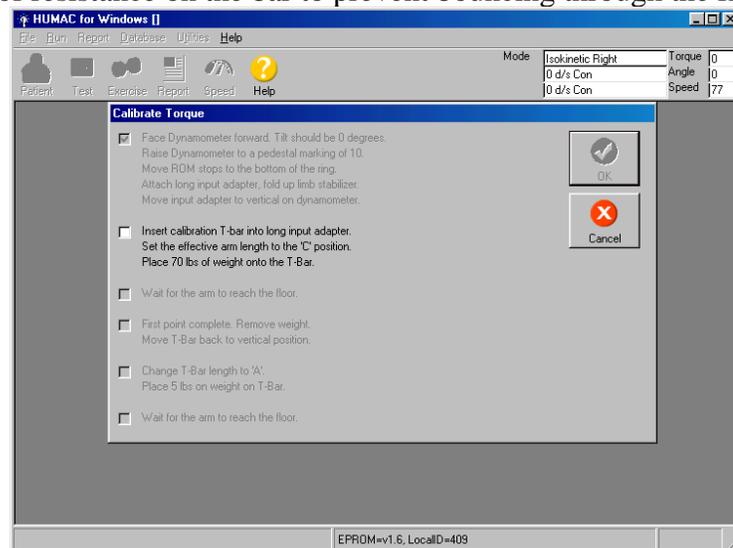
Choose Calibrate Torque

The Torque Channel Calibration procedure assures the HUMAC correctly converts the voltage from the CYBEX torque transducer to the correct Newton-meter values for the reports.

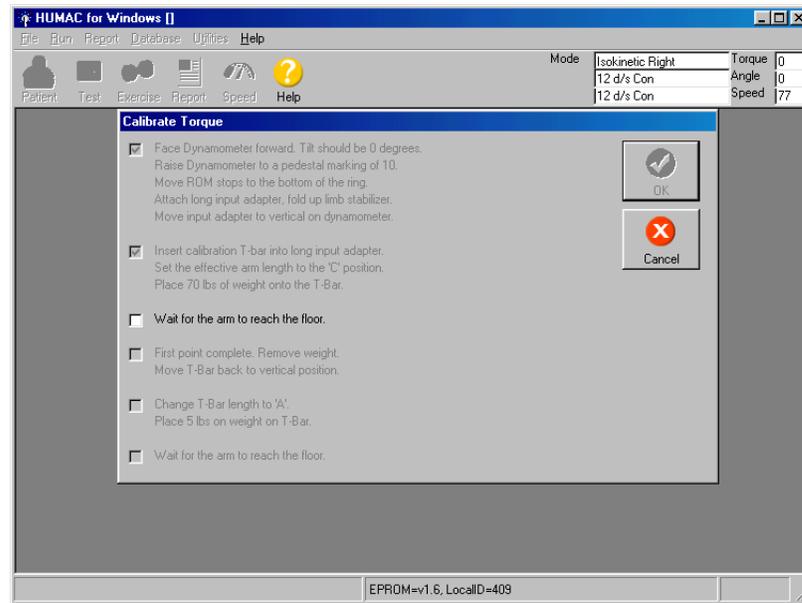
1. Setup the Dynamometer with the shaft facing away from the CYBEX and the input adapter pointed straight up. When you check this box, the HUMAC will set the speed to 0 deg/sec to hold the adapter in the vertical position.



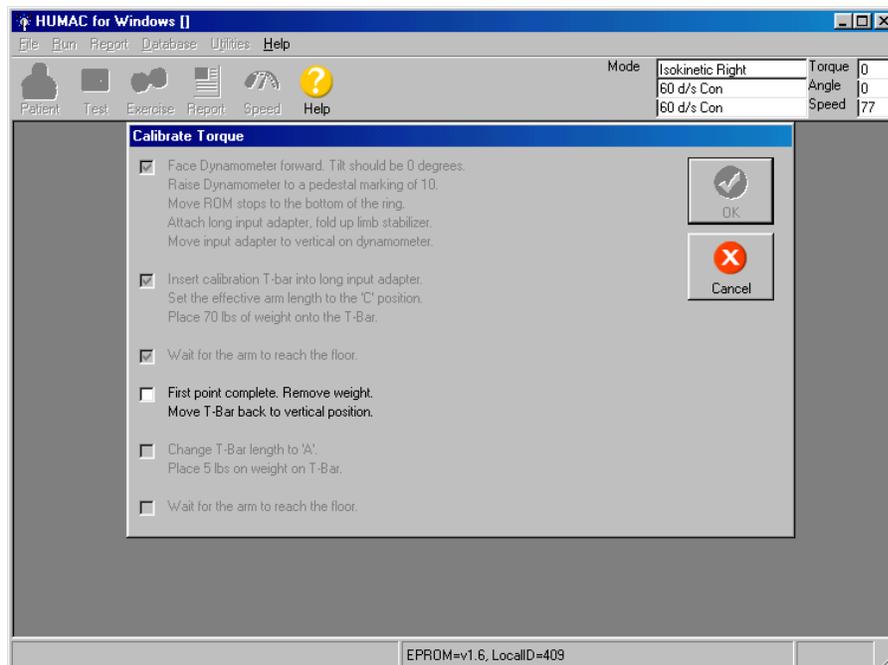
2. Insert the calibration bar into the adapter at the **C setting** and place 70 pounds to the bar. When you check this box, the HUMAC will set the CYBEX speed to 12 deg/sec and the weight will begin to fall. Place about 20 lbs of resistance on the bar to prevent bouncing through the first third of descent.



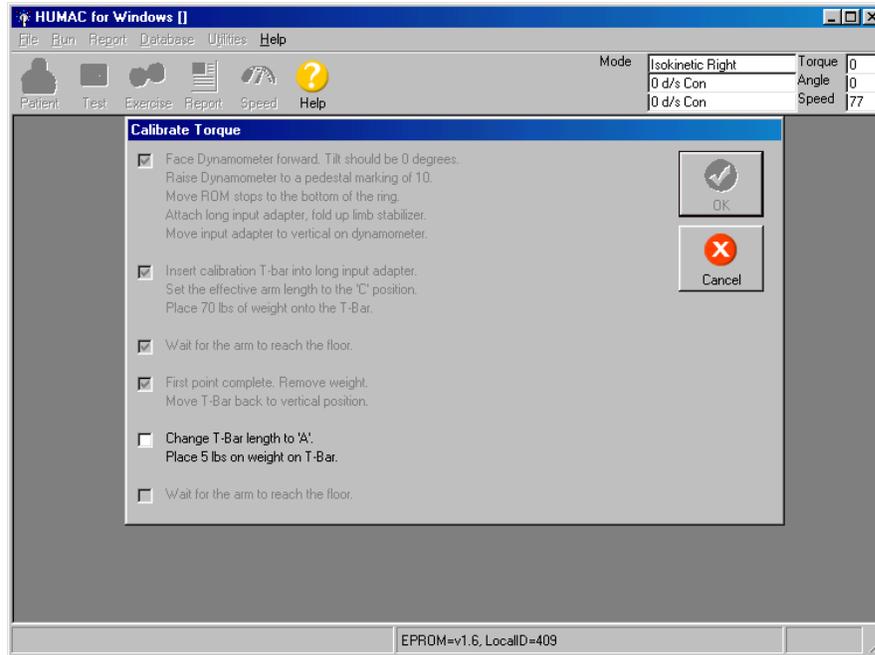
3. The weight should be falling smoothly. After the weight reaches the floor and stops falling, check this box. The HUMAC will set the speed back to 60 deg/sec.



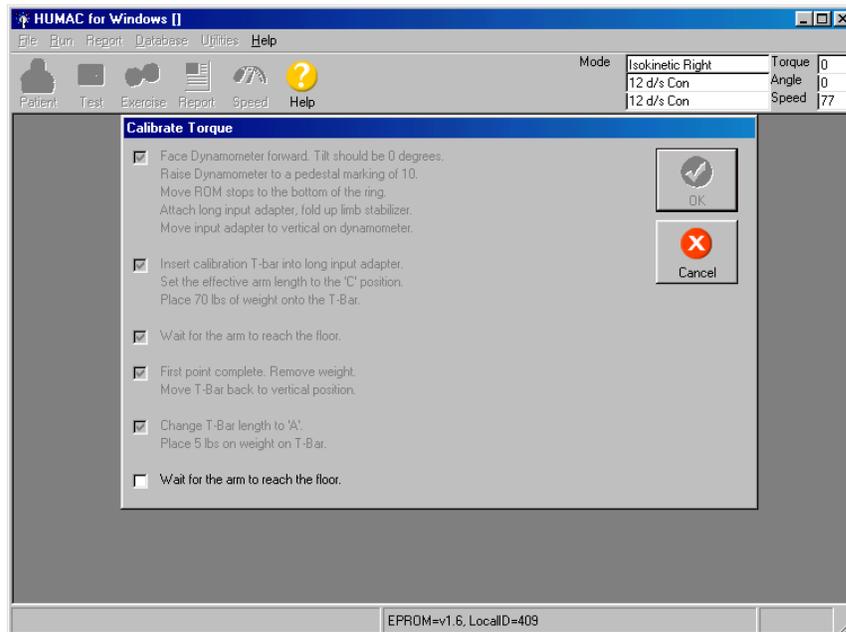
4. Return the T-Bar to the vertical position. After you check this box the HUMAC will set the speed to 0 deg/sec to hold the adapter in the vertical position.

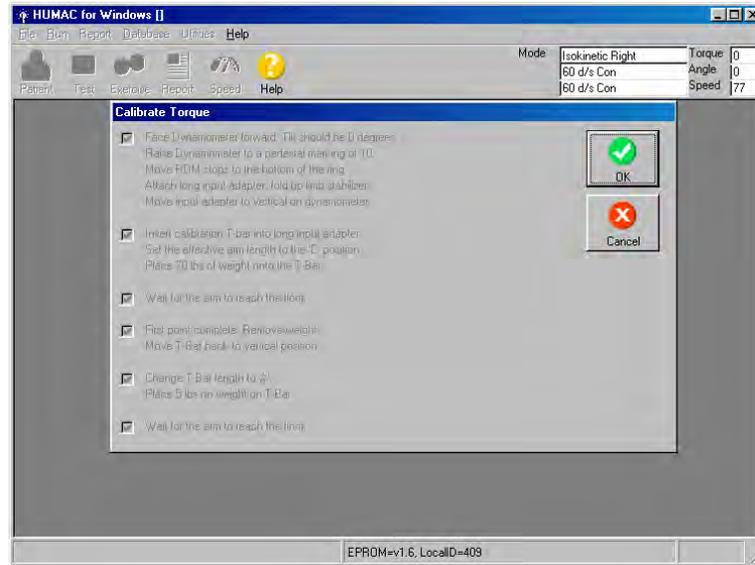


5. Insert the calibration bar into the adapter at the **A setting** and place 5 pounds to the bar. When you check this box, the HUMAC will set the CYBEX speed to 12 deg/sec and the weight will begin to fall.



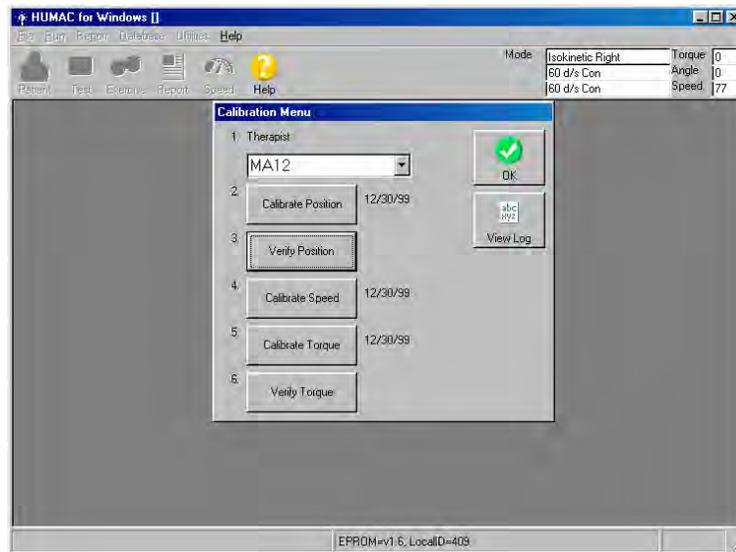
6. The weight should be falling smoothly. After the weight reaches the floor and stops falling, check this box. The HUMAC will set the speed back to 60 deg/sec.





Click OK or hit spacebar.

