

ADDENDUM

BIODEX RESEARCH TOOL KIT SOFTWARE

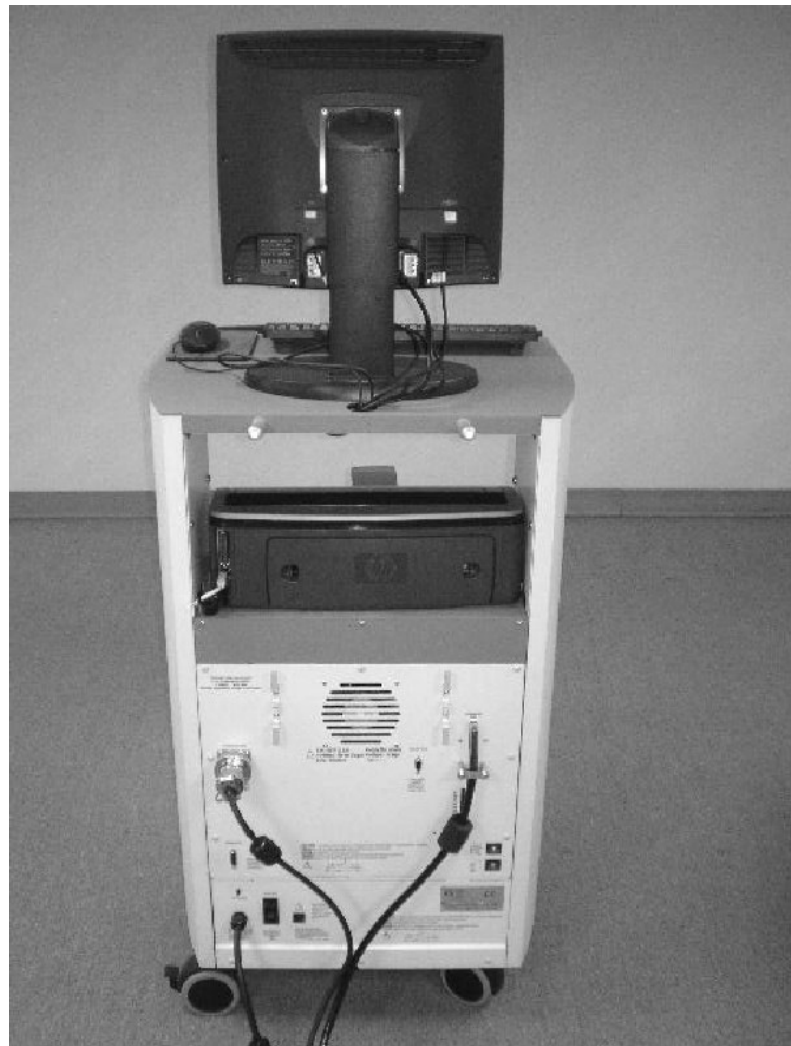
FOR SYSTEM 3 REVISION 2 AND SYSTEM 4 DYNAMOMETERS

830-000

835-000

840-000

850-000



BIODEX

Biodes Medical Systems, Inc.

20 Ramsey Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (Int'l 631-924-9000), Fax: 631-924-9241, Email: info@biodes.com, www.biodes.com

This manual contains operating procedures for the following Biomed products:

830-000	System 3 QUICK-SET
835-000	System 3 PRO
840-000	System 4 QUICK-SET
850-000	System 4 PRO



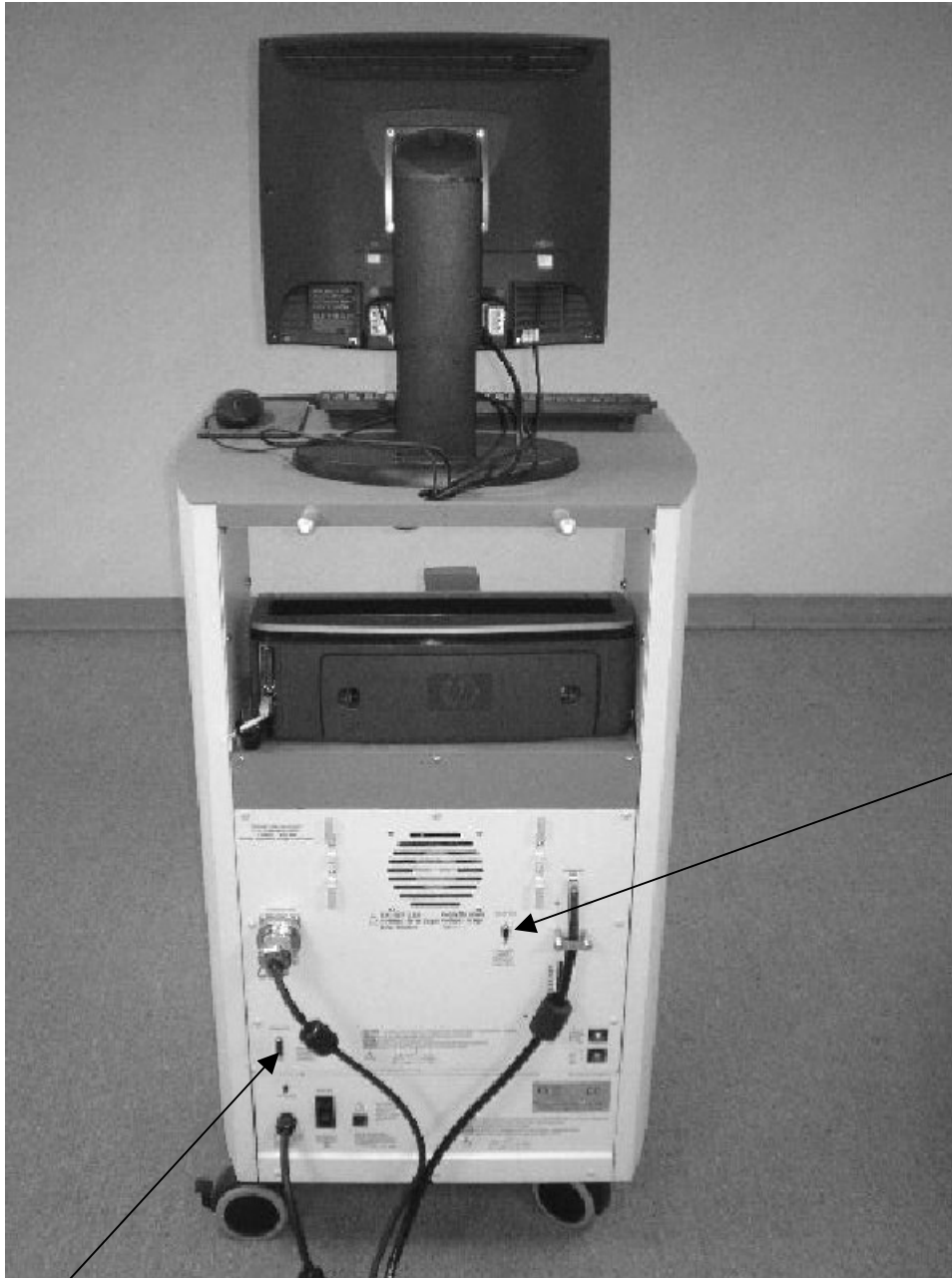
Need Help?
Contact Biomed Software Support
1-800-224-6339 ext 2120,
or softwaresupport@biomed.com

