



### HUMAC2015 New Feature List

The HUMAC 2015 includes new features for each type of user. The table below lists the features and the users they were designed for. Descriptions and examples of each feature follow.

FEATURE	REHABILITATING PATIENTS	SENDING REPORTS TO PHYSICIANS	WORKING WITH STROKE OR WEAK PATIENTS	RESEARCHER
Dashboard Protocols	✓			
Change Feedback Display	✓			
Real-Time Range of Motion Display	✓			
Position, Change the Count-Down Timer	✓			
Print Multi-Page Reports as Single PDF		✓		
Narrative Report		✓		
Preview Multi-Page Reports, Send to Printer		✓		
Robotic Modes			✓	
Interrupted Stroke Test	✓		✓	✓
Set Isometric Feedback Targets	✓		✓	✓
Export Reports and Group Summaries to Excel				✓
Export Markers to Text File				✓
Easier Torque Calibration				✓
Variable Sampling Rate				✓
Adjust Test Parameters During Trial Reps	✓		✓	
Analyze and Export All Tests in the Database				✓

## Table of Contents

Dashboard Protocols.....	3
Set Isometric Feedback Targets .....	4
Change Feedback Display.....	5
Real-Time Range of Motion Display.....	6
Interrupted Stroke Test.....	7
Print Multi-Page Reports as Single PDF .....	9
Robotic Modes .....	10
Export Reports and Group Summaries to Excel.....	11
Narrative Report .....	12
Export Markers to Text File.....	14
Preview Multi-Page Reports, Send to Printer .....	16
Position, Change the Count-Down Timer .....	17
Easier Torque Calibration.....	18
Variable Sampling Rate .....	19
Adjust the Test Parameters .....	20
Analyze and Export All Tests and Exercise Sets in the Database .....	21

## Dashboard Protocols

The Dashboard allows you to run System Protocols. To run a protocol:

1. Clear the Manual Settings checkbox.
2. Select a Protocol from the Pull-Down list.
3. Select the first row in the Protocol.
4. Click the **Single Set** or **All Sets** button.

*Note: The **Single Set** or **All Sets** buttons (like the **Go** button) are only enabled after you have set the ROM.*

**Feedback**

Manual Settings

**Mode and Action**

Mode	Action	Speed
<input type="radio"/> CPM	<input checked="" type="radio"/> Con/Con	60 0.9
<input type="radio"/> Isometric	<input type="radio"/> Con/Ecc	60 0.9
<input type="radio"/> Isotonic	<input type="radio"/> Ecc/Con	
<input checked="" type="radio"/> Isokinetic	<input type="radio"/> Ecc/Ecc	50 0.9
		50 0.9

**Feedback**

Torque vs. Time Curves

Torque vs. Position Curves

Velocity vs. Time Curves

Per-Rep Torque Bars

Display Targets

**Feedback**

Manual Settings

**Protocols**

2 Speed Protocol (60/180)

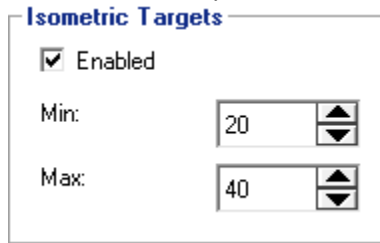
Single Set All Sets

Mode	Setting	Right	Left	Terminati
▶ Isokinetic C	60 - 60 deg	Not Tested	Not Tested	5 Repeti
Isokinetic C	180 - 180 de	Not Tested	Not Tested	15 Repe

## Set Isometric Feedback Targets

You can set Isometric Feedback targets for testing protocols.

1. From the **Protocol Editor**, select the **Set** to edit and click the **Edit** button.
2. From the **Protocol** form, select **Isometric** mode.
3. Click the **Feedback** button.
4. In the **Isometric Targets** area, select **Enabled** and set the **Min** and **Max** values. In this example, the targets will be set to 20% and 40% of the patient's MVC.



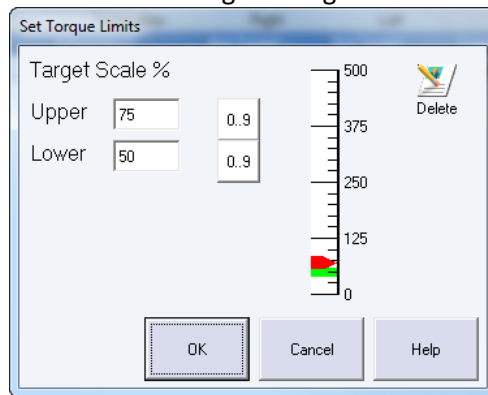
**Isometric Targets**

Enabled

Min: 20

Max: 40

5. Before the first set, the HUMAC will have the patient perform a Maximum Voluntary Contraction. This will be used when scaling the targets.