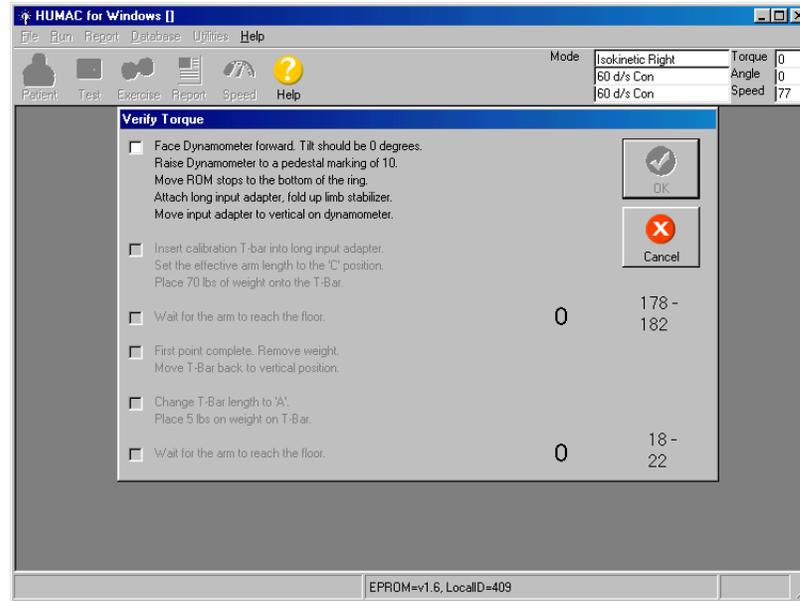
You'll be back at the original screen:



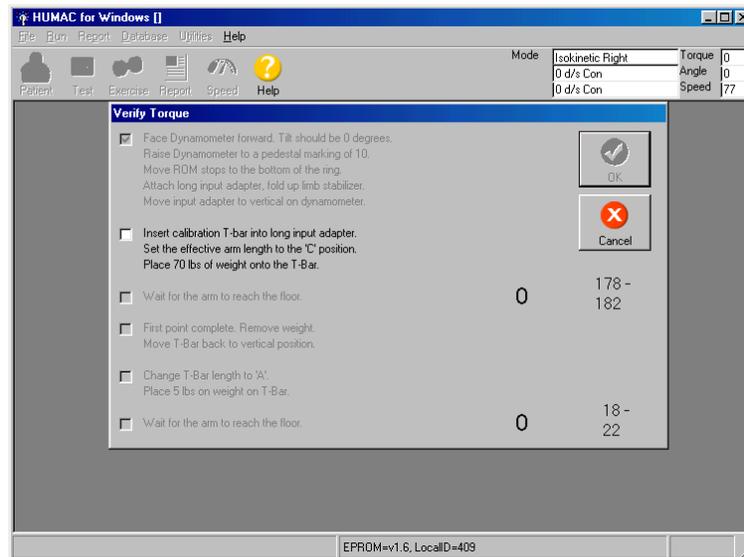
Choose Verify Torque

The Torque Channel Verification procedure checks the calibration results.

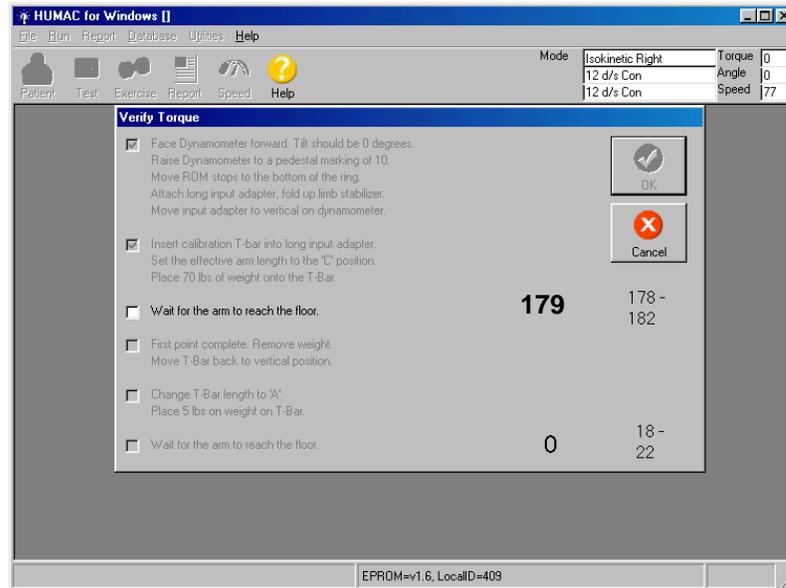
1. Set up the Dynamometer with the shaft facing away from the CYBEX and the input adapter pointed straight up. When you check this box, the HUMAC will set the speed to 0 deg/sec to hold the adapter in the vertical position.



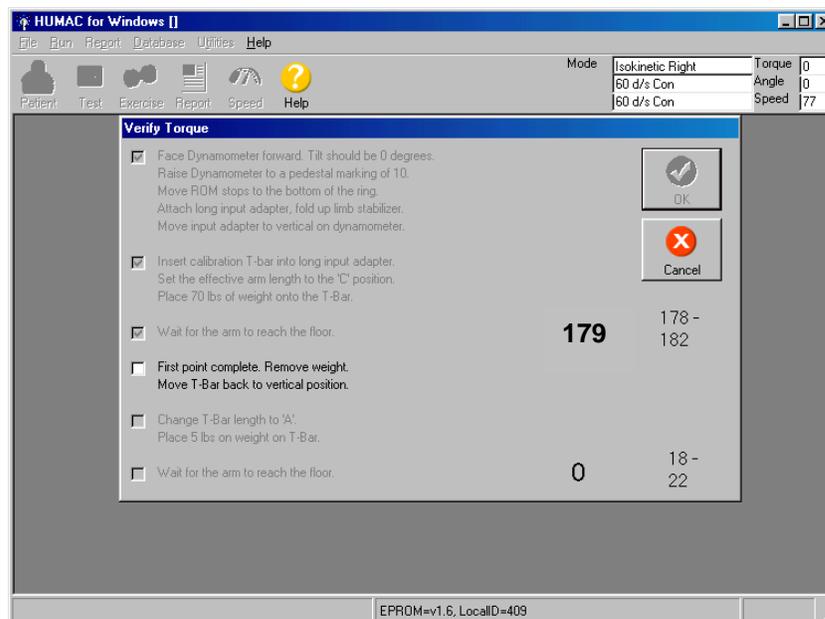
2. Insert the calibration bar into the adapter at the **C setting** and place 70 pounds to the bar. When you check this box, the HUMAC will set the CYBEX speed to 12 deg/sec and the weight will begin to fall.



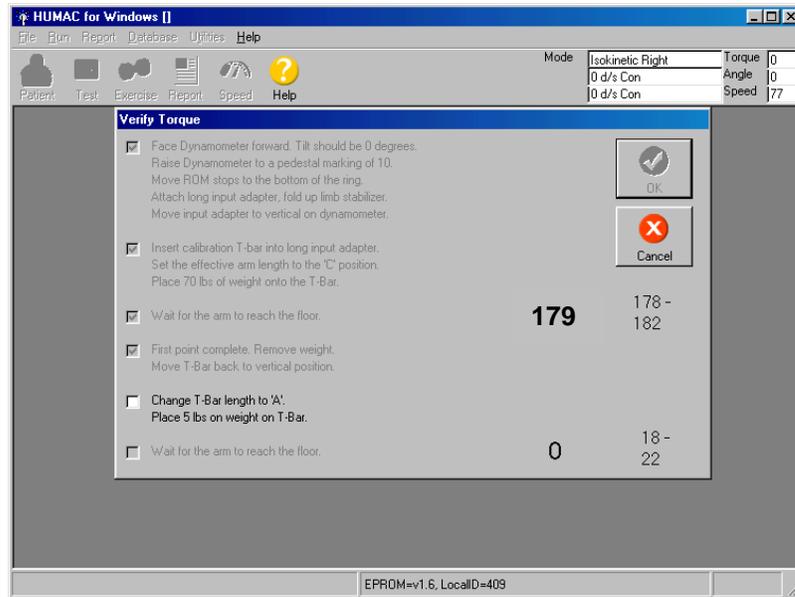
3. The weight should be falling smoothly. After the weight reaches the floor and stops falling, check this box. The HUMAC will set the speed back to 60 deg/sec. The number to the right of the screen shows the peak torque. This should be 178 to 182 ft-lbs. High or low values may indicate bouncing of weights during calibration while arm is moving. If out of range, repeat calibration once, making sure weights fall smoothly, followed by verification. If the calibration and verifications range is still not correct, call CSMI (781-255-1292).



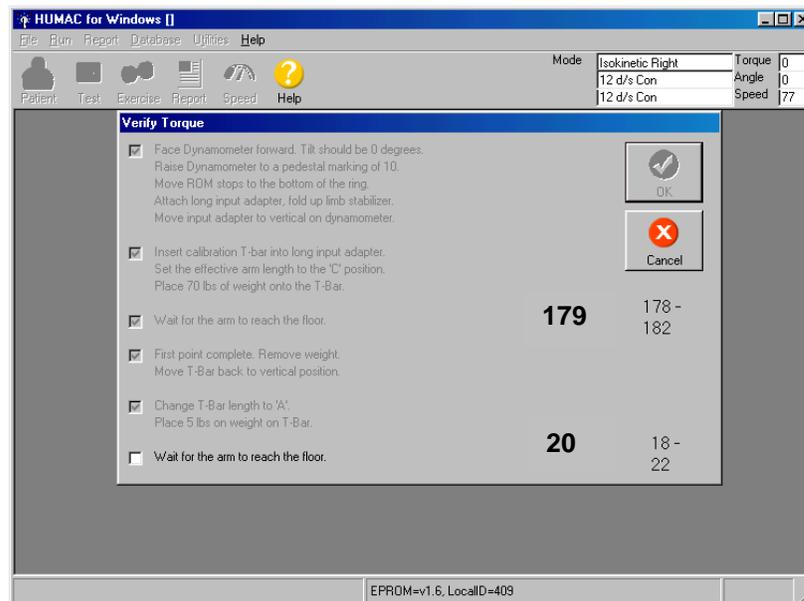
4. Return the T-Bar to the vertical position. After you check this box the HUMAC will set the speed to 0 deg/sec to hold the adapter in the vertical position.



5. Insert the calibration bar into the adapter at the **A setting** and place 5 pounds to the bar. When you check this box, the HUMAC will set the CYBEX speed to 12 deg/sec and the weight will begin to fall.



6. The weight should be falling smoothly. After the weight reaches the floor and stops falling, check this box. The HUMAC will set the speed back to 60 deg/sec. The number to the right of the screen shows the peak torque. This should be 18 to 22 ft-lbs.



Click OK or hit spacebar

You've completed the calibrations. These will automatically be recorded on the Calibration Log.

APPENDIX 2 Johnson Anti-shear Accessory Set-up

JOHNSON ANTI-SHEAR ACCESSORY*

User's Guide

**Patent No. 4407496*

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Printed in the United States of America

INTRODUCTION TO THE JOHNSON ANTI-SHEAR ACCESSORY

What is Shear?

During knee extension/flexion, the quadriceps tendon acts over the patella, which serves as a fulcrum, and exerts tremendous forces on the tibia. In addition to extending the lower leg, the pull of the tendon attempts to move the tibia up and forward of the tibiofemoral joint. This tibiofemoral translocation sliding is called shear. The femur and the tibia are sliding against one another. During this process, the normally functioning anterior cruciate ligament (ACL) restrains the tibia and limits its forward travel. Similarly, the hamstrings cause posterior shear during forceful knee flexion.

When is Shear a Problem?

Although shearing forces are normal during exercise and activity, under certain conditions there is a potential for damage from excessive tibial translocation. For instance, if the ACL has recently been damaged or repaired, it may not be capable of performing properly. In these circumstances the ACL may be injured further or a surgical repair damaged. Also, the secondary restraints, such as the collateral ligaments, may be placed under greater stress to compensate for the insufficient or lacking primary restraint. These secondary restraints may stretch beyond their normal limits over the course of a rehabilitation and exercise program causing further laxity and allowing the articular surfaces of the tibia and the femur to come into abnormal contact. This can result in unnecessary wear of the articular surfaces, causing crepitus and pain during exercise and normal daily activities.

Without proper precautions, exercising a knee that does not have a fully functional ACL may result in

further damage to the ACL and place other joint structures at risk. A repaired ACL may not be capable of handling the anterior shearing forces generated during uncontrolled exercise and functional movements for many months following surgery.