Table of Contents

CHAPTER 1 - Overview	4
What Is The Research Tool Kit?	4
What Are The Main Features?	5
What Are The Requirements?	6
CHAPTER 2 - Main Control Tab.....	8
Miscellaneous Controls.....	9
CHAPTER 3 - Remote Access Port Control.....	11
Analog Signal Resolution Affected By Scale Factor	13
Operating Modes	13
Table Of Scale Range and Factors	14
Analog Signal Specifications	15
EMG /Analog Signal Port Pin Configuration	16
CHAPTER 4 - Data Download for Motion Control	19
Data File Format Details... ..	19
How Can I Create These Data Files?	20
Data Download and Execute of Pattern File	21
Using the Data Download feature	22
CHAPTER 5 - Common Problems	26
CHAPTER 6 - FAQ's	27

1. Overview

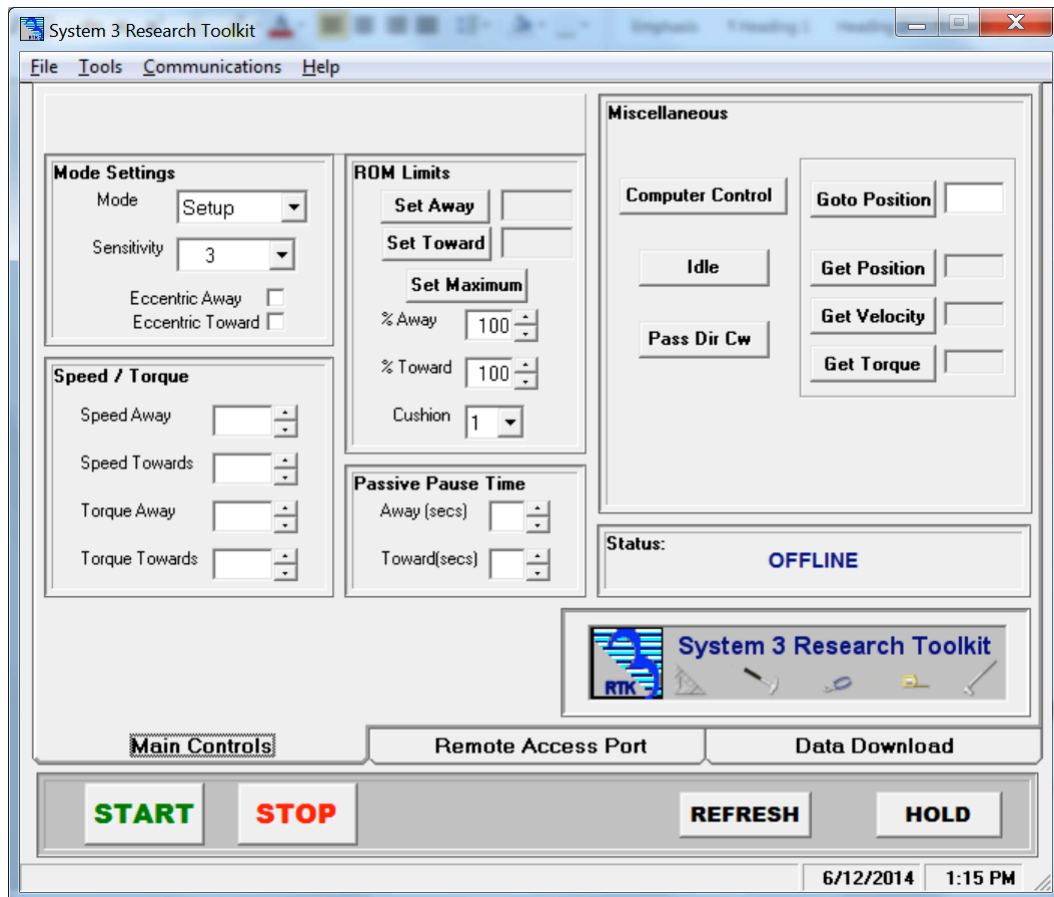
What Is The Research Tool Kit?



Remote Access for Analog Signals

Auxiliary RS 232 for RTK interface

The Biodex Multi-Joint System Research Tool Kit (RTK) software gives the advanced user of a System 3 or System 4 a more specialized, direct control of the system not otherwise available through the front panel of the unit or via the System 3 or 4 software application. The core of the RTK software is an extension to the built-in Biodex System firmware that provides a finer level of control to the system, and exposes these controls to an external interface. It takes advantage of the extra capabilities of the internally re-designed System 3, known as Revision 2, to accomplish some tasks that were not possible with the original System 3. All System 4 units are compatible with the RTK software.



What Are The Main Features?

The following features are available via the RTK software:

- Main Controls - discrete setting for finer adjustment and control, such as setting speed to any increment of 1 deg/sec, and setting torque to any increment of 1 ft-lb
- Remote Access Port control - for the analog signal output, defines the scaling of velocity, torque, and position. In addition, the update frequency rate can be specified, along with the output mode. For example, the mode can be set to output the analog signals only when the System 3/4 is in an active state (START, not in Hold or Idle).
- Data Download for Motion Control - a user provided data file of positional data can be downloaded to System 3/4, and executed to follow a custom pattern of motion. Tools such as MATLAB (from The MathWorks), MathCad (from MathSoft) or Prism (from GraphPad Software) can be used to generate these pattern files.

What Are The Requirements?

The RTK software must operate on a Biodex System 3 (Revision 2 model with the enhanced firmware) or System 4.

A separate PC with an RS-232 serial port is needed to host the Windows-based RTK software.

The RS-232 settings required are as follows:

19.2K BAUD, 8 data bits, 1 stop bit, no parity, no handshake

The requirements to install and run the PC Windows based RTK software program is a 32-bit version of Windows (95/98/NT/2000/XP), a minimum of 128 MB of memory (256 MB for 2000 and XP), and 9 MB of available disk space. The software is installed from CD via a SETUP program which will guide you through the process.

The RTK software can operate simultaneously with the Biodex System application. This has advantages -- especially with data monitoring controls -- but it could also corrupt the operation of the application by giving the System commands that conflict with the state the application is in. Therefore, this kind of usage must be done with great care.

Specifications on Acceleration/Deceleration

Acceleration to 90 deg/sec: 50ms to 75ms

Deceleration from 90 deg/sec: 80 ms to 120 ms

NOTES:

1. *The variation in the acceleration/deceleration times listed above is based on the momentum of the attachment and limb weight.*
2. *The acceleration/deceleration results were based on measurements made on a scope monitoring the analog signal output for velocity during data playback sessions using the RTK software.*
3. *The deceleration times were also based on a deceleration rate providing a smooth stoppage of motion. If a higher deceleration rate is attempted, a side effect such as a short distant jump (i.e., short bump or jolt) can occur.*

Command Summary

- uses the AUX port connector on the back of the System 3 - RS-232, 9600 BAUD, no parity, 1 stop bit
- all commands and parameter data is ASCII formatted terminated by a CR (code: 13), or CRLF (codes 13, 10)
- these commands are internally used by the RTK software.