**Set Torque Limits**

Target Scale %

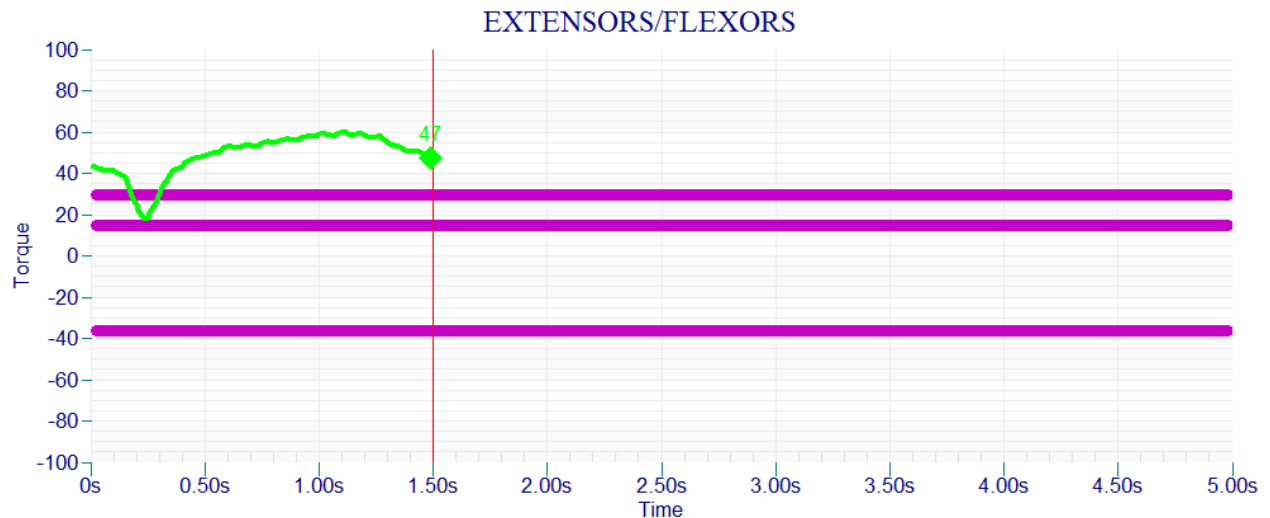
Upper: 75 0.9

Lower: 50 0.9

Scale: 0, 125, 250, 375, 500

Buttons: OK, Cancel, Help, Delete

**Note:** You cannot mix Con/Ecc and Ecc/Con sets with this feature.



## Change Feedback Display

You can change the feedback display directly from the real-time feedback screen. To change the display, click the desired button. The options include:

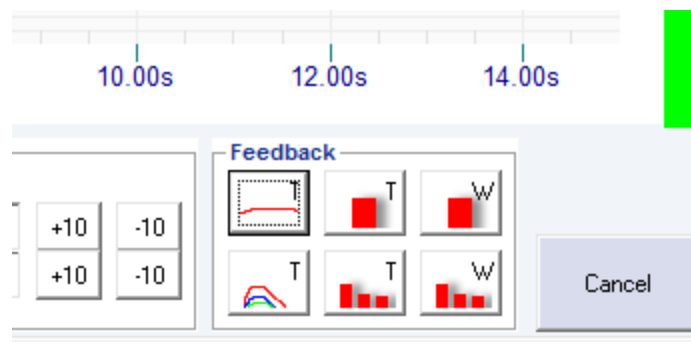
### Isokinetic, Isometric, CPM Mode

1. Torque vs. Time
2. Torque vs. Position
3. Single Torque Bar
4. Per-Repetition Torque Bars
5. Single Work Bar
6. Per-Repetition Work Bars

### Isokinetic, Isometric, CPM Mode

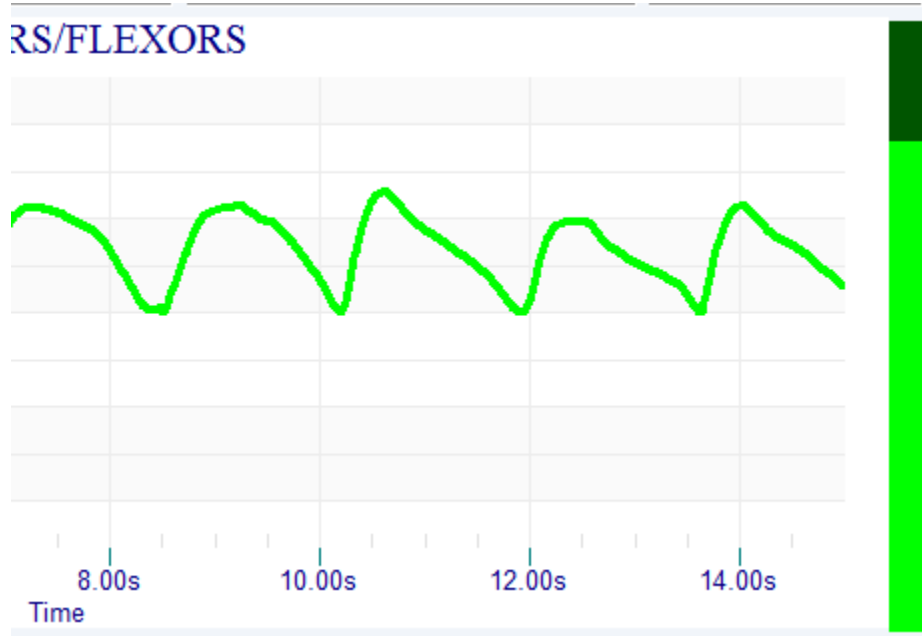
1. Power vs. Time
2. Power vs. Position
3. Single Power Bar
4. Per-Repetition Power Bars
5. Single Work Bar
6. Per-Repetition Work Bars

**Note:** When changing displays, the HUMAC erases the previous display and begins drawing the new display with the current real-timed data. All data from the start of the test is saved.