Shear can be Controlled While Strengthening the Knee:

The Johnson Anti-Shear Accessory was first described by Dave¹ Johnson in 1982. This device makes it possible for patients and athletes with diagnosed or suspected injuries to the ACL and other ligaments of the knee to perform knee extension/flexion just weeks after sustaining the injury and without over stressing the ligaments. It also allows earlier exercise rehabilitation after surgical repair or reconstruction. The dual-pad accessory counteracts anterior shear, controls subluxation of the tibia and allows the compression-loaded articular surfaces to resume a more normal roll-and-glide relationship during terminal extension. It protects the knee while permitting full and efficient development of strength, power and endurance.

The twin tibial contour pads and fulcrum can be adjusted to provide an amount of shearing counterforce appropriate to the individual case, from virtually total control of tibial translocation to a degree of control only slightly greater than provided by the standard CYBEX shin pad. Shearing counterforce can also be progressively decreased during the advanced stages of longer term rehabilitation so that the ACL and other joint structures can gradually adapt to the stresses that will be encountered during the return to full activity.

**The Johnson Anti-Shear Accessory
Can Help Solve Many Knee Problems*****Acute Injury to the Anterior Cruciate Ligament:***

The accessory's unique counterforce mechanism prevents the tibia from being pulled forward by the quadriceps. With limited stress on the ACL itself, the healing ligament can remodel along the lines of stress without elongating.

Repaired or Reconstructed ACL:

Counterforce mechanism also allows earlier exercise and rehabilitation after surgical repair or reconstruction.

Injury to Posterior Cruciate Ligament:

By limiting posterior shear during flexion, the accessory promotes healing of an injured posterior cruciate ligament.

Chronic Laxity That Hasn't Been Repaired:

Individuals with chronic laxity can strengthen hamstrings and quadriceps to increase functional control with eliminating or reducing tibiofemoral crepitus and pain that may have previously accompanied knee extension.

Post Meniscectomy:

Because the meniscus acts as a secondary stabilizer during knee extension, removal of meniscus, especially a large portion, often results in increased anterior laxity.

Any Significant Knee Injury That Might Involve or Compromise the ACL:

Because the ligaments, capsule and cartilage of the knee have overlapping functions and multiple movement, injuries are common. The accessory should be used as a precautionary measure until ACL involvement or compromise has been ruled out.

Adjusts for Any Patient

As explained in the following operating instructions, the shin pads of the anti-shear accessory can easily be adjusted to accommodate varying leg lengths and secured in place. The amount of counterforce to anterior shear is selected by adjusting the fulcrum position. The molded polyurethane pads surround the tibia, distributing force over a large area with minimum pressure. This helps reassure clients and makes leg extensions more comfortable, providing further motivation. Extra-long Velcro® straps can even fit around a knee orthotic.

Clinical Guidelines

Both testing and exercise of any knee with significant joint laxity (particularly injured or surgically repaired anterior cruciate ligaments) have always been cause for concern. The Johnson Anti-Shear Accessory is designed to help clinicians deal with many of these problems. One study by Timm³ has demonstrated its validity as a shear-restricting tool.

The position of the fulcrum assembly determines the amount of counterforce to shearing forces. Moving the fulcrum assembly distally (away from the knee) decreases the force applied to counteract tibial translocation. Moving the fulcrum assembly proximally (toward the knee) increases the force applied to counteract tibial translocation. Malone² recommends that the pivot position be initially set midway, and then adjusted proximally if more counterforce is required. Once properly set for the client, the distance between the two pads generally does not have to be changed. However, in the final stages of rehabilitation, it may be desirable to progressively increase shearing stresses on joint structures. In this case, the fulcrum may be progressively moved distally.

Certain surgical procedures (particularly, most intra-articular ACL repairs) warrant extremely conservative treatment with long term use of the Anti-Shear Accessory and appropriate limitation of range of motion. Malone² also recommends using the Anti-Shear Accessory only for extension(quadiceps) exercise for clients with a large amount of instability and/or secondary capsular involvement. During hamstring exercise (flexion), an anterior shifting force is placed on the proximal pad. For extremely lax clients, it may therefore be desirable to use the standard single tibial contour pad for flexion exercise.

Safe Exercise and Testing Is the Clinician's Responsibility

The Johnson Anti-Shear Accessory is an extremely useful tool for earlier rehabilitative exercise of diagnosed ACL injuries, surgical repairs and reconstructions, chronic anterior laxity and a number of injuries to other joint structures that can cause

increased stresses on the ACL. *However, it is the clinician's responsibility to ascertain when a patient is ready for resistive exercise.* Experienced users recommend careful evaluation of the patient's status before prescribing exercise, submaximal exercise programs with controlled progression towards maximal exercise, range limiting depending on injury or surgical procedure, and use of the Johnson Anti-Shear Accessory on all at-risk patients.

Testing with the Johnson Anti-Shear Accessory

The use of this accessory for testing has been documented in only one study³, in which no significant difference was found in torque curves whether testing was performed with the Accessory or the tibial contour pad. Further research on normal knee quantifying differences in torque measurements and torque curve shapes is necessary and would be welcomed.

PART	DESCRIPTION	PART NUMBER
A	Locking Knob (aluminum)	260AK039
B	Inside tube assembly	2600S030
C	Locking knob, $\frac{3}{8}$ -24x $\frac{3}{4}$	PP460011
D	Fulcrum assembly	2600S004
E	Upper and lower molded pad	PR010002
F	Outside tube	2600P020
G	Padded Velcro strap for upper pad	2600S047
H	Padded Velcro strap for lower pad	2600S046
I	Pivot tube assembly	2600S010
J	Orthotron II Anti-Shear Accessory input adapter	2610P001*
K	Straight input adapter (CYBEX 300 Series and Orthotron KTs)	2600P001

* The Johnson Anti Shear Accessory does not require an additional input adapter when used with the old style Orthotron. The accessory attaches directly to either of the actuator arms on the Orthotron.

Operating Instructions

1. Measure the distance in centimeters (one inch = 2.54 centimeters) from the inferior border of the tibia tubercle to the superior border of the medial malleolus. See Fig. 13.



Figure 13

2. The distance from the top edge of the upper pad to the bottom edge of the lower pad must be set to match this measurement. The white numbers on the black inside tube assembly (B) are used to set this distance.

To set this overall pad-to-pad distance, loosen the knurled aluminum locking knob (A) on the top of the black inside tube assembly (B) by turning the knob counterclockwise (CCW). Slide the tube assembly up or down as necessary, until the correct distance marking appears at the top edge of the chrome outside tube (F). See Fig. 14.

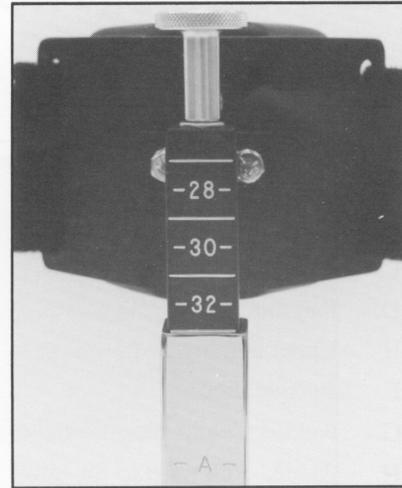


Figure 14

3. Tighten the knurled aluminum locking (A) by turning it clockwise (CW).

The distance from the top edge of the upper pad to the bottom edge of the lower pad now matches the distance from the tibial tubercle to the medial malleolus measured in step 1. See Fig. 15.

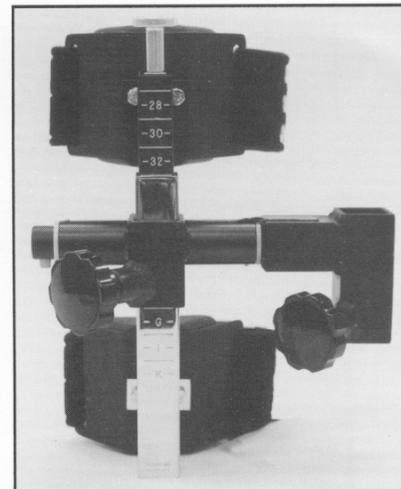


Figure 15

4. Attach the appropriate input adapter (determined by the CYBEX equipment being used) to the input shaft of the dynamometer of actuator being used. See Figs. 16A and 16B.

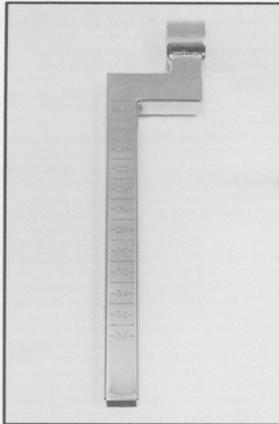


Figure 16A – Orthotron II Anti-Shear Accessory input adapter

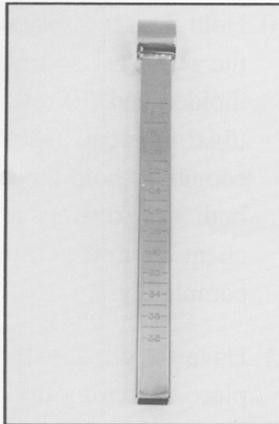


Figure 16B – Straight input adapter for CYBEX II/II+, CYBEX 300 Series and Orthotron KT

Note: When using the Johnson Anti-Shear Accessory on the Orthotron II or the Orthotron KT, be sure to attach the input adapter to the actuator according to the instructions in their respective User's Guides making certain to align the engraved dot on the input shaft with the correct marking on the input adapter.

5. Position and stabilize the client for knee extension/flexion according to the guidelines in appropriate User's Guide.

Careful alignment of the knee's axis of rotation is essential when using the Johnson Anti-Shear Accessory.

6. The removable pivot tube assembly (I) allows the anti-shear accessory to be in an upright position (knurled aluminum knob on top) when exercising the left or the right knee.

To remove the pivot tube assembly (I), press in the push button (J) on the end of the tube. Slide the tube out of the fulcrum assembly (D). See Fig. 17.

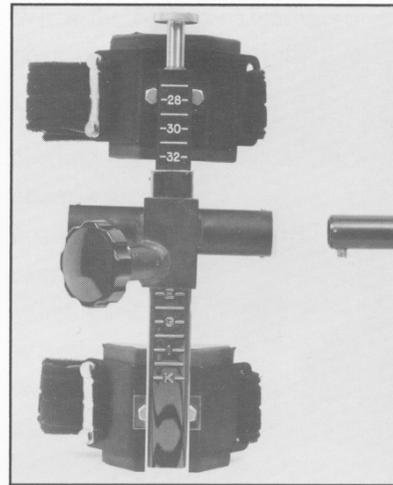


Figure 17

7. Fig. 18 shows the accessory and pivot tube assembly ready for use on a right knee.

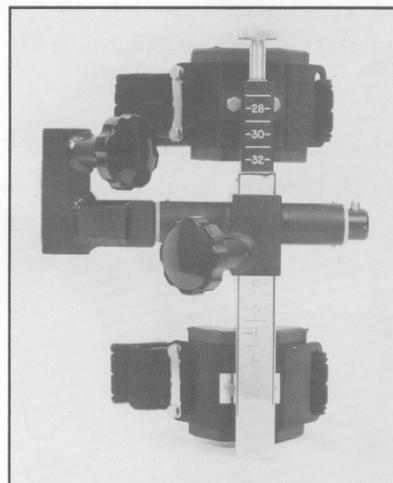


Figure 18

Fig. 19 shows the accessory and pivot tube assembly ready for use on a left knee. Note that locking knob C1 on the pivot tube assembly (I) always the front of the accessory.

Assemble the anti-shear accessory and pivot tube assembly for the leg to be tested by pressing in the push button (J) and slipping the fulcrum assembly over the tube.

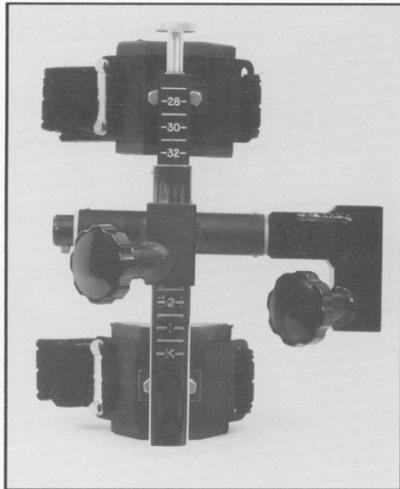


Figure 19

8. Loosen the large black locking knob (C) on the fulcrum assembly (D) by turning the knob CCW. Pull open both Velcro straps. Loosen the large black locking knob (C₁) on the pivot tube assembly (I) by turning the knob CCW.
9. Holding the accessory upright, slip the pivot shaft assembly (I) onto the input adapter of the dynamometer or actuator. See Fig. 20. Do not tighten the two black locking knobs.