Here is the complete list:

BEEP ### - Issue a Beep tone on the Front Panel for ### msec

CTRL {1/2} - Set COMPUTER Control = 1, PANEL Control = 2

CUSH {1-9} - Set Cushion (1 is smallest cushion width)

DATARUN - Run/Execute the DSP Data

DATASET {1/2} - Choose the Data Set for the DSP Run

DNLD 1/2 - Initiate Data Download for Set 1 or 2

ECHO {1/0} - Command Line Echo ON = 1, OFF = 0

ECA {1/0} - Eccentric Away = 1, Concentric Away = 0

ECT {1/0} - Eccentric Toward = 1, Concentric Toward = 0

GOTO ### - Go To the position specified

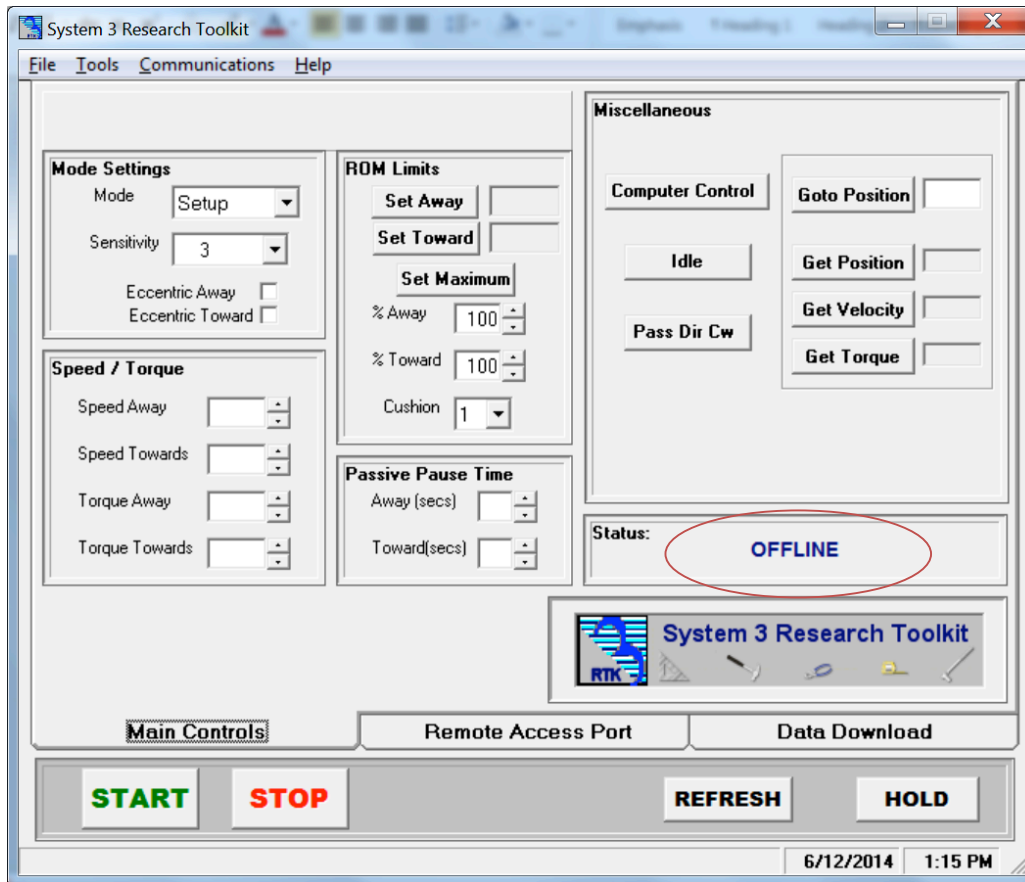
HOLD {1/0} - HOLD Enable = 1, Resume = 0

IDLE {1/0} - IDLE Enable = 1, Resume = 0

LOG - Display the Fault Log file
MAXROM - Set Maximum Range Of Motion
MODE {mode} - Setup, Isok, Pass, Isom, Isot, Reac
POS - Get current position, in 10th's of a degree, from CW end
PASSDIR {1/2} - Set Initial Passive Dir (CW=1, CCW=2)
PA ## - Set Pause Away time, in seconds
PT ## - Set Pause Toward time, in seconds
RAMODE {ON {##}/OFF/AUTO/ONGO} - Remote Access Port mode
RARATE {1-6} - Rate of update:2000/sec=1, 1000/sec=2...125/sec=5, 10/sec=6
RASCALE V {1-5} - Velocity Scaling: Full=1, Half=2, Qtr=3, 1/8=4, 1/16=5
RASCALE T {1-5} - Torque Scaling: Full=1, Half=2, Qtr=3, 1/8=4, 1/16=5
RASCALE P {1/2} - Position Scaling: Full=1, Range Of Motion=2
RLA ### - Set ROM Limit Away to the position specified
RLT ### - Set ROM Limit Toward to the position specified
RPA ### - Set ROM Limit %% Away to the position specified
RPT ### - Set ROM Limit %% Toward to the position specified
SA ### - Set Speed Away, ### = degs/sec
ST ### - Set Speed Toward, ### = degs/sec
START - START running a mode
STOP - STOP running a mode
SENS 0-6 - Set Sensitivity (6 is most sensitive, 1,3,5 are std)
TA ### - Set Torque Away, ### = ft-lbs
TT ### - Set Torque Toward, ### = ft-lbs
TQE - Get current torque, in 10th's of deg/sec, CW is negative
VEL - Get current velocity, in 10th's of deg/sec, CW is negative
VER - Displays firmware versions
GETCTRL - COMPUTER Control = 1, PANEL Control = 2
GETCUSH - Cushion Value 1-9, 1 is smallest cushion width
GETECA - Eccentric Away = 1, Concentric Away = 0
GETECT - Eccentric Toward = 1, Concentric Toward = 0
GETMODE - Calibration/Setup/Isokinetic/Passive/Isometric/Isotonic/Reactive
GETPA - Pause Away, # of seconds
GETPT - Pause Toward, # of seconds
GETRLA - ROM Limit Away position
GETRLT - ROM Limit Toward position
GETRPA - ROM Limit % Away position
GETRPT - ROM Limit % Toward position
GETSA - Speed Away in degs/sec
GETST - Speed Toward in degs/sec
GETSENS - Sensitivity Value 0-6, 6 is most sensitive, 1,3,5 are std
GETTA - Torque Away, in ft-lbs
GETTT - Torque Toward, in ft-lbs

2. Main Control Tab

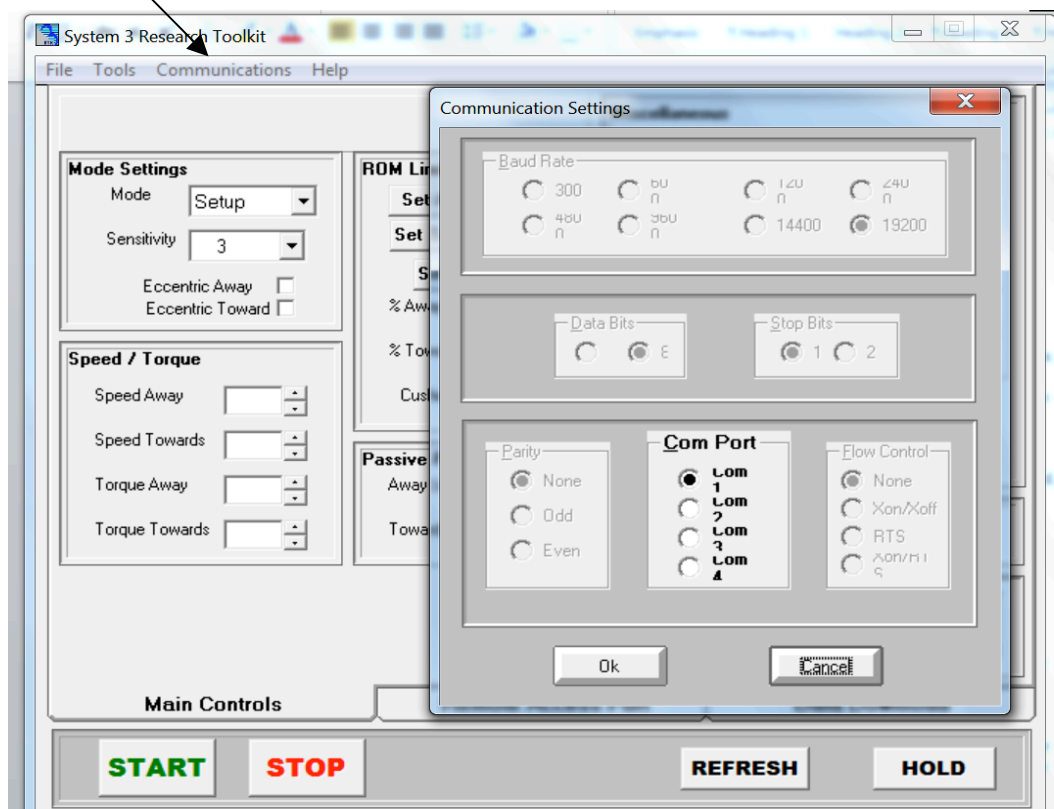
The functionality of the System 3 Front Panel or System 4 Biofeedback mode has been duplicated here with some additional features:



- Mode: provides selection of Setup, Isokinetic, Isometric, Isotonic, Reactive Eccentric or Passive mode.
- Two additional sensitivity settings have been added: 0 for extra low, and 6 for extra high.
- Eccentric Away or Toward can be specified.
- Speed and Torques can be set to any value in increments of 1, rather than pre-set specific values.
- ROM limits can be set automatically to the maximum possible range with the <Set Maximum> button.
- Speed and Torque settings are not restricted by the mode in effect. For example, Passive mode can be executed over 300 degrees/sec, up to 500 degrees/sec.

OFFLINE: when the Status is OFFLINE, this means there is no communication between the host computer and the Biodex System. When communication is established, the box will read ONLINE. The controls provided on the screen will only function if they are relative to the current operating state of the Biodex System.

To get ONLINE - The RS 232 connection from the host computer where the RTK software resides to the RS232 Auxiliary connection on the back of the CDS cart must be established. An available Serial communication port must be selected. Go to Communications and select an available Com Port.



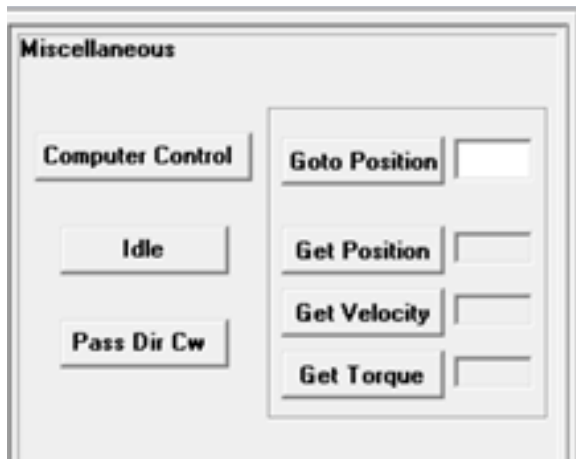
Some usage notes:

- If using a Biodex System 3, be Sure the Biodex System is in Computer Control. Most of the control commands will not work if Panel Control is in effect. This is not an issue with System 4. (Biofeedback is ok.)
- To set ROM limits, the System must be in Setup mode. To clear the ROM limits, while in Setup mode, re-select Setup mode again – this duplicates the behavior of pressing the Front Panel Setup button twice.
- Use the <Refresh> button to update the displayed information from the Biodex System 3/4. This way you can be sure of the current operating mode and settings that are in effect.
NOTE: *If you change something, the changes may not necessarily be reflected on the screen until you select REFRESH.*

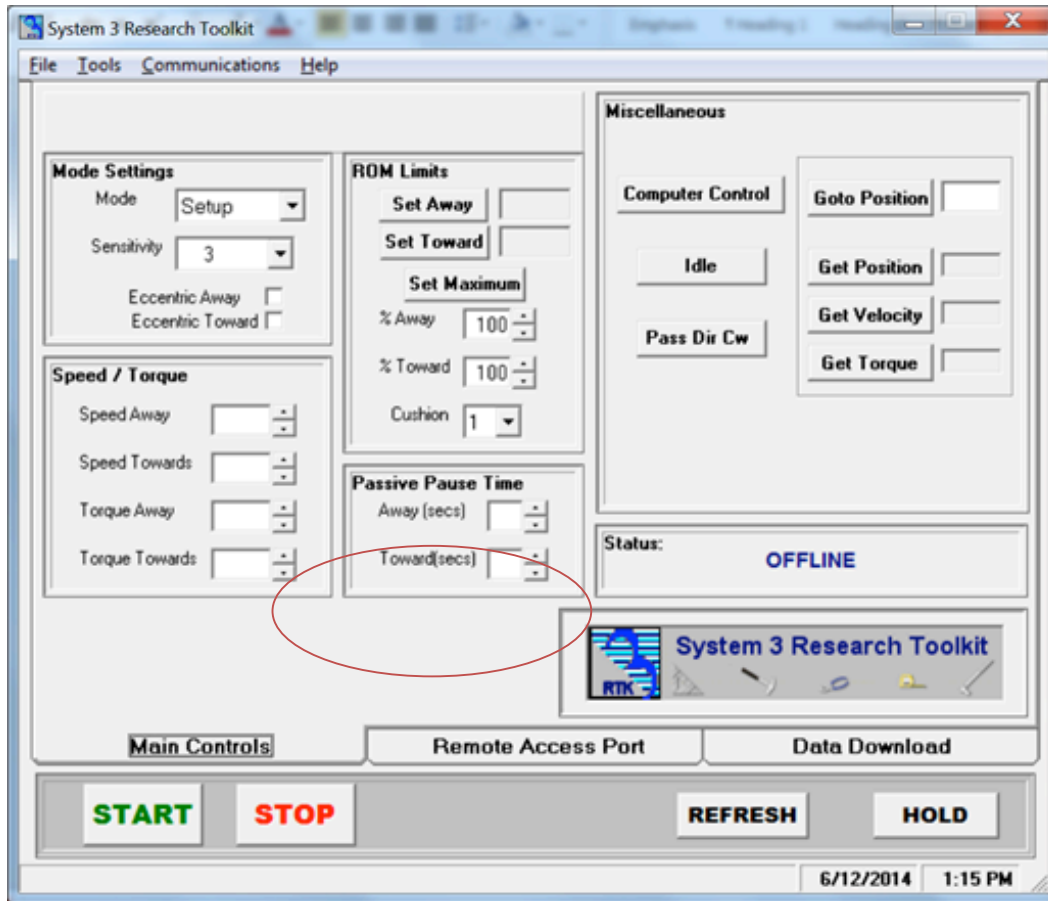
Miscellaneous controls that may be useful to the researcher:

- Computer/Panel Control – only applicable to System 3. This switches the System 3 to Computer or Panel Control. Most of the controls available in this RTK software require Computer Control to be in effect.
- Idle/Resume Idle – turns the Idle state On or Off. Idle state is similar to HOLD, except it does not lock the motor in position, but rather frees it up. To engage Idle, the system must be in an active state.
- Pass Dir CW/CCW – switches the initial starting direction for Passive mode motion. The system defaults to an initial starting direction of counter clockwise (CCW).