### Real-Time Range of Motion Display

The HUMAC includes a real-time ROM display along the right side of the patient feedback. This helps patients know how far they need to move to reach their full range of motion.



## Interrupted Stroke Test

The HUMAC2015 allows you to preform Interrupted Stroke Testing.

1. From the **Protocol Editor**, select the **Set** to edit and click the **Edit** button.
2. From the **Protocol** form, select **Isokinetic** mode.
3. Select **Interrupted Stroke**.

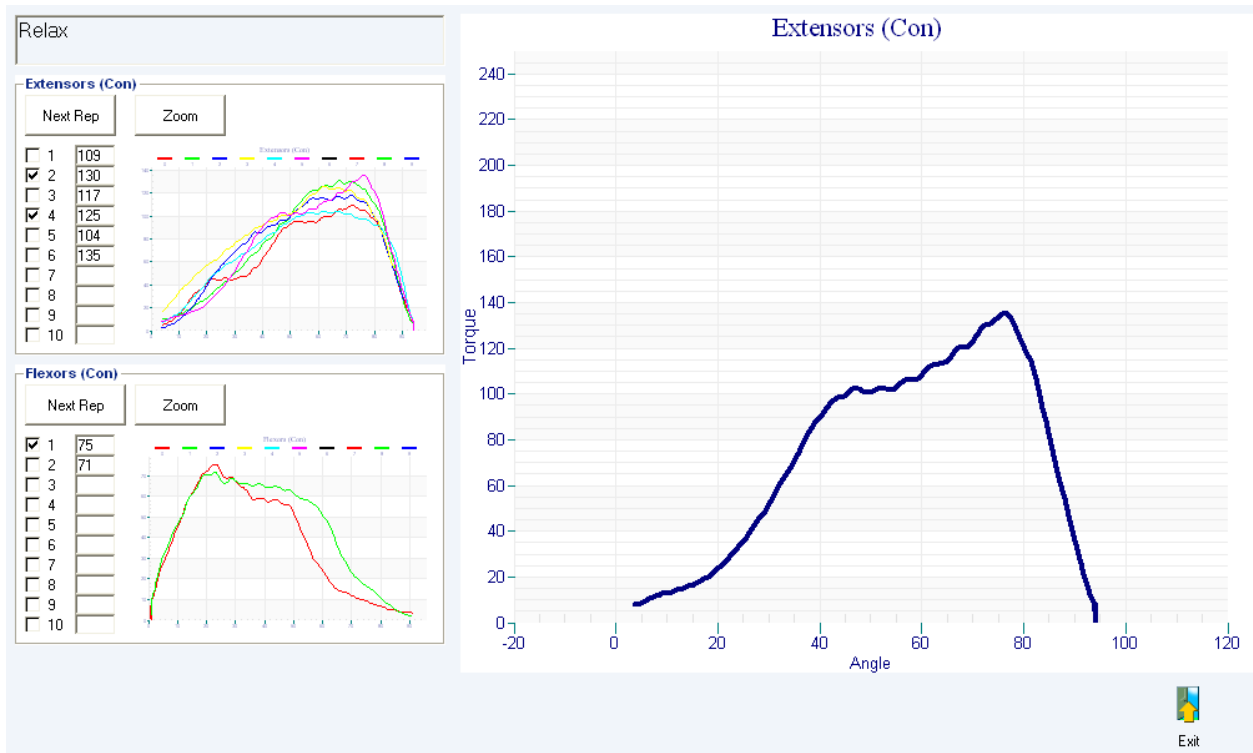
**Mode**

CPM                       Zero Gravity  
 Isometric                       Interrupted Stroke  
 Isotonic  
 Isokinetic

4. Set the Repetitions for the number of valid repetitions you want to select, e.g. 3 if you want to select 3 repetitions. The HUMAC allows the patient to perform up to 10 repetitions.

During the test, the HUMAC displays the following screen:

Item	Description
<b>Instructions</b>	Instructions to the patient, e.g. "Relax", "Move to Full Flexion".
<b>Next Rep</b>	Perform another repetition for the indicated motion.
<b>Zoom</b>	Zoom-in the repetitions performed. (Figure 2)
<b>1, 2, 3</b>	Select the repetitions you want to accept.
<b>Large Display</b>	Patient feedback.