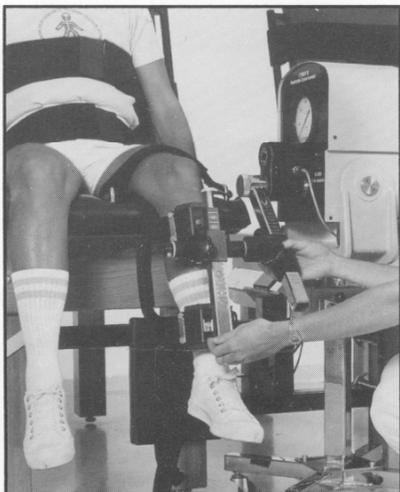


Figure 20

10. Hold the accessory on the adapter and position the accessory so the top edge of the upper molded pad (E) rests at the inferior border of the tibial tubercle. Tighten both black locking knobs enough to hold the accessory in place. Secure both Velcro straps around the leg as tight as client comfort permits. Loosen the locking knobs completely.
11. Have the client extend the leg. Lock the limb in place by setting the unit speed to 0. See Fig. 21.



Figure 21

Tightening the locking knobs with the leg extended helps prevent the the clients tendency to slide forward on the table when exercising.

12. Position the fulcrum assembly (D) just above the mid-point between the two pads. This places slightly more force on the upper pad (E).

Clinical evaluation indicates that splitting contact force 60% upper pad/40% lower pad neutralizes tibial translocation forces during forceful extension. Most clients with significant joint laxity will find this more comfortable. See Fig. 22.

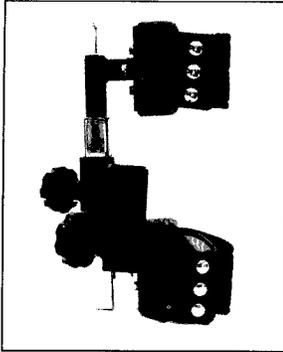


Figure 22

The fulcrum position may be adjusted for the greatest patient comfort during exercise and for the degree of shearing counterforce desired.

13. When the fulcrum assembly is properly positioned, securely tighten both locking knobs.
14. The engraved numbers on the accessory and chrome input adapters should be noted on the client's record to allow quick and accurate positioning of the anti-shear accessory in future exercise or testing sessions.
When used on the old style Orthotron, the anti-shear accessory attaches directly to either input arm of the actuator; an extra adapter is not necessary. In this case, count the number of holes exposed on the input arm to record the location of the accessory.
15. The client is now ready to begin. Perform the test or exercise in the normal fashion for the system used. Refer to the appropriate User's Guide for complete details.

References:

1. Johnson D: *Controlling anterior shear during isokinetic knee extension exercise*. J Orthop Sports Phys Ther 4:23-31, 1982
2. Malone T: *Clinical use of the Johnson Anti-Shear device: how and why to use it*. J Orthop Sports Phys Ther 7:304-9, 1986
3. Timm K: *Validation of the Johnson Anti-Shear Accessory as an accurate and effective clinical isokinetic instrument*. J Orthop Sports Ther 7:298-303, 1986

APPENDIX 3 MOST Report

Use File, Preferences command to set report heading
MOST Knee Extension/Flexion Protocol (Page 1 of 2)

MOST ID: MB00001
Birth date: 1/1/50
Pref Side: Right

ACROSTIC: GWAS
Weight: 81 Kilograms
Tester: B05

Date: 1/7/03
Sex: True

Protocol: 1 Speed Protocol (60/60)
Isokinetic Con/Con
Speed 60/60 Repetitions 4

Manual Position Setting

Chair Back Angle:	85
Chair Back Translation:	M
Chair Seat Fore/Aft Position:	6
Dynamometer Tilt:	0
Dynamometer Height:	3
CW ROM Stop:	-
CCW ROM Stop:	-
Straight Input Adapter:	22
Upper Tube:	31
Lower Tube:	J

RIGHT SIDE

Repetition	Peak Torque	Extensors		Flexors	
		Angle at Peak	Peak Torque	Angle at Peak	Peak Torque
0	360.15	45.9	35.12	69.3	
1	355.14	38.4	33.22	69.3	
2	350.39	38.4	31.32	69.3	
3	345.64	38.4	29.56	69.3	
Coeff Var	0.02	0.09	0.1	0.	

LEFT SIDE

Repetition	Peak Torque	Extensors		Flexors	
		Angle at Peak	Peak Torque	Angle at Peak	Peak Torque
0	331.14	38.4	24.27	69.3	
1	327.07	38.4	22.51	69.3	
2	323.	38.4	20.88	69.3	
3	318.93	38.4	19.39	69.3	
Coeff Var	0.02	0.	0.13	0.	

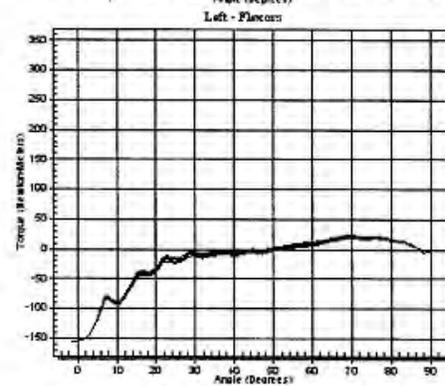
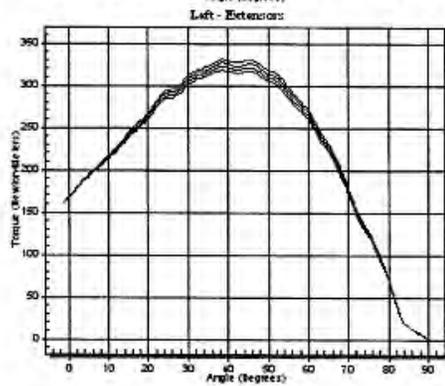
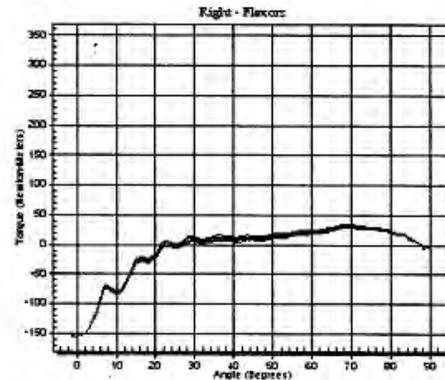
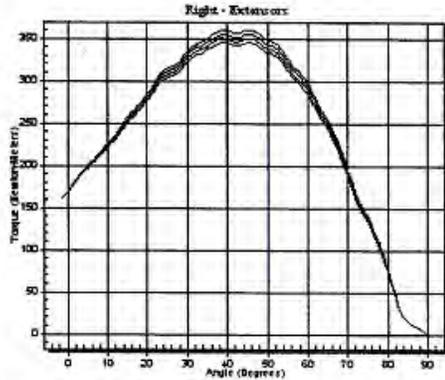
HUMAC for Windows Version: 4.2.4 Copyright Computer Sports Medicine, Inc., 1982-2002.

Use File, Preferences command to set report heading
MOST Knee Extension/Flexion Protocol (Page 2 of 2)

MOST ID: MB00001
Birth date: 1/1/50
Pref Side: Right

ACROSTIC: GWAS
Weight: 81 Kilograms
Tester: B05

Date: 1/7/03
Sex: True



HUMAC for Windows Version: 4.2.4 Copyright Computer Sports Medicine, Inc., 1982-2002.

APPENDIX 4 Setting the Computer for the MOST Report



Setting the Computer for the MOST Report

The MOST report is enabled by setting a registry key on the computer. This prevents the report from appearing for standard HUMAC users.

1. Select **Start, Run**.
2. Enter **REGEDIT** in the **Open** box and click **OK**.
3. From the registry editor, open the **HKEY_CURRENT_USER** folder.
4. Open the **SOFTWARE** folder.
5. Open the **WB and VBA Program Settings** folder.
6. Open the **HUMAC** folder.
7. Click on the **Options** folder.
8. From the menu, select **Edit, New, String Value**.
9. Enter **MOST** as the **New Value #1**.
10. Double click the **MOST** name and enter **True** as the **Value data**.
11. Click **OK** to save the value.
12. Select **Registry, Exit** to save your changes.



Figure 1 - Registry with MOST Key

File: I:\Humac\Windows\Setting_the Computer for a MOST Report.doc

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APPENDIX 5 Error Year Changes to 2000 When Entering Data**Error Year Changes to 2000 When Entering Dates**

PRB: *You enter a date and the year changes to 2000 when you leave the field.*

SYMPTOMS

You enter a date, e.g. 10/16/2002 and leave the date field. The year then changes to 2000.

CAUSE

This is caused by a problem in the Date control.

RESOLUTION

1. Select **Start, Search**.
2. Select the **All Files and Folders**.
3. Enter **PVDATEEDIT.OCX** as the file to search for.
4. Start the search. It should find the file in **C:\Windows\System32**.
5. Delete the **PVDATEEDIT.OCX** file.
6. Place the HUMAC CD in the computer. When the setup program starts, select the **Repair** option.

STATUS

This corrects the problem.

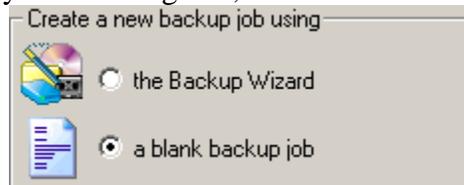
File: I:\Humac\Windows\Errors>Error Year Changes to 2000 When Entering Dates.doc

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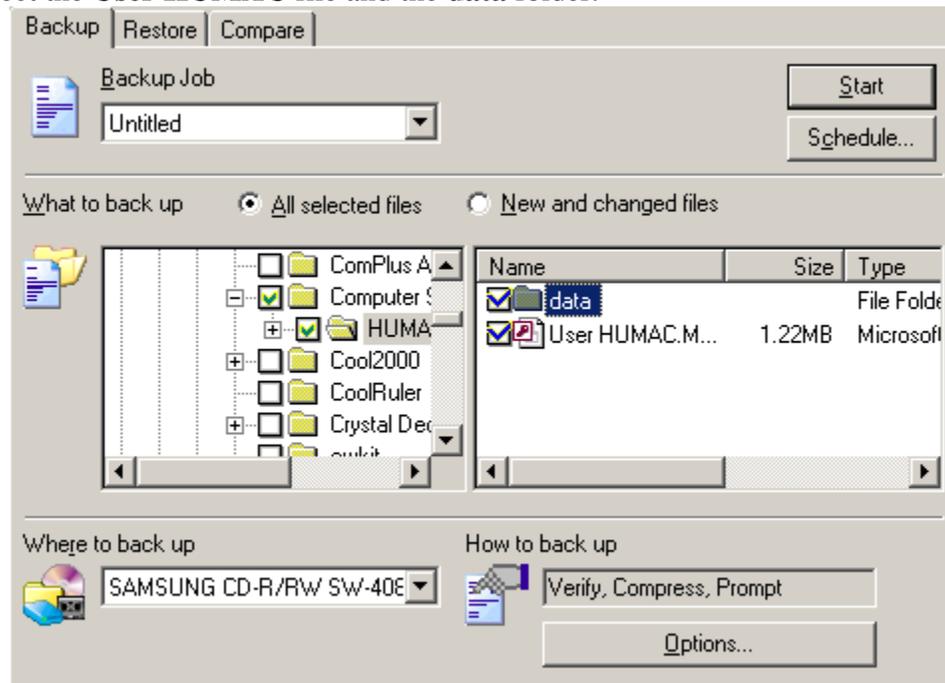
APPENDIX 6 HUMAC Data Transfer

HUMAC Data Transfer - UAB**Creating A Backup At The Site**

1. Exit out of the **HUMAC** program.
2. Select **Start, All Programs, STOMP, Backup My PC, Backup My PC**.
3. If this is the first time you are doing this, select a **blank backup job** and click **OK**.



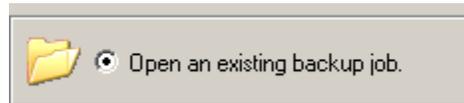
4. From the **Backup** tab, **What to Backup** area, go to the **C:\Program Files\Computer Sports Medicine, Inc.\HUMAC** folder.
5. Select the **User HUMAC** file and the **data** folder.



6. From the **Where to backup** area, select your **CD-ROM** drive.
7. Click **Start**.
8. The program will ask if you want to save the backup job. Answer **Yes**.
9. Enter **HUMAC Backup** as the **Job Name** and click **Save**.
10. The program will then backup your data to CD. When the backup is completed, click **OK**. To exit the status screen and then **OK** to exit the backup screen.
11. From the backup program, select **Job, Exit**.