-
- Go to Position - only applicable to System 3. Moves the motor to the position entered. The position entered must be in degrees, and ranges from 12 to approximately 318. In order for this operation to work, the system must be in Isometric mode.
 - Get Position - displays the current instantaneous position the motor is in, in 10th degrees. It ranges from 12.0 to approximately 118.0, where 12.0 degrees is the maximum clockwise position.
 - Get Velocity - displays the current instantaneous velocity the motor is moving at, in 10th degrees/second. The velocity is positive in the CCW direction and negative in the CW direction.
 - Get Torque - displays the current instantaneous torque applied to the motor in 10th ft-lbs. The applied torque is positive acting in the CCW direction and negative acting in the CW direction.

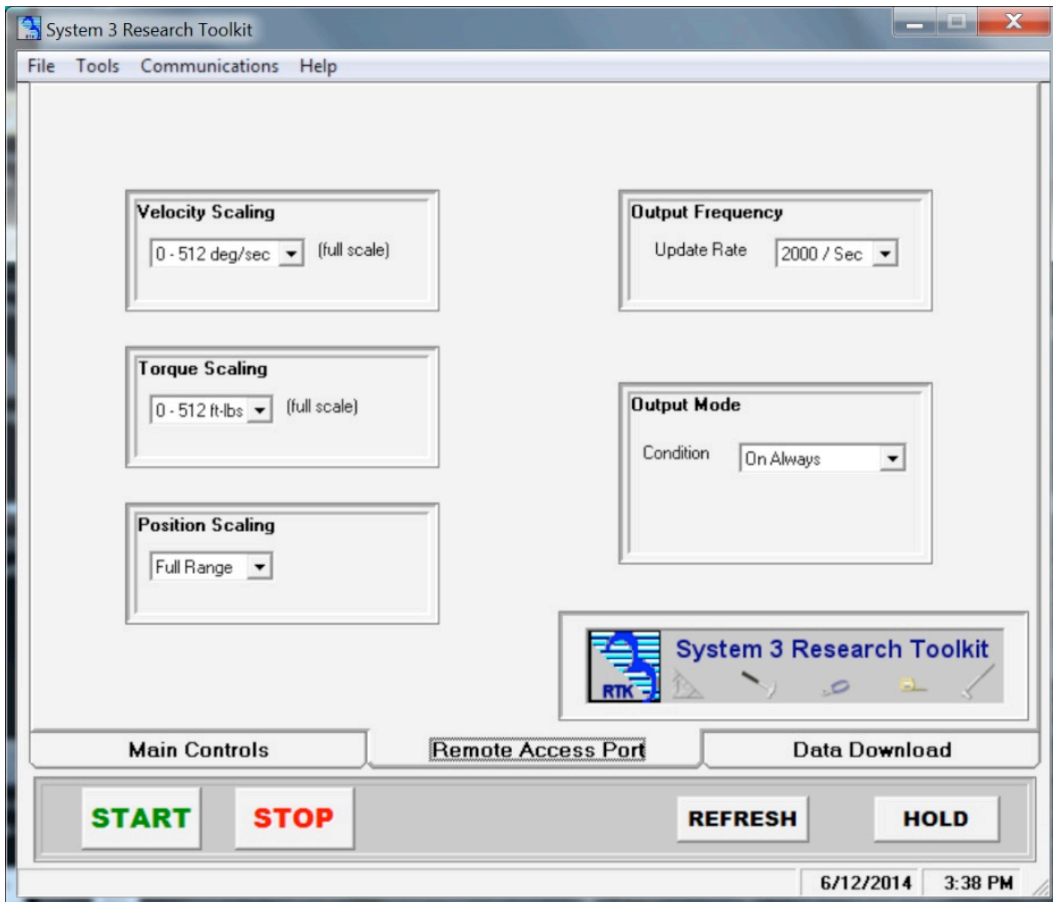


3. Remote Access Port



The Remote Access port provides a connection to an output of analog signals of velocity, torque and position data in real-time directly from the motor control Digital Signal Processor (DSP). In addition to the real-time data, a synchronization pulse is issued whenever the real-time data is updated. The synchronization pulse can be used by the monitoring equipment to know when the real-time data output has changed.

NOTE: The EMG/Analog Signal Access port is a DB-15 female connector located on the back of the System 3's lower tray. It is labeled: "REMOTE ACCESS." The Pin Outs are described later in this document.



Analog Signal Resolution Affected By Scale Factor

The analog signals range from -5 volts to +5 volts, resulting in a total range of 10 volts. With the standard Remote Access option available on a System 4 or 3 Rev 2, all analog output signals are at full scale (full scale being the default). Full scale for torque as an example is -512 ft-lbs to +512 ft-lbs, for a total range of 1024 ft-lbs. This results in an output resolution scale factor as follows:

$$1024 \text{ ft-lbs} = 10 \text{ volts,}$$

$$1 \text{ ft-lb} = 9.8 \text{ milli-volts}$$

9.8 milli-volts is well below the signal noise rated for this port. Therefore it is not possible to see 1 ft-lb increments on this analog signal. The toolkit provides scaling options separately for all three analog signals, so if typical usage is well below the maximum levels, 1 ft-lb increments can be seen on typical analog monitoring equipment. For example, applying a range of +/- 0 to 64 ft-lbs, the output resolution scale factor would look as follows:

$$128 \text{ ft-lbs} = 10 \text{ volts,}$$

$$1 \text{ ft-lb} = 78.1 \text{ milli-volts}$$

78.1 milli-volts is well above the worst case of signal noise (15 - 35 mV), so increments as low as ¼ to ½ ft-lbs can be seen reliably.

Operating Modes

The Output Frequency, or update rate, controls how frequent the System will change the analog outputs. The top rate is 2,000 times per second, which is the default. If this high frequency is not needed or may even be causing problems with the monitoring equipment, the update rate can be lowered. Every time the analog signals are output, the synchronization signal is also pulsed. Therefore the update rate controls how frequent the synchronization signal is pulsed.

The Output Mode selects the state in which the analog signal outputs are updated. The options are as follows:

On Always - always output regardless of current operational state

On Timed - turns on analog outputs only for the next fixed period of time (in seconds)

Off (disabled) - totally shuts down the analog signal outputs

Auto, when active - is automatically on only when the system is in an active state, meaning not STOP'ed and not in HOLD

On Go command - synchronizes the analog signal output with the System 3 application's GO command, so the output is performed only during the trials exercised

Table of Scale Range and Factors

Following is the breakdown of ranges and the resulting scale factors for all three signals:

Scaling Option	Range	Scale Factor
Velocity:		
0 – 512 <u>deg/sec</u>	-512 to +512 <u>deg/sec</u>	9.8 mV per <u>deg/sec</u>
0 – 256 <u>deg/sec</u>	-256 to +256 <u>deg/sec</u>	19.5 mV per <u>deg/sec</u>
0 – 128 <u>deg/sec</u>	-128 to +128 <u>deg/sec</u>	39.1 mV per <u>deg/sec</u>
0 – 64 <u>deg/sec</u>	-64 to +64 <u>deg/sec</u>	78.1 mV per <u>deg/sec</u>
0 – 32 <u>deg/sec</u>	-32 to +32 <u>deg/sec</u>	156.3 mV per <u>deg/sec</u>
Torque:		
0 – 512 <u>ft-lbs</u>	-512 to +512 <u>ft-lbs</u>	9.8 mV per <u>ft-lb</u>
0 – 256 <u>ft-lbs</u>	-256 to +256 <u>ft-lbs</u>	19.5 mV per <u>ft-lb</u>
0 – 128 <u>ft-lbs</u>	-128 to +128 <u>ft-lbs</u>	39.1 mV per <u>ft-lb</u>
0 – 64 <u>ft-lbs</u>	-64 to +64 <u>ft-lbs</u>	78.1 mV per <u>ft-lb</u>
0 – 32 <u>ft-lbs</u>	-32 to +32 <u>ft-lbs</u>	156.3 mV per <u>ft-lb</u>
Position:		
Full scale (~ 306 degrees)	0 to 306 degrees	29.2 mV per degree
ROM Only (varies)	Ex: 45 degrees	Ex: 198.7 mV per degree