**Figure 1 IST Display Showing Rep Selection and Patient Feedback**

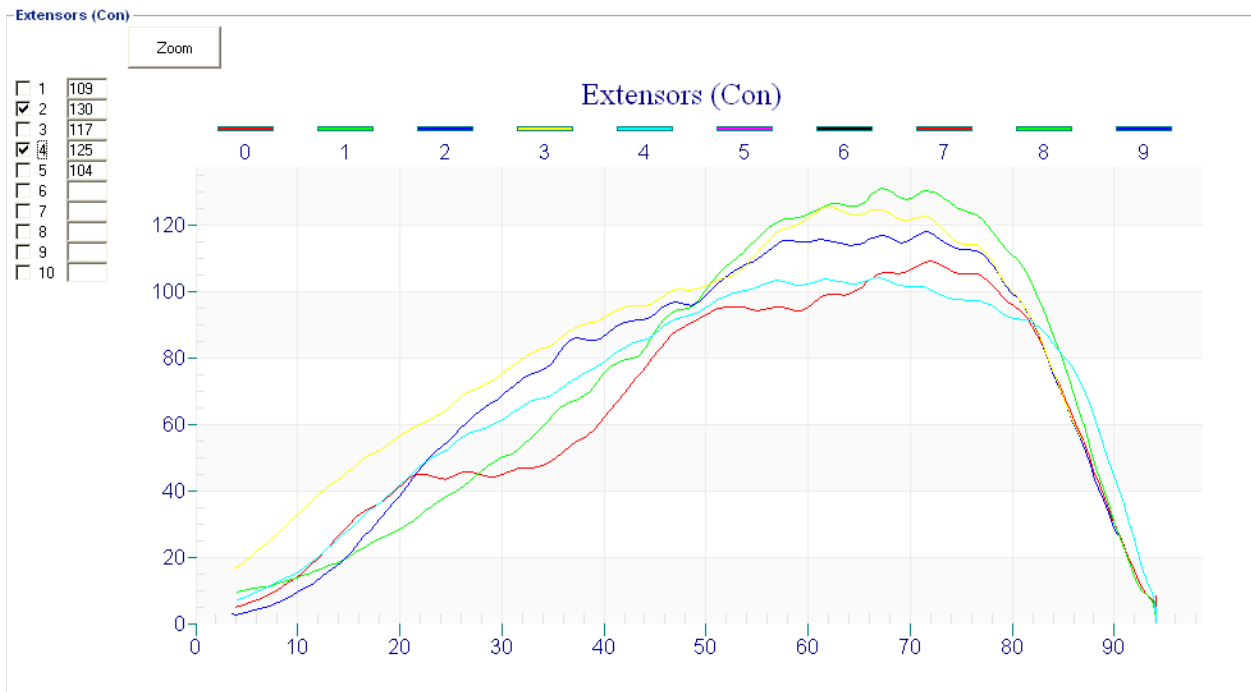
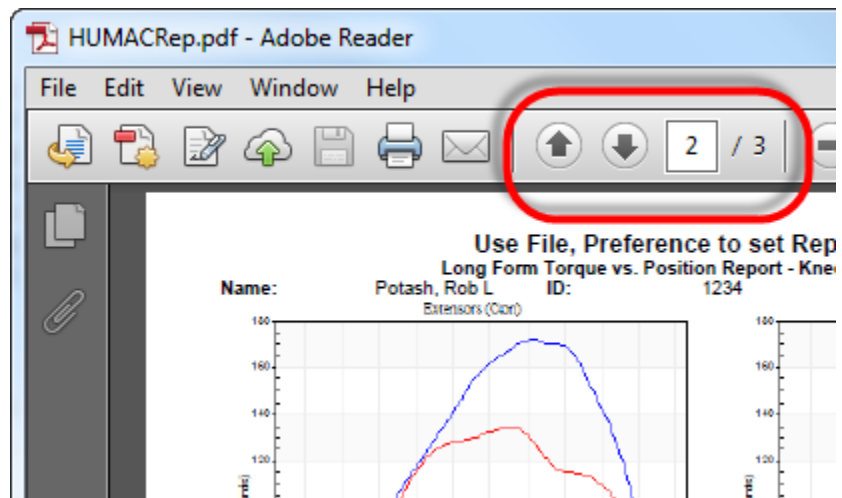


Figure 2 IST Zoom for Rep Selection



## Print Multi-Page Reports as Single PDF

Multi-page HUMAC reports are now rendered as a single, multi-page PDF file.



## Robotic Modes

The HUMAC implements a number of Robotic Modes which utilize Concentric Torque Thresholds. You can think of the course of rehabilitation as follows:


Mode	Setting	Description
<b>CPM, No Torque Threshold</b>	<div style="border: 1px solid black; padding: 5px;"> <p>Torque Limits-Con  <input type="checkbox"/> EXTS=FLXS            EXTS/FLXS    50    50            Torque Threshold    0    0            Overtorque mode</p> </div>	<ol style="list-style-type: none"> <li>1. HUMAC beings the CPM motion automatically.</li> </ol>
<b>CPM, Torque Threshold</b>	<div style="border: 1px solid black; padding: 5px;"> <p>Torque Limits-Con  <input checked="" type="checkbox"/> EXTS=FLXS            EXTS/FLXS    50    50            Torque Threshold    10    10            Overtorque mode</p> </div>	<ol style="list-style-type: none"> <li>1. The patient must generate the Torque Threshold (in this case 10 ft-lbs) to initiate each CPM motion.</li> <li>2. Once the motion is initiated, the motion continues until the End of Range is reached.</li> </ol>
<b>Isokinetic, No Torque Threshold</b>	<div style="border: 1px solid black; padding: 5px;"> <p>Torque Limits-Con  <input type="checkbox"/> EXTS=FLXS            EXTS/FLXS    500    500            Torque Threshold    0    0            Overtorque mode    Continue</p> </div>	<ol style="list-style-type: none"> <li>1. The HUMAC beings the isokinetic motion as soon as any concentric torque is generated.</li> <li>2. The patient can change direction any point in the Range of Motion.</li> </ol>
<b>Isokinetic, Torque Threshold, Continue</b>	<div style="border: 1px solid black; padding: 5px;"> <p>Torque Limits-Con  <input type="checkbox"/> EXTS=FLXS            EXTS/FLXS    500    500            Torque Threshold    10    10            Overtorque mode    Continue</p> </div>	<ol style="list-style-type: none"> <li>1. The patient must generate the Torque Threshold to initiate the Isokinetic motion.</li> <li>2. Once the motion is initiated the patient no longer needs to maintain the Threshold to continue the motion.</li> <li>3. The patient must go through the full range of motion before they can change direction.</li> </ol>
<b>Isokinetic, Torque Threshold, Wait</b>	<div style="border: 1px solid black; padding: 5px;"> <p>Torque Limits-Con  <input type="checkbox"/> EXTS=FLXS            EXTS/FLXS    500    500            Torque Threshold    10    10            Overtorque mode    Wait</p> </div>	<ol style="list-style-type: none"> <li>1. The patient must generate the Torque Threshold to initiate the Isokinetic motion.</li> <li>2. The patient must maintain the Torque Threshold to continue the motion.</li> <li>3. If they fall below the Threshold the input adapter will stop.</li> <li>4. Once they generate the Threshold again, the adapter will resume moving.</li> <li>5. The patient must go through the full range of motion before they can change direction.</li> </ol>

## Export Reports and Group Summaries to Excel

Print/Preview report



Preview



Print



File



Excel

Long Form Torque vs. Posit ▾

When exporting a test, two Worksheets are created in the Spreadsheet.

Page	Description
0	Average or Maximum values based on File, Preferences
1	Per-repetition values

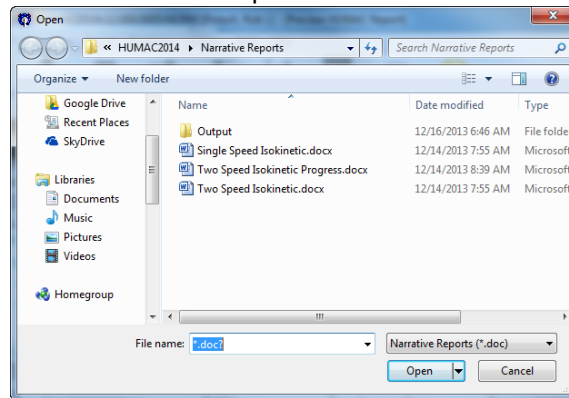
	A	O	P	Q	R	S	T	U	V	W	X	Y
1	FullName	Side	Motion	Stat	Inv	Dom	pt	pt_bw	t_deficit	t_ratio	InitialPeal	InitialPeal
2	Sample X>	0	0	0	TRUE	FALSE	51	31	-24	114	51	31
3	Sample X>	0	0	1	TRUE	FALSE	0.139255	0	0	0	0	0
4	Sample X>	0	1	0	TRUE	FALSE	58	35	-9	0	58	35
5	Sample X>	0	1	1	TRUE	FALSE	0.116464	0	0	0	0	0
6	Sample X>	1	0	0	FALSE	TRUE	39	24	0	136	39	24
7	Sample X>	1	0	1	FALSE	TRUE	0.156024	0	0	0	0	0
8	Sample X>	1	1	0	FALSE	TRUE	53	32	0	0	53	32
9	Sample X>	1	1	1	FALSE	TRUE	0.166011	0	0	0	0	0
10	Sample X>	0	0	0	TRUE	FALSE	51	31	-24	114	51	31
11	Sample X>	0	0	1	TRUE	FALSE	0.140846	0	0	0	0	0
12	Sample X>	0	1	0	TRUE	FALSE	58	35	-7	0	58	35

## Narrative Report

The **Narrative Report** allows you to merge data from a patient test with a Word Document.

### Printing the Report

1. From the main HUMAC Screen, click the **Patient** button to select the patient.
2. Click the **Report** button.
3. Select the **Test Protocol** to be included in the report.
4. Click the **Narrative** button to add **Modalities** and **Goals** for the report.
5. From the Print/Preview area, select **Narrative Report** as the report type.
6. Click the **Preview** button to preview the report on the screen or the **Print** button to send the report to the printer.
7. The HUMAC will display the Windows Open dialog box. Select the Word Document you want to merge with the Test Data and click the Open button.