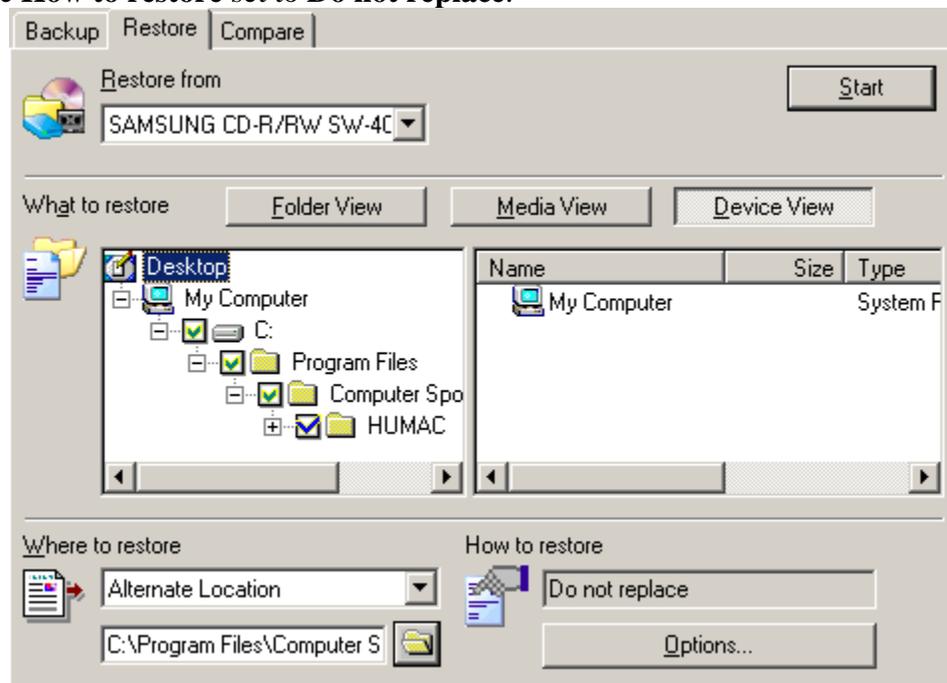
Note:

The next time you perform the backup, select **Open Existing Backup Job** and select **HUMAC Backup**.



At The Central Site – Restoring the Data From The CD

1. Create a temporary folder on your C: drive, e.g. **C:\HUMACTEMP**.
2. Delete all files from the **C:\HUMACTEMP** folder.
3. Delete all files from the **C:\Program Files\Computer Sports Medicine, Inc.\HUMAC\Import** folder.
4. Place the CD in the computer.
5. Exit out of the **HUMAC** program.
6. Select **Start, All Programs, STOMP, Backup My PC, Backup My PC**.
7. Select **A blank restore job** and click **OK**.
8. Set the **Restore from** to your CD ROM.
9. Select **Device View**.
10. From the **Select Backup Sets** dialog box, click **OK**.
11. Open the **C:\Program Files\Computer Sports Medicine, Inc.** folder.
12. Click the checkbox next to the **HUMAC** folder. Checkmark will be blue.
13. From the **Where to restore** area, select **Alternate Location**.
14. From the **Alternate location**, select the **C:\HUMACTEMP** folder.
15. Leave **How to restore** set to **Do not replace**.



16. Click **Start**.
17. From the **Media Required** dialog box, click **OK**.
18. Click **OK** when the restore is completed.

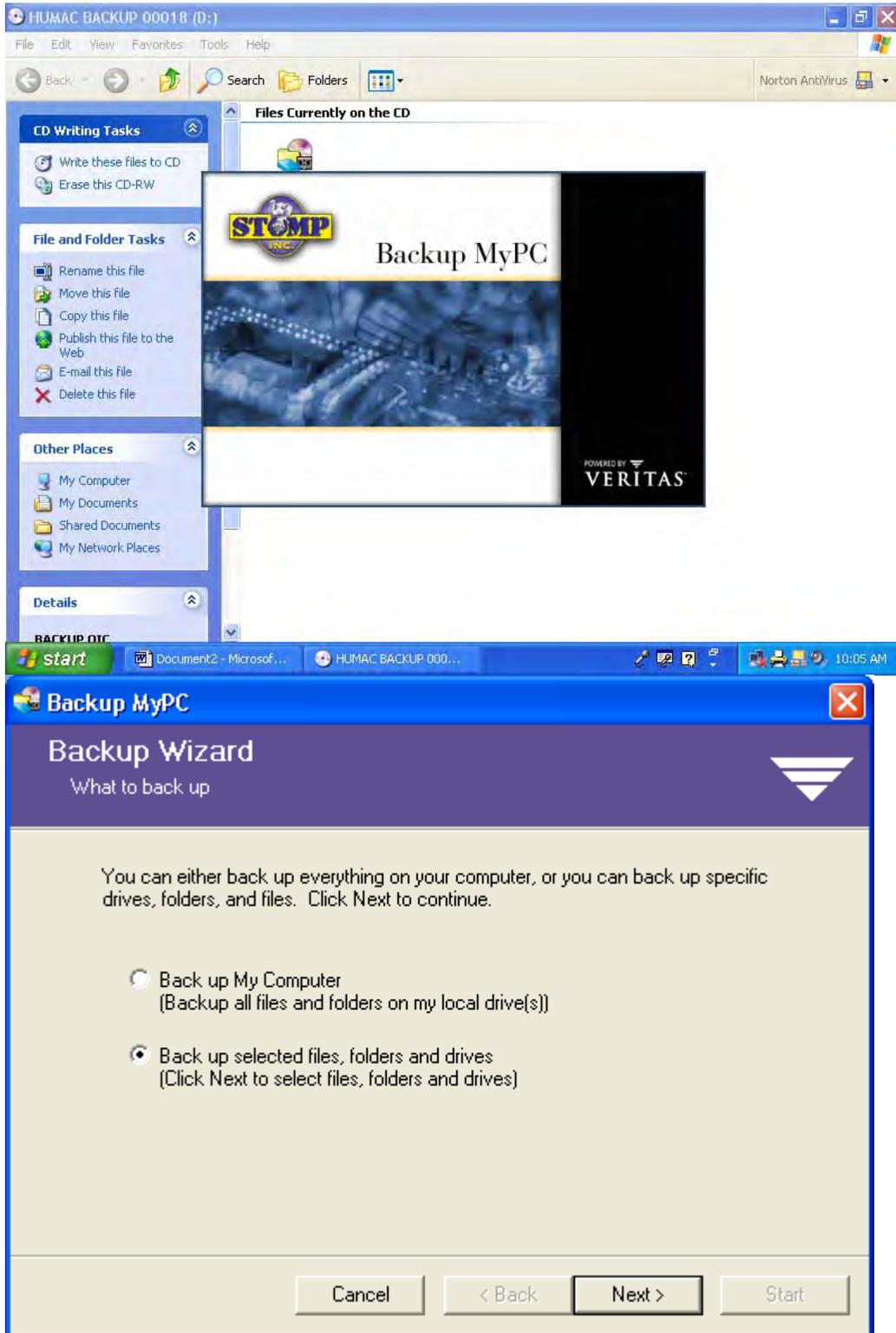
19. Copy all files from
 C:\HUMACTEMP\Program Files\Computer Sports Medicine, Inc.\HUMAC
to
 C:\Program Files\Computer Sports Medicine, Inc.\HUMAC\Import.

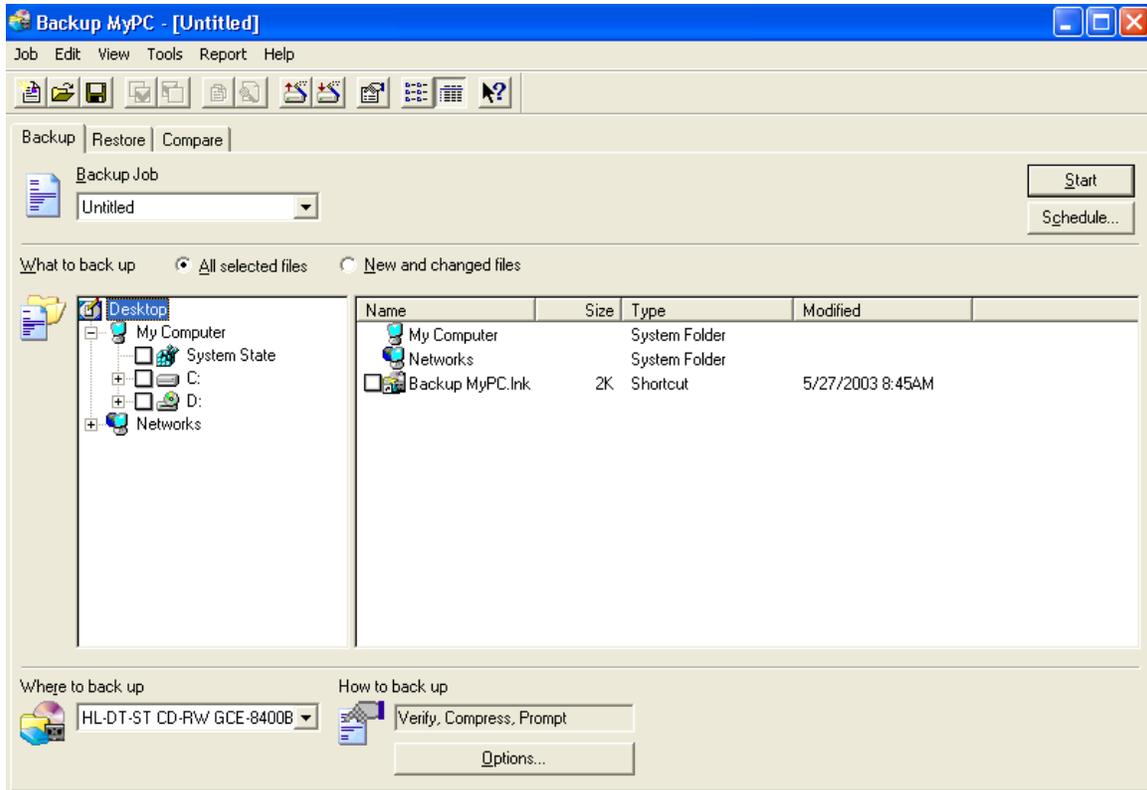
At The Central Site – Loading the Data Into The HUMAC

1. Start the HUMAC program.
2. From the **File** menu, select **Import**.
3. Select **Import Data**.

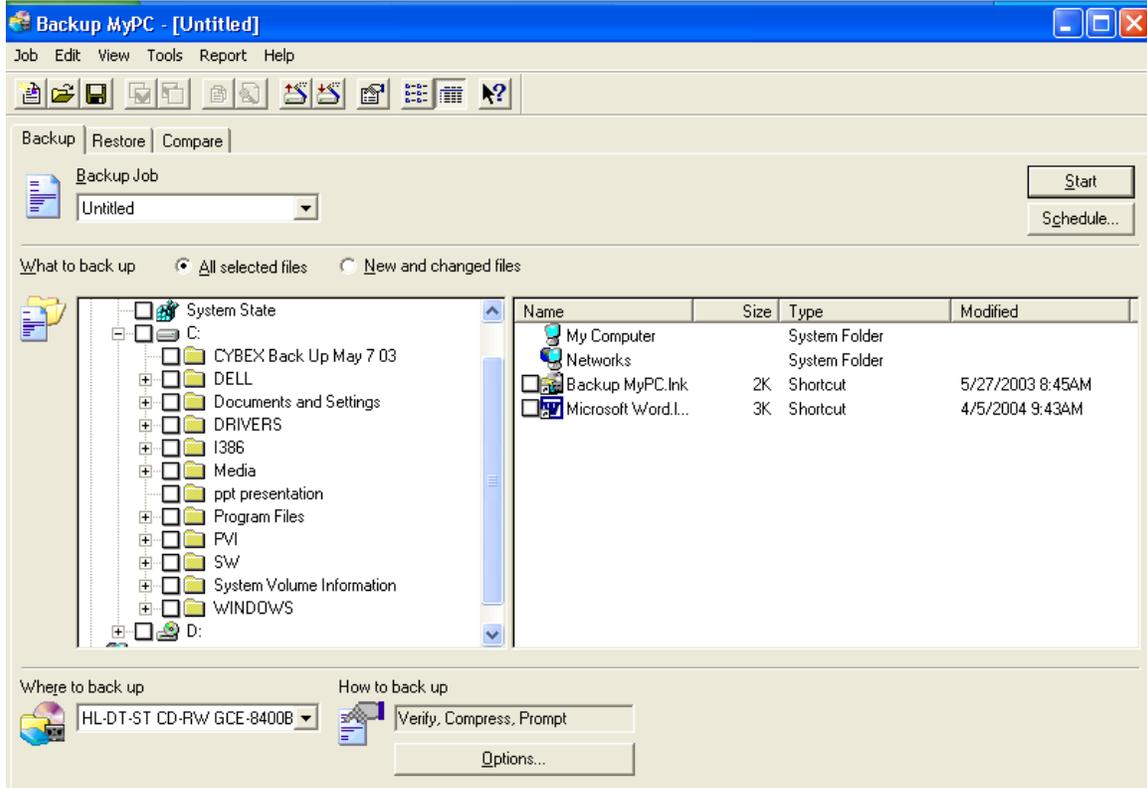
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HUMAC Data Transfer - Iowa