Analog Signal Specifications

Accuracy: $\pm 2\%$

Resolution: 16 Bits

Minimum Vout Increment: 152.5 μ v

Signal Noise: 15 mVrms [20KHz Bandwidth]

35 mVpp [20 μ S minimum, 150 μ S maximum width]

Response Time: 500 μ S

Connector: DB-15 male "D" Connector

Output Short Circuit Duration: Infinite

Output Impedance: 100S

2.0 Individual Signals

Torque* Analog torque signal

5 volts is cw torque (512 ft-lbs)

0.0 volts is 0 ft-lbs

-5.0 volts is ccw torque (512 ft-lbs)

Scale Factor = 9.76 mV/ft-lbs

Velocity Analog velocity signal

5 volts is full scale cw speed (512 deg/sec)

0.0 volts is 0 deg/sec

-5.0 volts is full scale ccw speed (512 deg/sec)

Scale Factor = 9.76 mV/[deg/sec]

Position Analog position signal

4.60 volts is when dyna shaft is fully cw

-4.28 volts is when dyna shaft is fully ccw

Scale Factor = 28.7 mV/[deg]

Total ROM is 306 degrees; Total Vout = 8.88V

Synchronization Digital TTL pulse

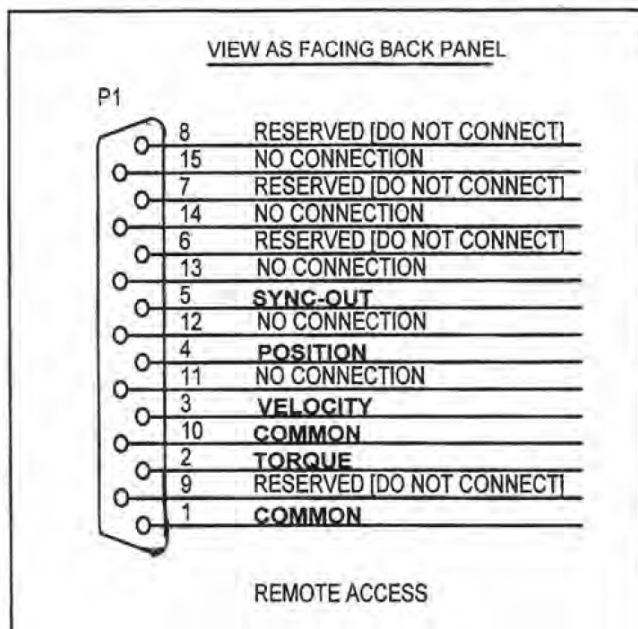
Active High

29 μ s Pulse width Continuous

Indicates voltage output update, [\sim 2KHz], mode dependent

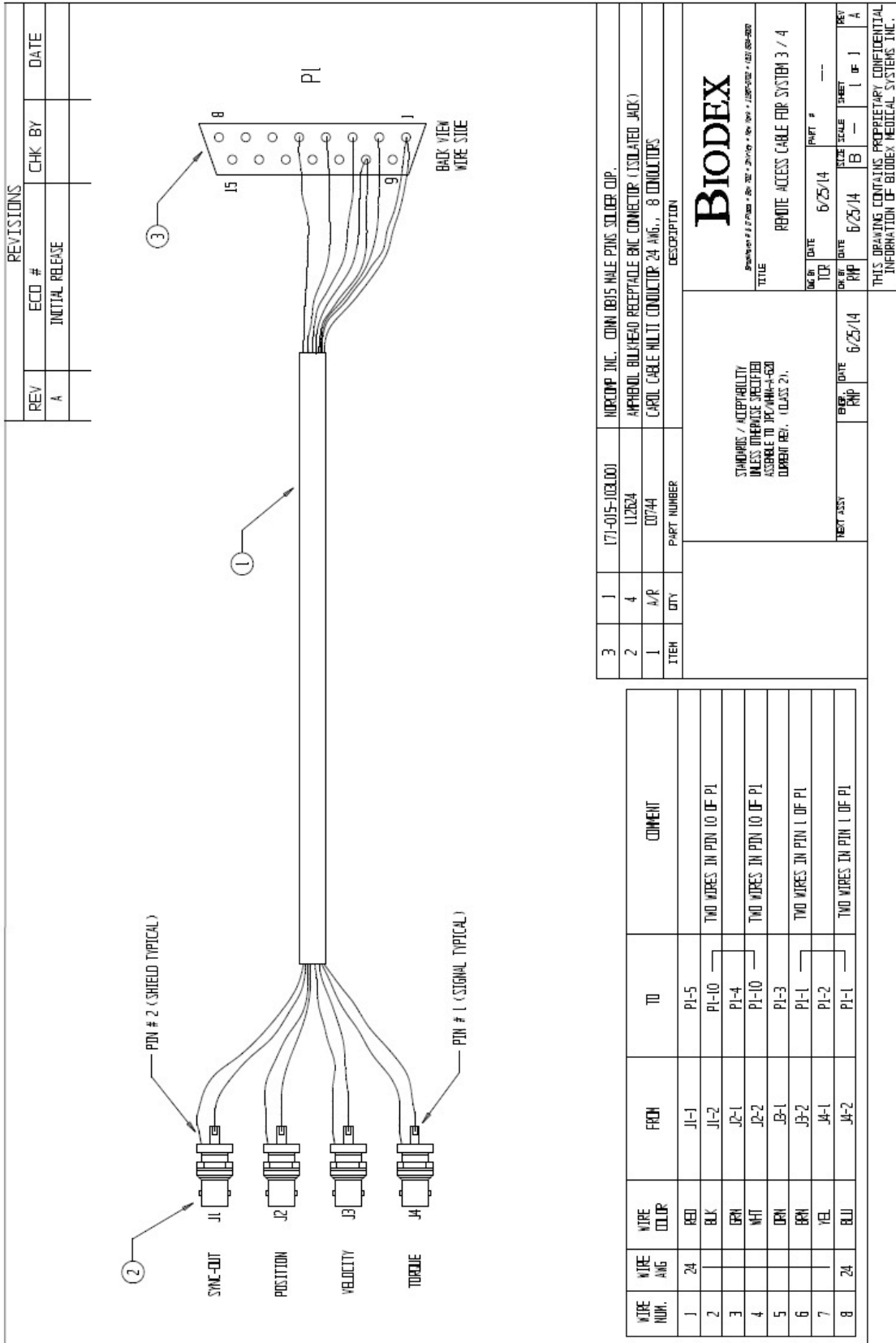
EMG/Analog Signal Port Pin Configuration

NOTE: The EMG/Analog Signal Access port is a DB-15 female connector located on the back of the System 3's lower tray. It is labeled: "REMOTE ACCESS."



PIN #	DESIGNATION	DESCRIPTION
1	Common	Signal ground
2	Torque	Analog torque signal
3	Velocity	Analog velocity signal
4	Position	Analog position signal
5	Syncout	TTL pulse
6-9	reserved	Do not connect!
10	Common	Signal ground [same as pin 1]
11-15	not connected	

BNC Cable example.