8. The HUMAC will open the merged document in Word and save a copy in the Output folder.

**Note:** You can also create Narrative Reports from the Progress Report screen.

### Editing the Word Document

The HUMAC Narrative Reports are created using Microsoft Word. When creating a narrative report, the HUMAC looks for the following tags (<FullName>, <PTRI[s]>) and replaces them with data from the patient's test. The default location for the Narrative Reports is C:\Users\Public\Documents\CSMi\HUMAC2015\Narrative Reports.

As the HUMAC can now create multi-set and Progress Narrative Reports, the tags have been expanded to include the Set and Test number. For example:

Tag	Description
<PTRI[0]>	Single Test, <b>Peak Torque, Right Side, Initial Motion, First Set.</b>
<PTRI[1]>	Single Test, <b>Peak Torque, Right Side, Initial Motion, Second Set.</b>
<PTRI[0,0]>	Progress Report, <b>Peak Torque, Right Side, Initial Motion, First Test, First Set.</b>
<PTRI[1,0]>	Progress Report, <b>Peak Torque, Right Side, Initial Motion, Second Test, First Set.</b>
<PTRI[0,1]>	Progress Report, <b>Peak Torque, Right Side, Initial Motion, First Test, Second Set.</b>
<PTRIChange[0]>	Progress Report, <b>Peak Torque, Right Side, Initial Motion, Change from First to Second Test, First Set.</b>

## Patient Information

Tag	Description
<FullName>	Patient Full Name
<FirstName>	Patient First Name
<LastName>	Patient Last Name
<Doctor>	Doctor
<Injury>	Injury

## Test Information

Tag	Description
<MGI[s]>	Muscle Group Initial Motion
<MGR[s]>	Muscle Group Reciprocal Motion
<ANGLE[s]>	Isometric Angle
<MUSCLE[s]>	Isometric Muscle Group
<SettingInit[s]>	Setting (Speed, Torque, Angle) for initial motion
<SettingRecip[s]>	Setting (Speed, Torque, Angle) for reciprocal motion
<Termination[s]>	Termination (repetitions)

## Narrative Report button on Report screen.

Tag	Description
<Modalities[s]>	Selected Modalities
<Goals[s]>	Selected Goals

## Torque Values

Single Test	Progress Report	Progress Change	Description
<PTRI[s]>	<PTRI[t,s]>	<PTRIChange[s]>	Peak Torque Right Side Initial Motion
<PTLI[s]>	<PTLI[t,s]>	<PTLIChange[s]>	Peak Torque Left Side Initial Motion
<PTDI[s]>	<PTDI[t,s]>	<PTDIChange[s]>	Peak Torque Initial Motion R/L Deficit
<PTRR[s]>	<PTRR[t,s]>	<PTRRChange[s]>	Peak Torque Right Side Reciprocal Motion
<PTLR[s]>	<PTLR[t,s]>	<PTLRChange[s]>	Peak Torque Left Side Reciprocal Motion
<PTDR[s]>	<PTDR[t,s]>	<PTDRChange[s]>	Peak Torque Reciprocal Motion R/L Deficit

## Torque Plots

Tag	Description
<PTGraphInit[s]>	Trq vs. Pos Graph for Initial Motion
<PTGraphRecip[s]>	Trq vs. Pos Graph for Reciprocal Motion

## Export Markers to Text File

The HUMAC Export to Text now adds a number of annotations, e.g. where each repetition ran, the peak torque location. This saves researchers the task of manually annotating the data. The following points are annotated in the data:

Annotation	Description
<b>EndPnt 0</b>	Repetition/motion extent
<b>Pos Start</b>	Position Start. Point where the patient moved ½ degree into the motion.
<b>Peak Trq Start</b>	Start of Peak Torque production
<b>Peak Trq End</b>	End of Peak Torque production.
<b>Half Peak Trq</b>	Half Peak Torque Point (Isometric Tests)
<b>Stim</b>	Simulus to patient (Reaction Time Test).
<b>Reaction Start</b>	Patient moved toward stimulus (Reaction Time Test)
<b>Target Found</b>	Patient entered the Target (Reaction Time, LOS Test)
<b>Target End</b>	Patient was in target for required time (Reaction Time, LOS Test)

*Note: Because there is an initial and reciprocal motion, the annotations are numbered:*

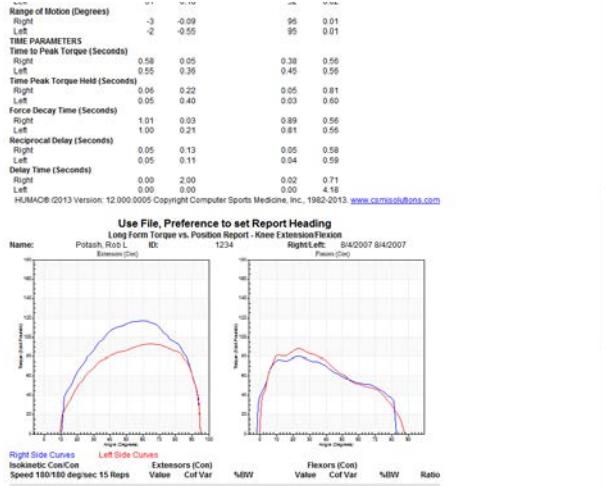
Number	Description
<b>0</b>	Initial Motion, First Repetition
<b>1</b>	Reciprocal Motion, First Repetition
<b>2</b>	Initial Motion, Second Repetition