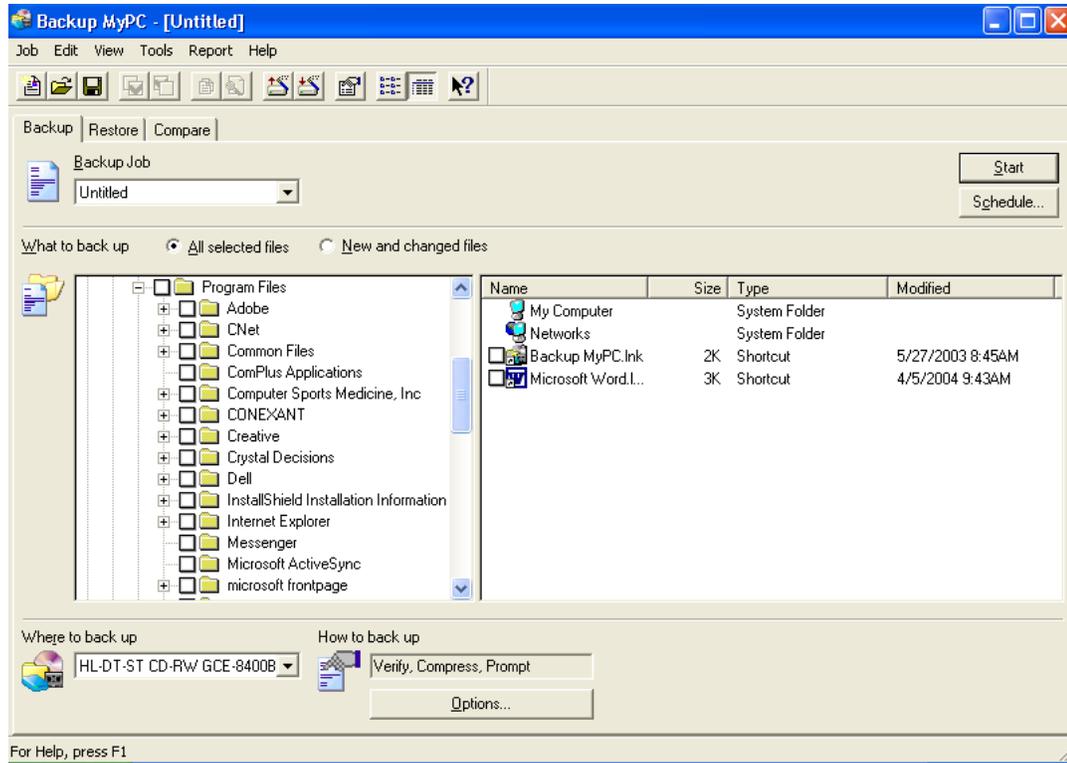




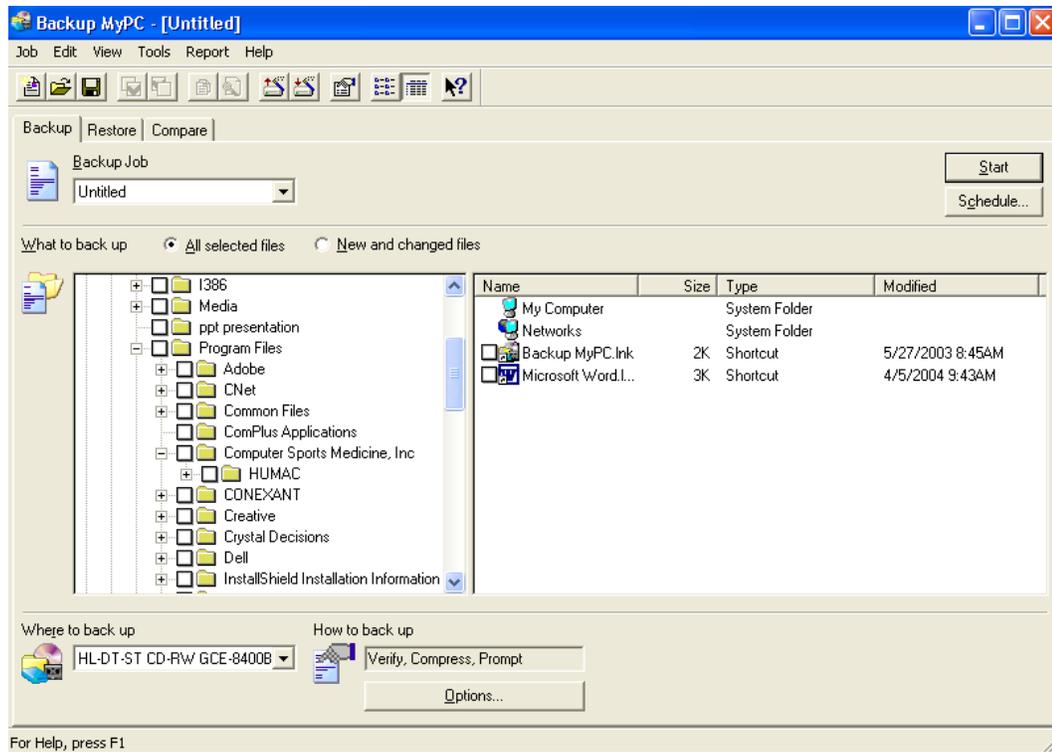
For Help, press F1



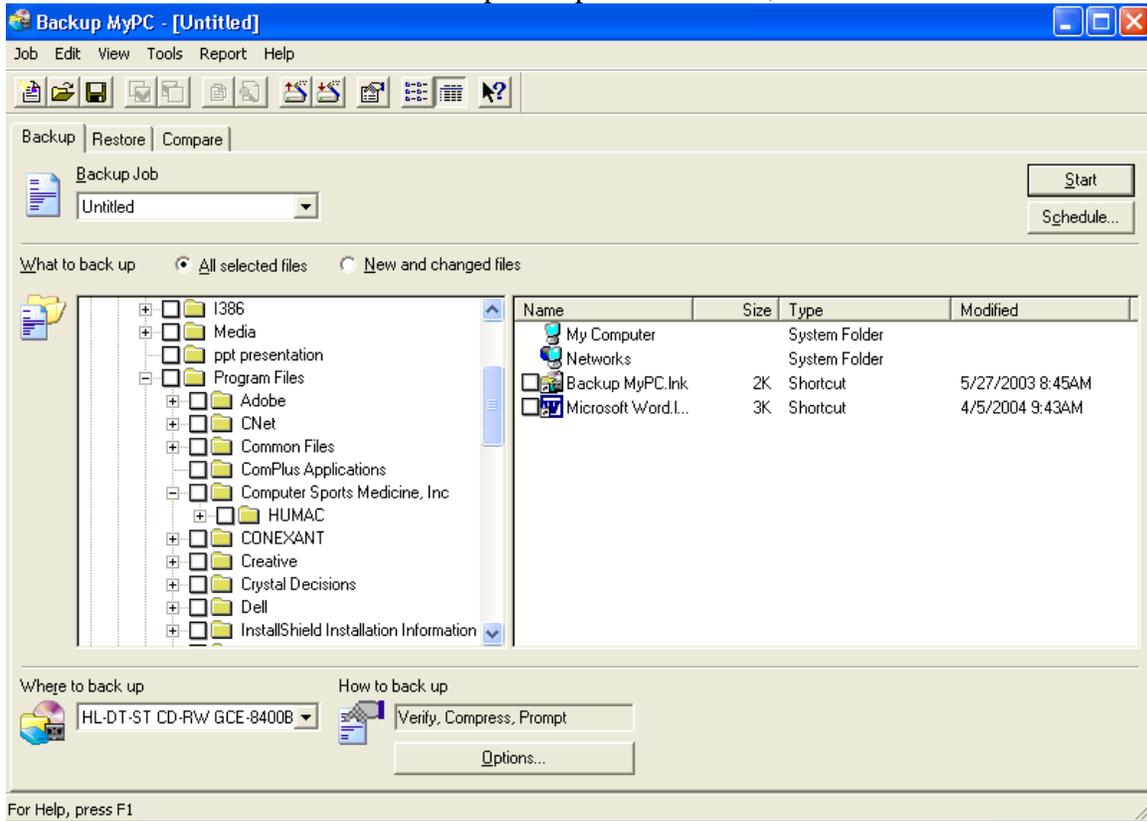
For Help, press F1



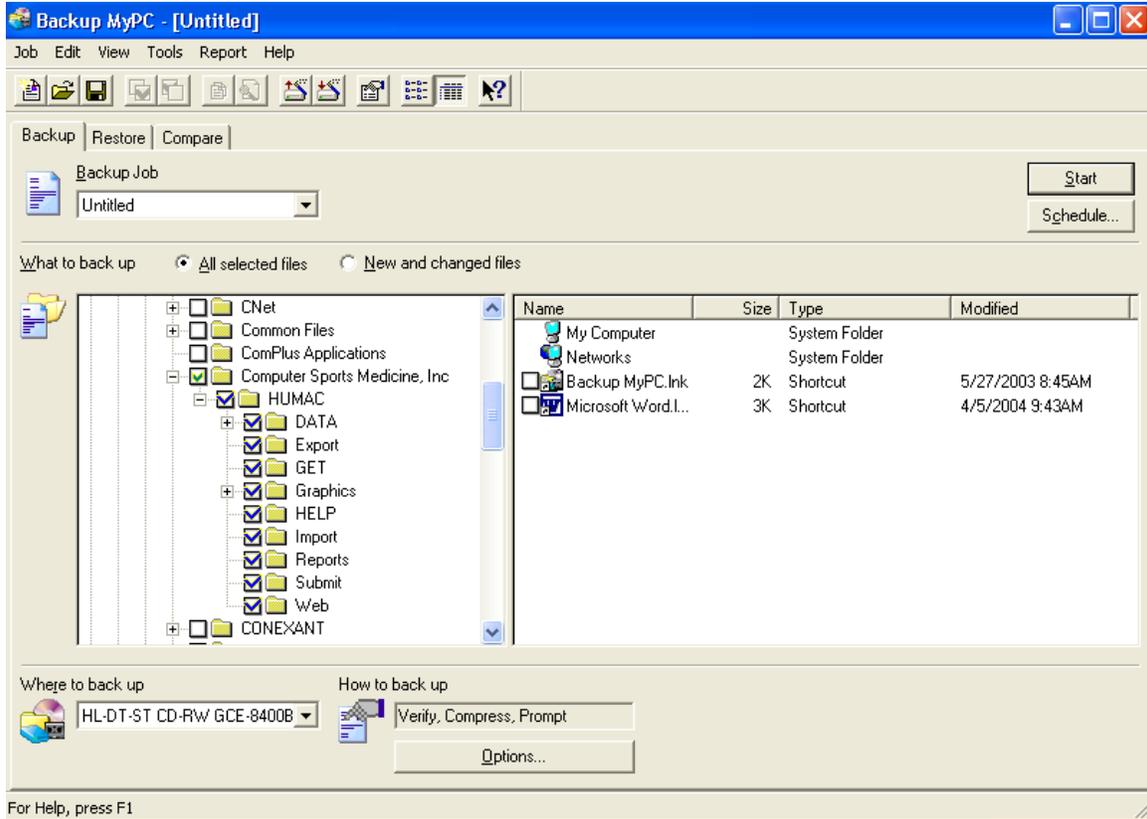
Program Files + button should be selected then you'll see the above screen.