Specifications

Accuracy: $\pm 2\%$

Resolution: 16 Bits

Minimum Vout Increment: 152.5 μ v

Signal Noise: 15 mVrms [20KHz Bandwidth]

35 mVpp [20 μ S minimum, 150 μ S maximum width]

Response Time: 500 μ S.

Connector: DB-15 male "D" Connector

Output Short Circuit Duration: Infinite

Output Impedance: 100S

Individual Signals

Torque* Analog torque signal

5 volts is cw torque (512 ft-lbs)

0.0 volts is 0 ft-lbs

-5.0 volts is ccw torque (512 ft-lbs)

Scale Factor = 9.76 mV/ft-lbs

Velocity Analog velocity signal

5 volts is full scale cw speed (512 deg/sec)

0.0 volts is 0 deg/sec

-5.0 volts is full scale ccw speed (512 deg/sec)

Scale Factor = 9.76 mV/[deg/sec]

Position Analog position signal

4.60 volts is when dyna shaft is fully cw

-4.28 volts is when dyna shaft is fully ccw

Scale Factor = 28.7 mV/[deg]

Total ROM is 306 degrees; Total Vout = 8.88V

Synchronization Digital TTL pulse

Active High

29 μ s Pulse width Continuous

Indicates voltage output update, [\sim 2KHz], mode dependent

4. Data Download for Motion Control

This is the most advanced feature of the toolkit. Using the toolkit program, a data file defining fixed frequency and positional point patterns can be downloaded into the Biodex System, and then executed on command. Up to 2 data sets can be stored in the Biodex System. With this feature, the Biodex System can be controlled to perform (in Passive mode) a variable speed pattern.

By specifying the positions at some fixed rate, a pattern could perform:

- Accelerations of varying degrees
- Switching fixed speeds through a Range Of Motion
- Patterned pauses
- Motion sequences with changes of direction

Data File Format Details

A user provided data file of positional data could be downloaded to the System, and executed to follow a custom pattern of motion. Tools such as MATLAB (from The MathWorks), MathCad (from MathSoft) or Prism (from GraphPad Software) can be used to generate these pattern files.

Following are the specifics regarding the pattern data file formats:

- A filename extension of .PAT is suggested but not required
- It is an ASCII file with one position per line terminated by a CR/LF
- The position values must be in units of radians, and can be in standard exponential notation or using decimal points. Since the numbers are in radians, be sure there is enough precision (ie: digits to right of decimal point). Typical examples of position value are:

2.11329448568321

5.13731090056142E-02

- Increasing position values go in the counter-clockwise direction, while lower values are closer to the clockwise ROM stop position
- A maximum of 28,000 points or rows is allowed per data file. This is a restriction imposed by the available memory on the Digital Signal Processor (DSP).
- The data is offset when it is downloaded so the position offsets start relative to the starting position of the attachment. This assures a smooth initial start of the pattern.
- All pattern data files should start and end with a smooth ramped up speed where the deltas from point to point are small. The toolkit will NOT give a warning or reject a file, which could result in erratic, unsafe behavior.
- Timed pauses can be injected into a pattern file simply by sequencing a series of identical position values (delta between adjacent points in the pattern are zero).

How Can I Create These Data Files?

The generation of these data files can usually be directly output from the math or modeling tool used to generate the pattern. Tools such as MATLAB, MathCad or Prism can be used to generate these pattern files. Be sure to make use of the curve-fitting feature of the tool in order to produce a smooth data pattern with fine increments from point to point. A large or sudden difference between two adjacent points in the file will result in erratic, unsafe behavior. Be sure all newly developed patterns are tested prior to using it on a patient.

A Test Data Generator is available for use on the Data Download tab of the toolkit software. It generates a file named testdata.pat with the parameters as specified. It can be used to see a sample pattern data file, as well as running it on the System to observe its behavior or become familiar with setting up and executing a file.

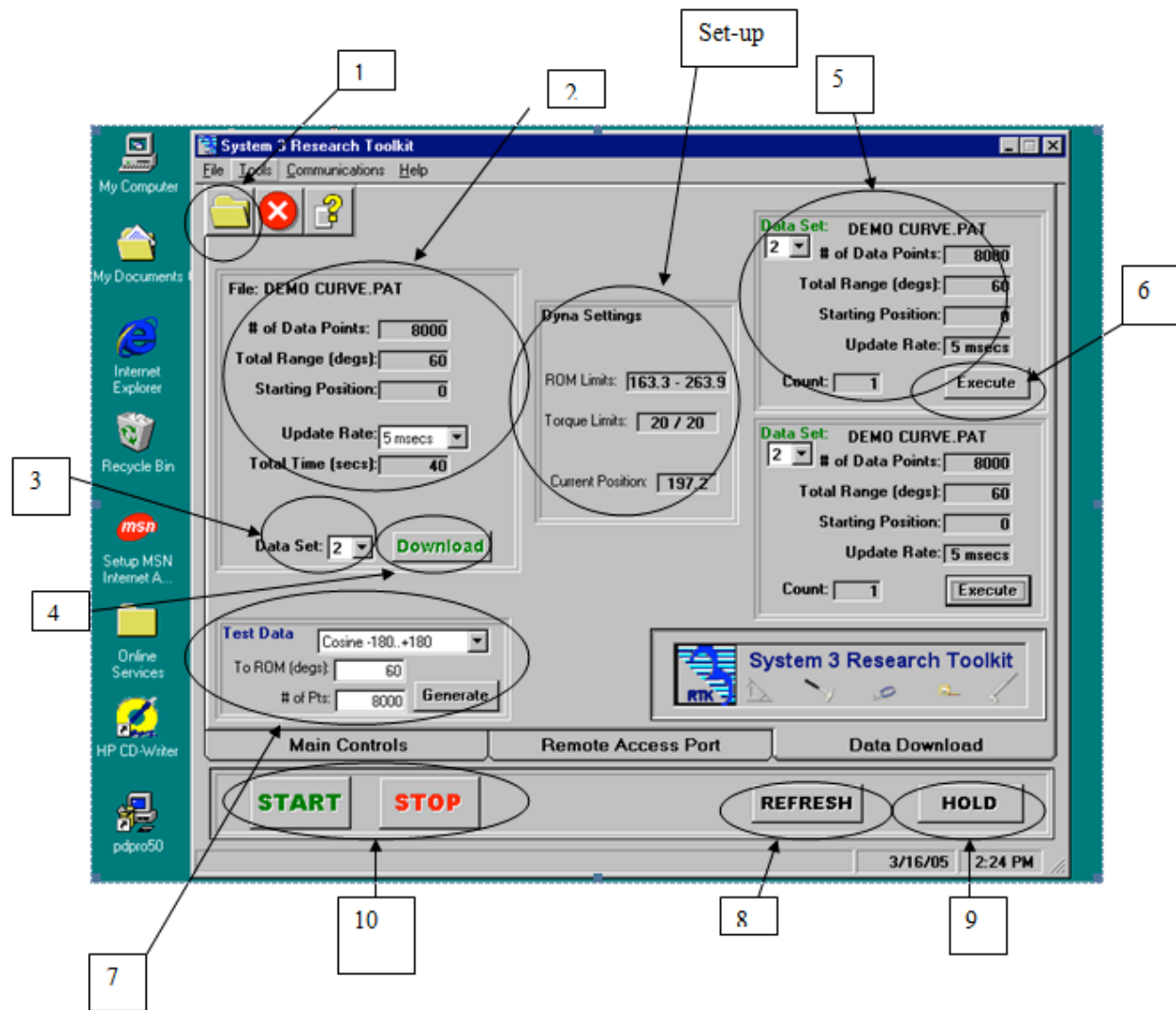
What Are The Operating Characteristics of this Motion Control?