Time (Seconds)	Position (Degrees)	Torque (Foot-Pounds)	Speed (deg/sec)	End Pnt 0	Peak Trq Start
1.44	97.3	2.5333	8	0	
1.45	97.1	0.0222	16.6	0	
1.46	96.9	2.9	25.1	0	
1.47	96.6	6.1	32.2	0	
1.48	96.3	9.7556	37.4	0	
1.49	95.8	14.3	43.6	0	
2.14	57.5	133.7556	59.6	0	
2.15	56.8	134.1111	59.7	0	
2.16	56.2	134.3556	59.9	0	
2.17	55.7	134.5111	59.9	0	
2.18	54.9	134.5778	60	0	0
2.19	54.4	134.4889	59.9	0	
2.2	53.8	134.2556	59.8	0	
3.1	0.9	4.0556	16.4	0	
3.11	0.8	0	2.1	1	
3.12	0.8	0	-9.9	1	

Time (Seconds)	Position (Degrees)	Torque (Foot-Pounds)	Speed (deg/sec)	End Pnt 0	Peak Trq Start
<b>3.13</b>	0.9	0	-19.2	1	
<b>3.14</b>	1.3	0	-30.3	1	
<b>3.15</b>	1.6	0.6296	-35.8	1	
<b>3.16</b>	1.9	8.4864	-40.1	1	

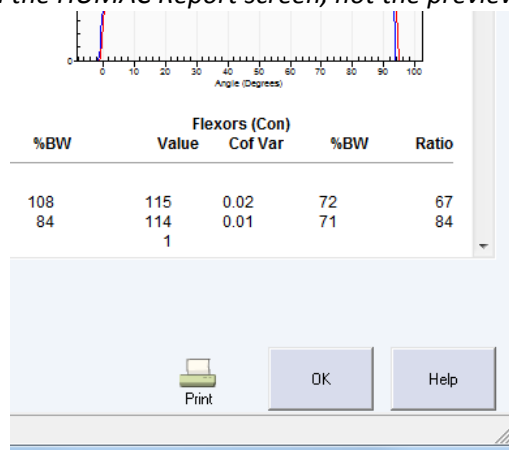
## Preview Multi-Page Reports, Send to Printer

The HUMAC Report Preview Screen displays multi-page reports as a single scrolling window making it much easier to review all of the sets.



The Preview screen includes a Print button to send reports directly to the printer.

**Note:** For speed the preview screen uses reduced resolution graphs. For the best printed resolution, reports should be printed from the HUMAC Report screen, not the preview screen.





## Position, Change the Count-Down Timer

The Count-down timer options can be set from the **File, Preferences** command.

**Timer**

**Style**

Show clock face.

**Location**

Center                       Up-Right

## Patient Information

Tag	Description
<b>Show Clock Face</b>	When checked the analog clock dial and digital counter are displayed. Many patients like the analog dial. When cleared only the digital counter is displayed which allows you to see more of the underlying screen.
<b>Location, Center</b>	Center the clock on the screen.
<b>Up-Right</b>	Place the clock in the upper-right-hand side of the screen.

## Test Information

**Timer**

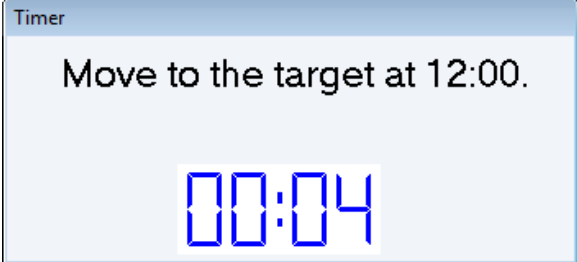
Move to the target at 12:00.



**Figure 3 Show Clock Face**

**Timer**

Move to the target at 12:00.



**Figure 4 Don't Show Clock Face**

## Easier Torque Calibration

The Torque Calibration and Verification only requires the user to place 100 pounds on the NORM one time and 25 pounds on the NORM one time. The calibration procedure automatically moves the weights to each of the required positions.

**Calibration**

- Set the ROM Stops at Teal "U" and Gray "U"  
Set the arm to number 45. (Pin should click in-place.)  
Rest the input adapter against the Teal "U" Stop  
Set dynamometer tilt to position 0.
- Move arm toward Teal "Q" until it locks in-place.

**Calibration**

- Place 100 pounds on the arm. (Weights #1, 2, 3 and 4).