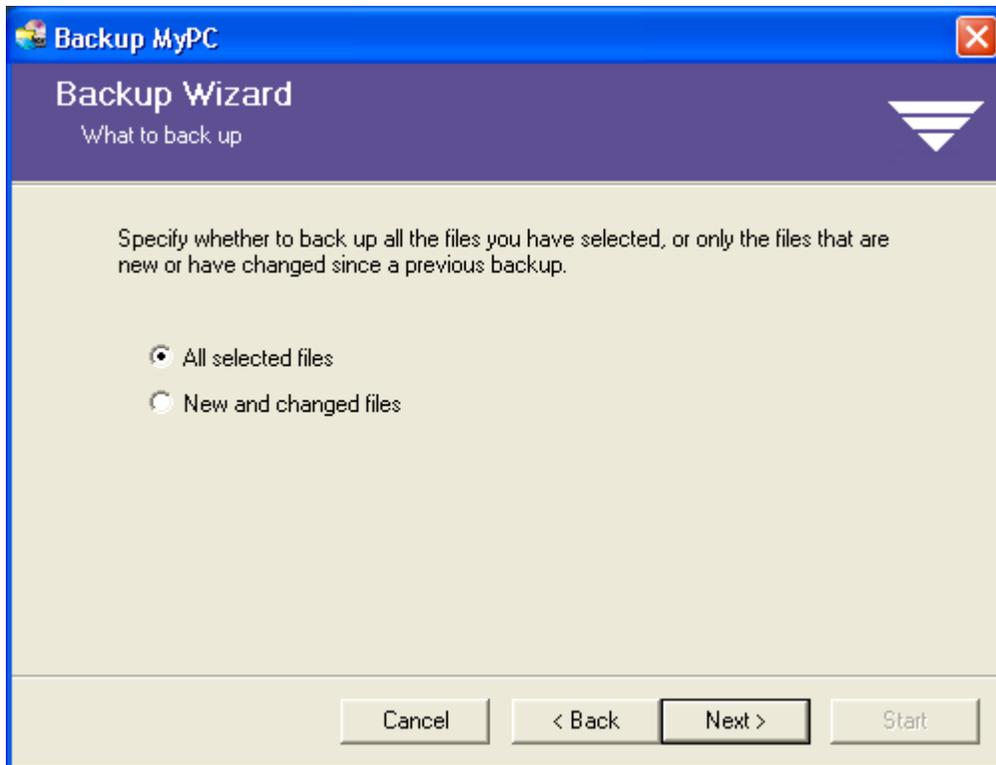
Click on the + button in front of Computer Sports Medicine, Inc.



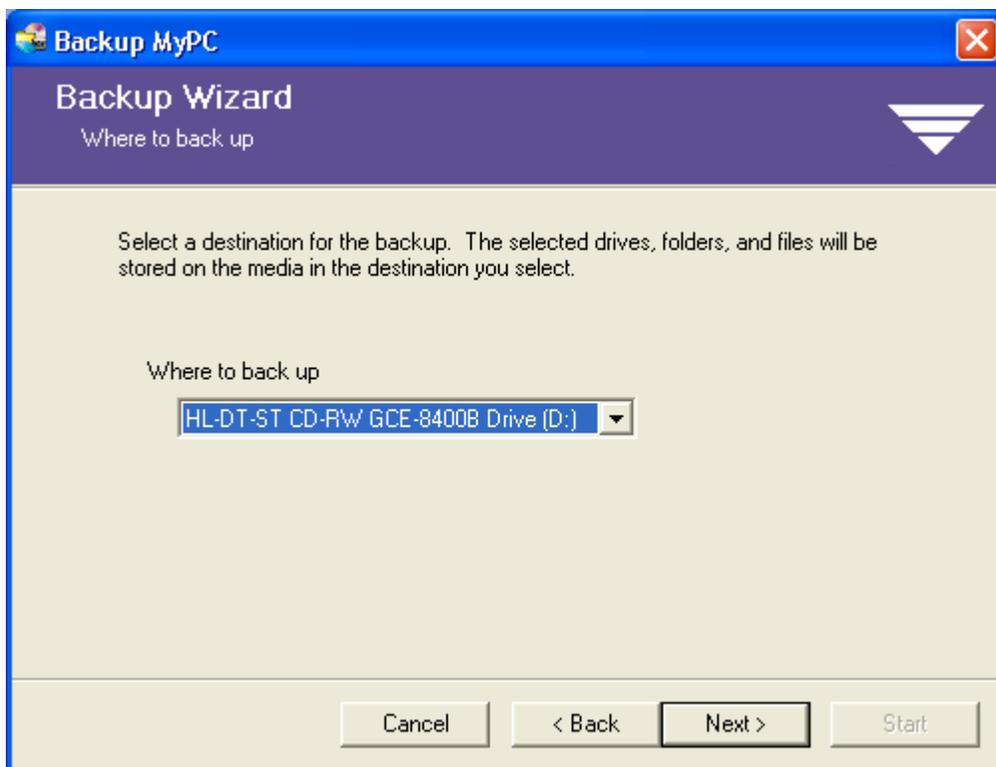
Select the + button in front of HUMAC.



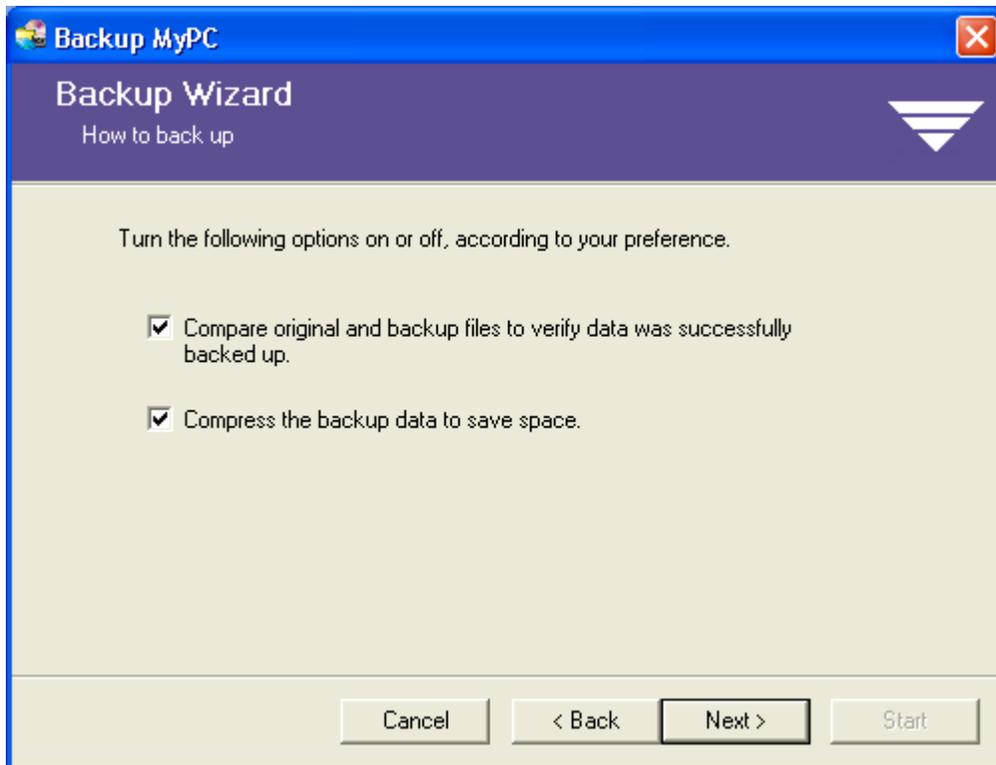
Click on the empty box to the left of the HUMAC file. All files under HUMAC will now appear checked. Press Start.



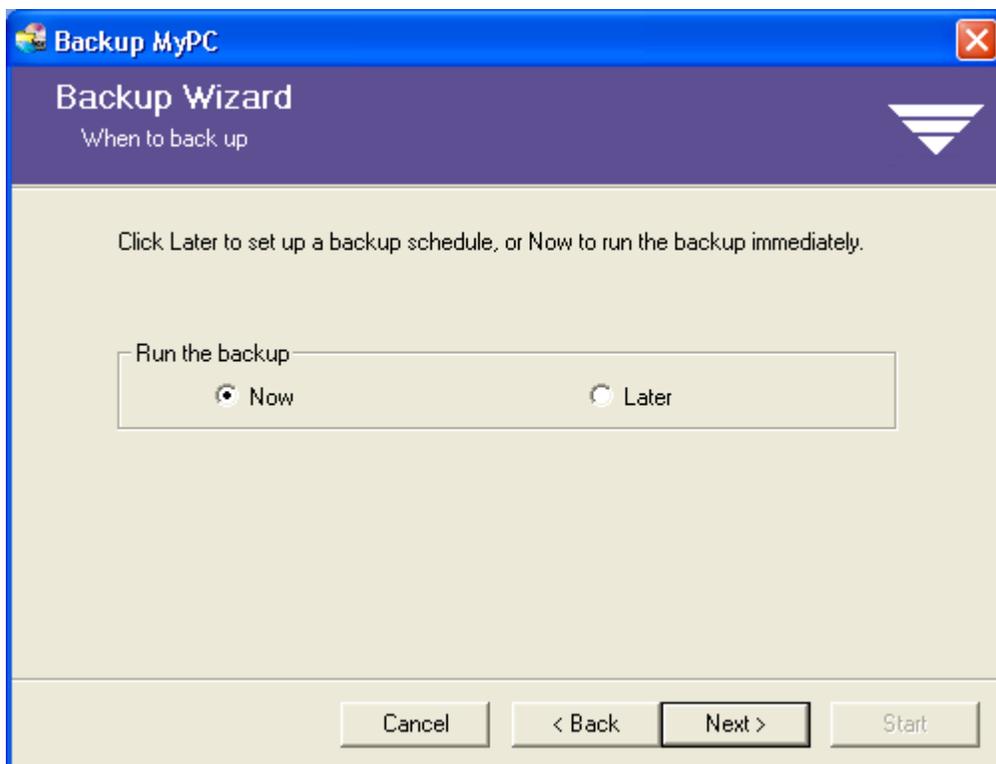
Select the Next button.



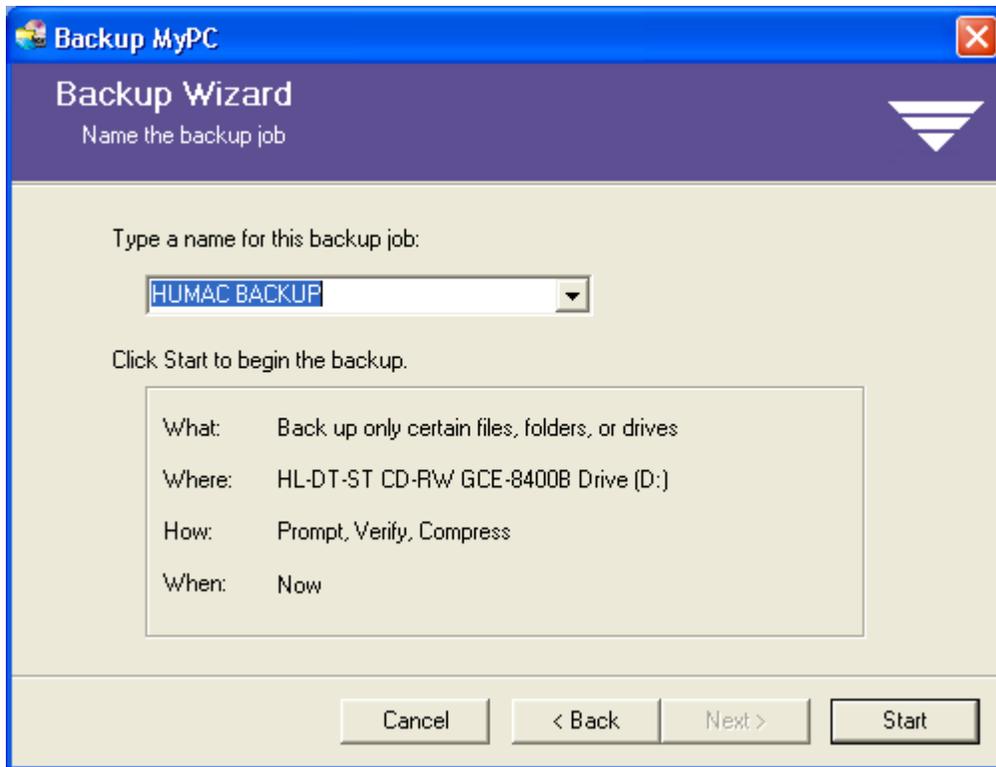
Select the Next button.



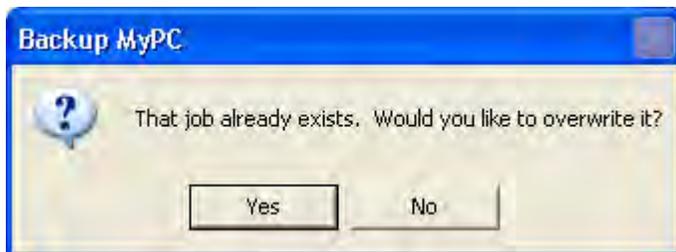
Select the Next button.



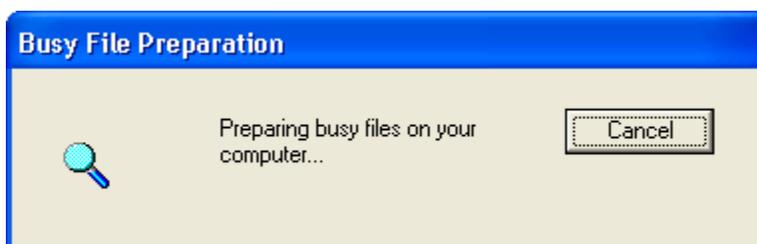
Select the Next button.

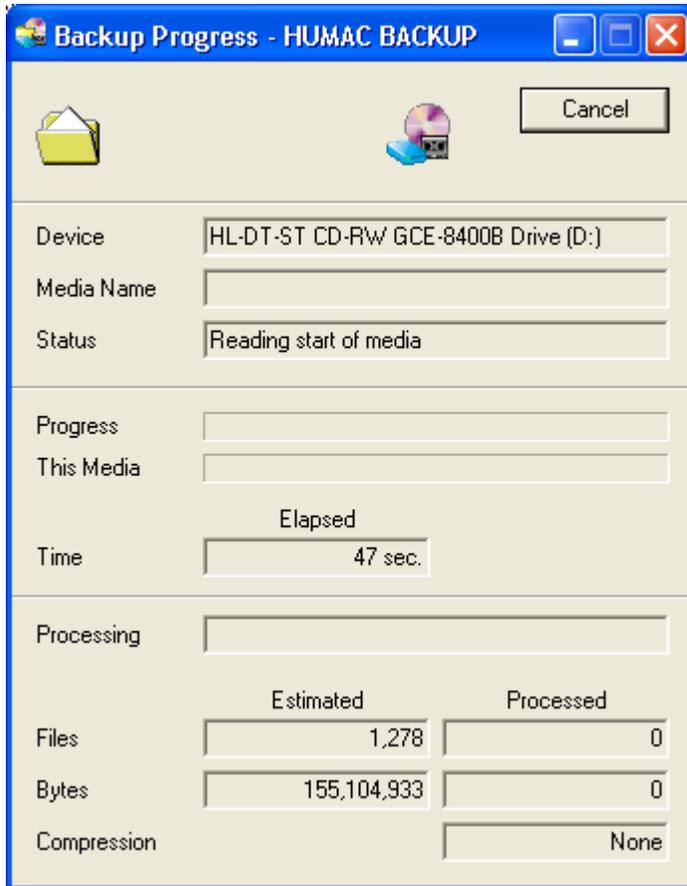


Select the Start button.

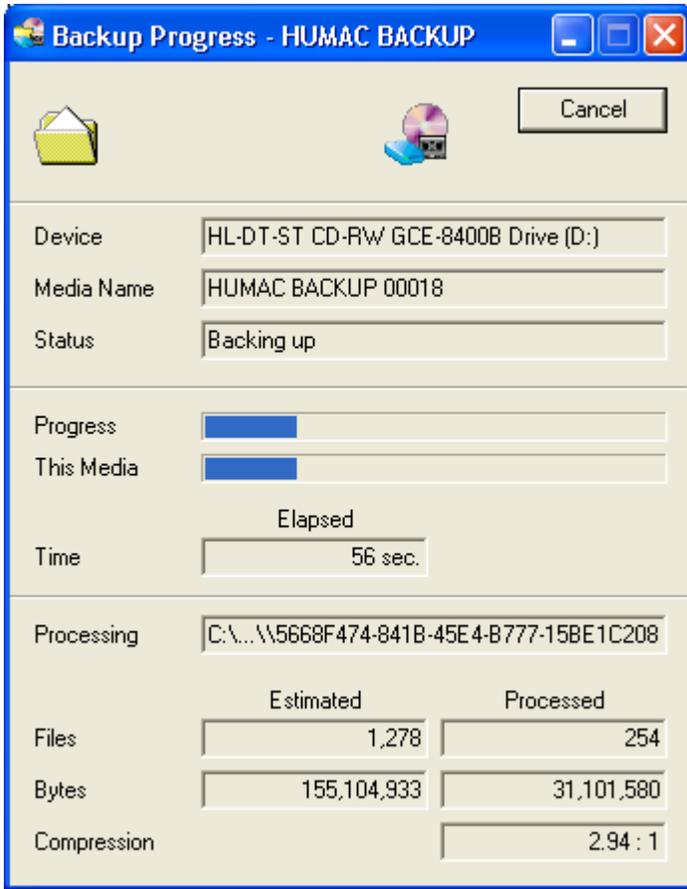


Select the Yes button.

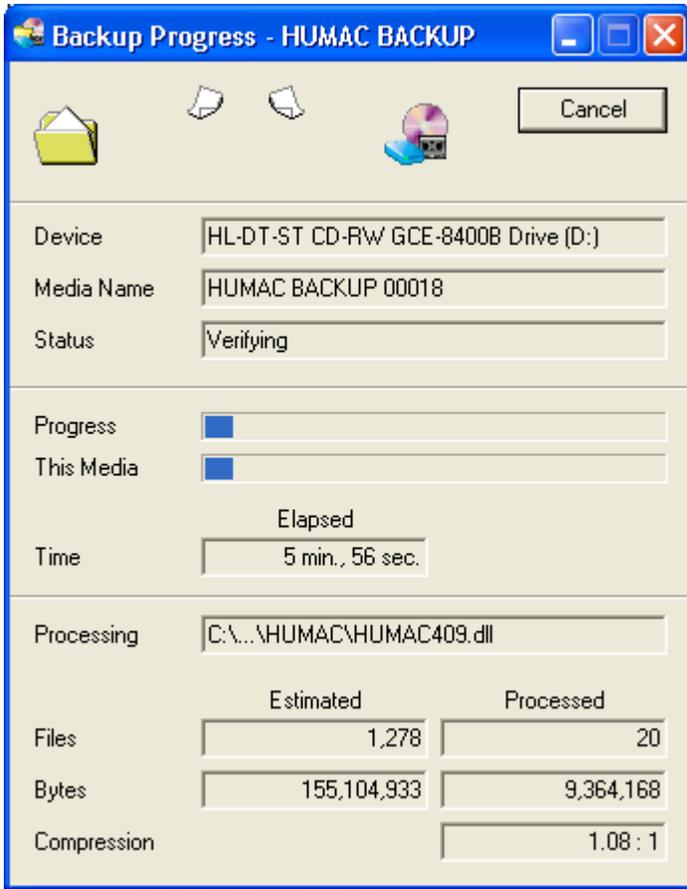




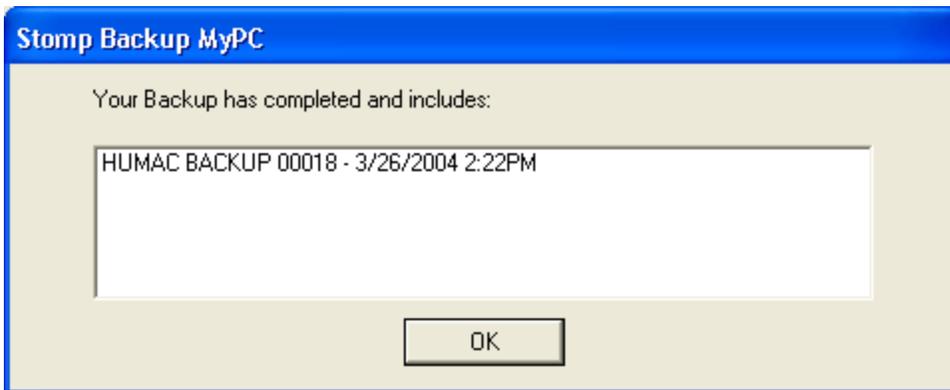
Select the Overwrite button.



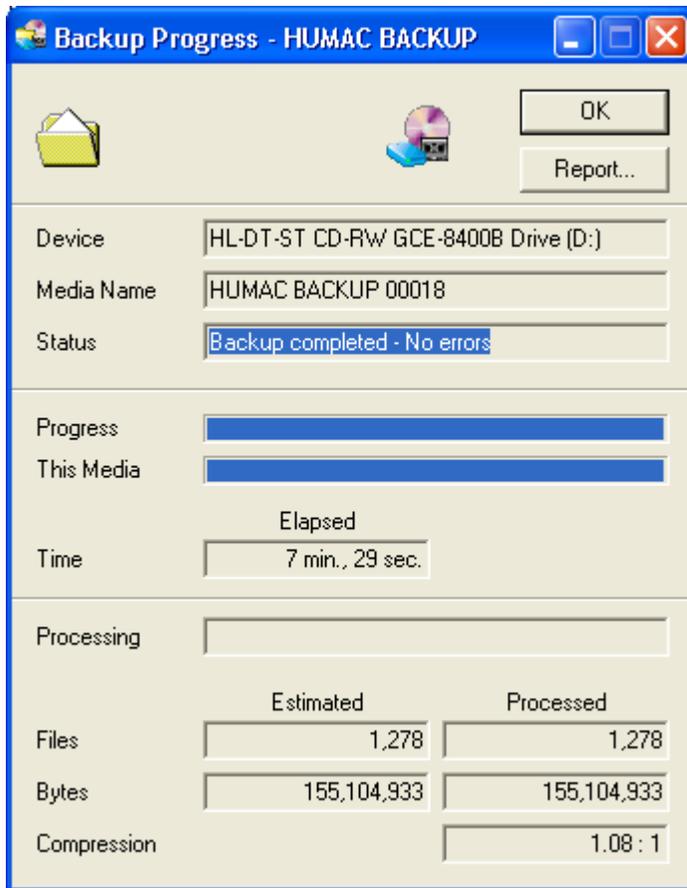
In the process of backing up.



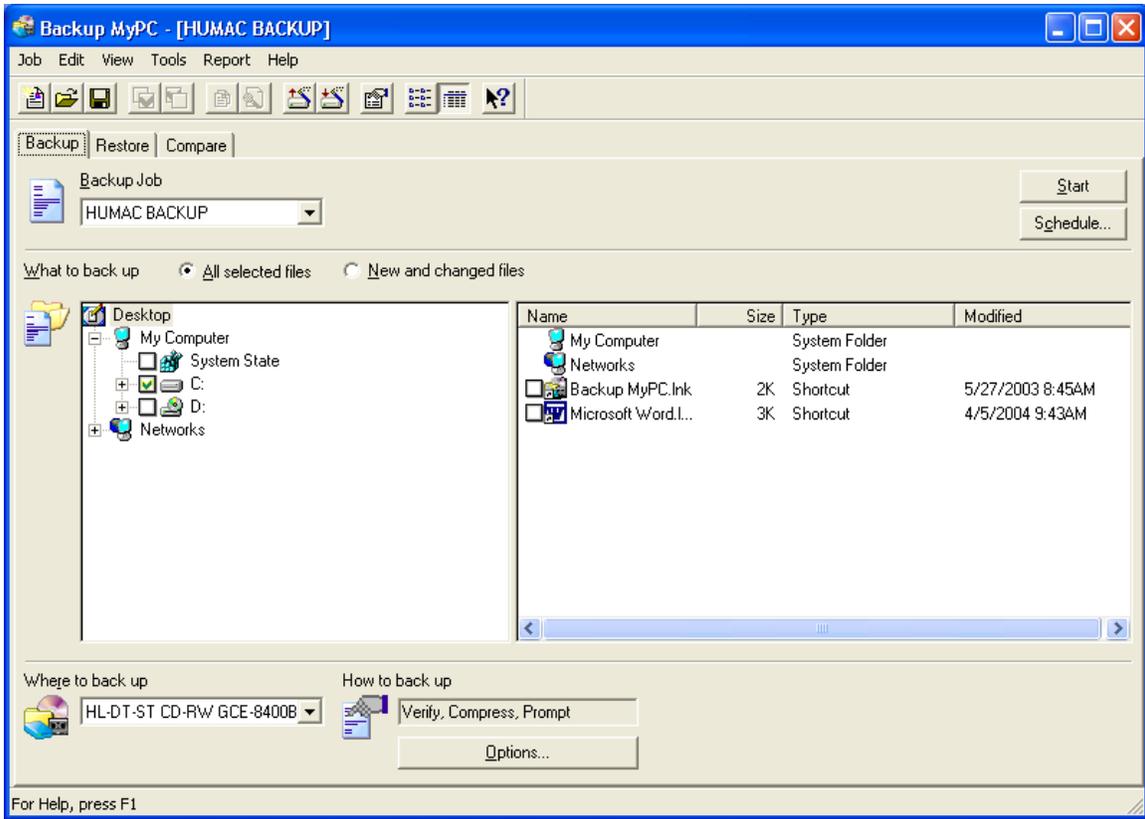
Verification of data records.



Backup has finished.



Backup is now complete.
Click on Report to print a daily backup report.



Select Exit under job to quit the backup program.