**Verification**

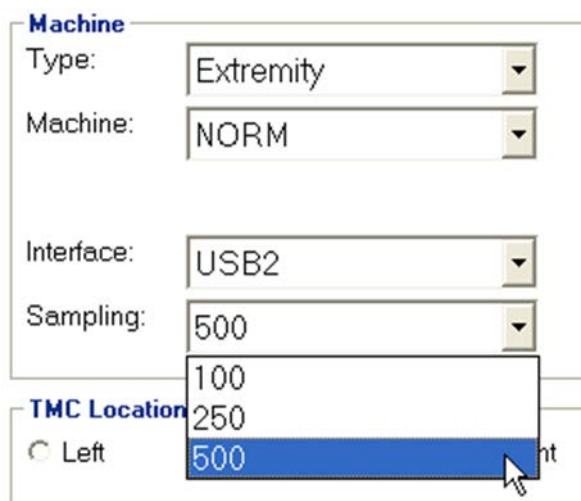
- Place 100 pounds on the arm. (Weights #1, 2, 3 and 4).
- Place 25 pounds on the arm. (Weight #1).
- Remove all weight from the input arm assembly.

OK Cancel Help

## Variable Sampling Rate

When using the HUMAC 64-bit interface you can select different sampling rates for testing and exercise sessions.

1. From the File, Preferences screen in the Machine area, select a sampling rate from 10 to 1,250 Hz.

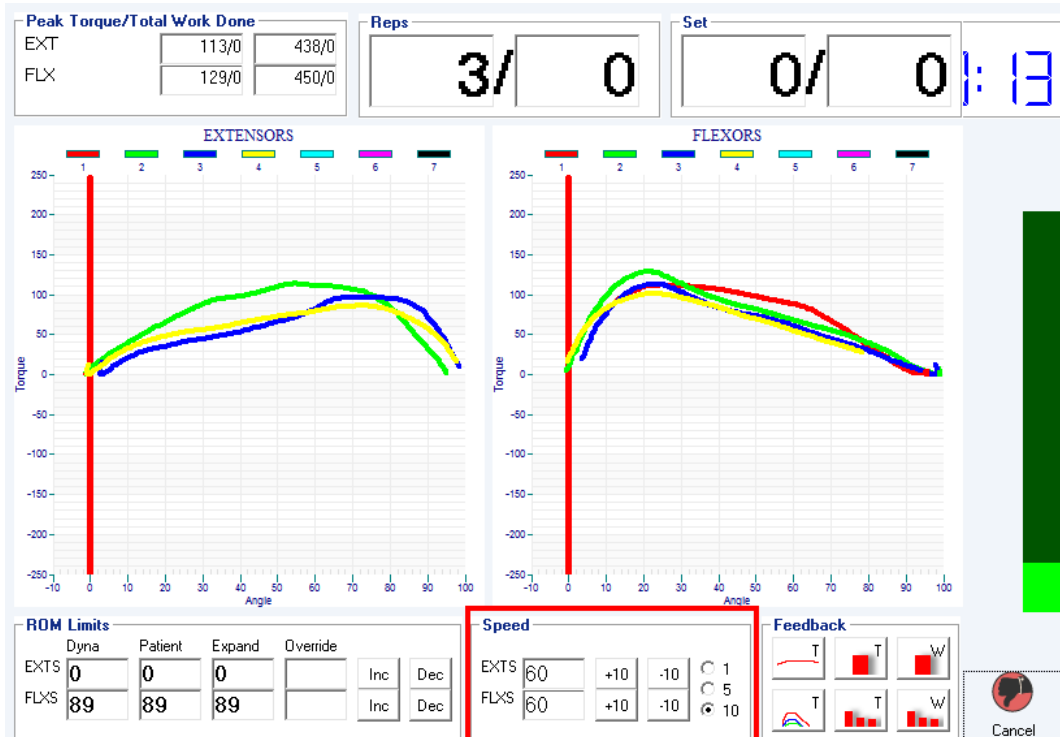


The screenshot shows the 'Machine' section of the HUMAC 64-bit interface preferences. It contains several dropdown menus: 'Type' set to 'Extremity', 'Machine' set to 'NORM', 'Interface' set to 'USB2', and 'Sampling' set to '500'. Below these is the 'TMC Location' section, which includes a radio button for 'Left' and a dropdown menu with options '100', '250', and '500'. The '500' option is currently selected and highlighted in blue, with a mouse cursor pointing at it.

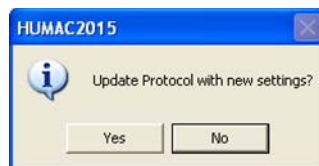
## Adjust the Test Parameters

The HUMAC allows you to adjust the test parameters from the Feedback screen. For example, if a patient can't reach a high test speed, you can reduce the test speed from the feedback screen to a speed they can reach and use the new setting during the test.

1. From the Feedback Screen, while doing Trial Reps, change the Speed or Force settings.
2. You can select increments of 1, 5 or 10 when changing the settings.



3. After making the change and clicking Cancel to leave the feedback screen, the HUMAC will ask if you want to update the protocol with the new settings. If you answer yes, when you proceed to the test screen, the new settings will be used. **Note:** Data collected on the opposite side for that set will be erased because the settings under which it was run have changed. To independently set Right and Left side values, use two sets.



## Analyze and Export All Tests and Exercise Sets in the Database

From the Group Summary you can analyze every test and exercise session in the database and export the complete set of results an Access database.

1. From the Group Summary click the **ALL TO ACCESS** button.
2. The HUMAC will analyze every test and exercise session in your database and export the result to an Access table.