There are a few important notes and limitations relating to the physical machine limits, and what is currently supported by the firmware.

- The Torque limits are actively supported during the pattern execution. When a torque limit is exceeded, the pattern execution will terminate and motion will stop.
- The Range Of Motion and the attachment position must be set up prior to running a pattern to allow enough range for the pattern to complete. If there isn't enough of a range of motion, the system will not execute the pattern, or it will terminate upon encountering the ROM limit.
- Acceleration rates and top speeds are restricted to System limits. Even though the data file can command speeds of higher than 500 degrees/second or extremely high acceleration rates, the machine can only perform within its design constraints.
- The limit of 28,000 points per data file results in a time limit for a pattern. For example, using an update rate of 1 msec, a 28,000 point data file would take 28 seconds. The rate can be set as low as 10 msec, but any rate lower than 2 msec is not recommended - it will result in erratic behavior. Therefore the effective time limit for a pattern is 56 seconds.
- Smooth behavior of a pattern is a function of the quality of the pattern generation, as well as what update rate is selected. Larger update rates will generally cause courser behavior.

Set-up

- A. Set Range Of Motion using System 3 Front panel, or System 4 Biofeedback. Be sure ROM is large enough for pattern.
- B. Be sure that total ROM is more than pattern ROM.
- C. Also be sure torque limits are high enough not to stop machine. Data download patterns are performed in the passive mode. In passive mode, dynamometer arm will stop moving if torque limits are exceeded.
- D. Switch panel to Computer control.
 - ROM is in absolute values. Total ROM of dynamometer is about 307 degrees.
 - CW direction numbers are smaller than CCW.
 - Initial direction of movement is always CCW.
 - Software assumes start position as 0.
- E. Position arm at 0.



Data Download And Execution Of Pattern File

1. Open file to get pattern file.
2. This area describes the pattern. In this case the pattern consists of 8000 data points, total ROM is 60 degrees, and the starting position is 0. The update rate can be changed from $\frac{1}{2}$ msec up to 10 msec. Total time for the pattern is then calculated. The more frequent the update rate, the faster the dynamometer will rotate.
3. Data Set: The file is downloaded to the microprocessor in the dynamometer control board (DCB). Up to 6 discrete data sets can be resident. This allows the user to toggle back and forth between data sets.
4. Click on Download to load file into the DCB. Once pattern is downloaded, it will be displayed as 5.
5. Display of selected pattern.
6. Click Execute and pattern will run.
7. Test data: The two sample curves below, both cosine functions, are shown as examples.
8. REFRESH: Updates the front panel to reflect what is displayed on RTK screen.
9. HOLD/RESUME: allows the operator to toggle back and forth.
10. START STOP: Start is not really needed for data download patterns. Execute initiates the pattern. STOP will stop the pattern if needed. However, pattern will stop on its own once it completes the total time.

Using The Data Download Feature

What follows is a step-by-step example of how to download a .pat data file and execute the pattern file.



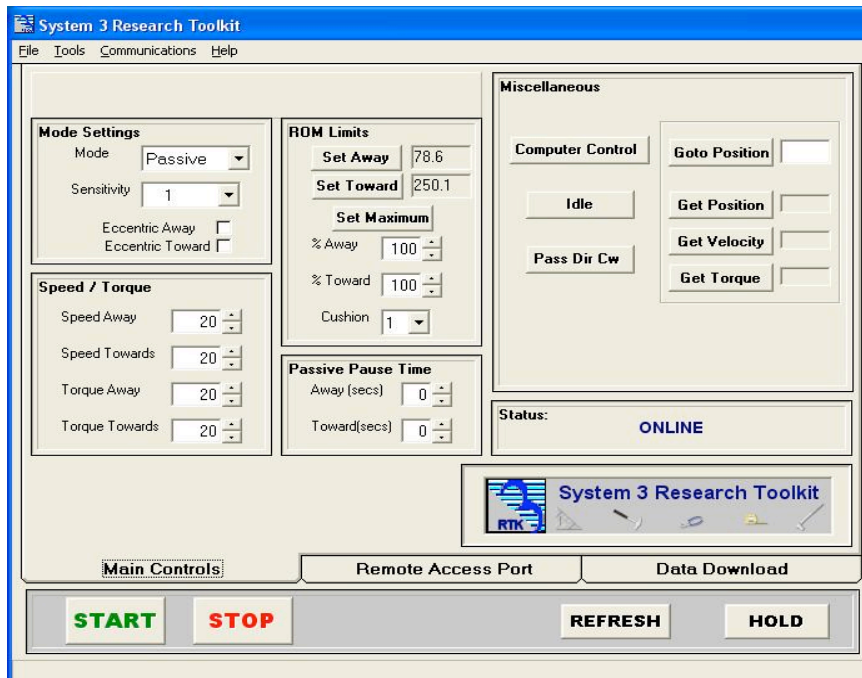
It helps to use the shoulder attachment and set the ROM limits to a considerable range in both directions.

Bring attachment back to horizontal position; that will be the starting point. The RTK data download will move in the CCW direction first.



Next we are going to go through a progression that ultimately will download a .pat file

1. Try Passive mode in Biofeedback first. Set torque limits to at least 20 in both directions and set speed to 20 in both directions. A message for “high speed enable” will appear. HOLD/RESUME will need to be pressed. Press START; the attachment should move. Press STOP to stop.
2. Next - do the same thing using the Main controls of the RTK.



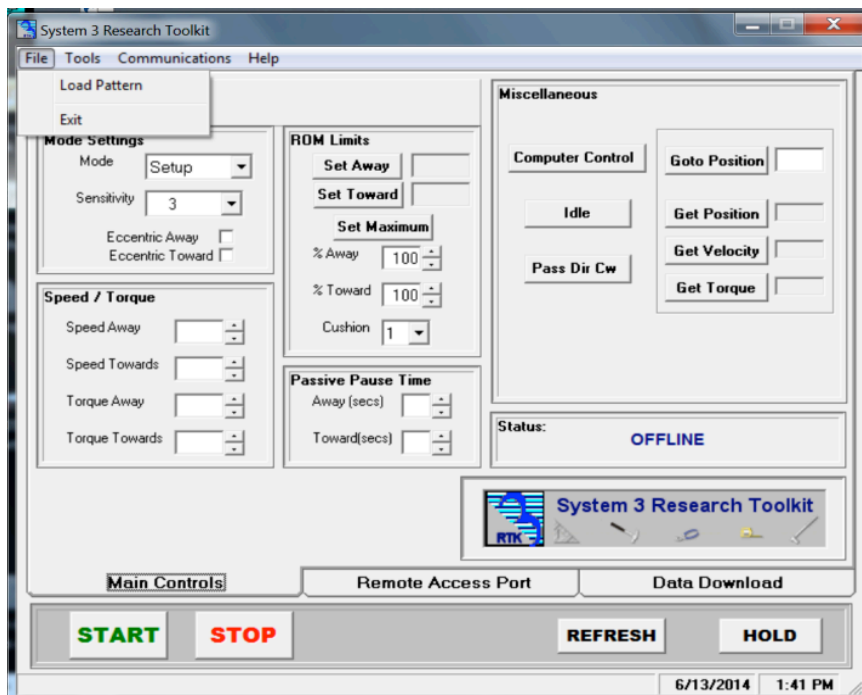
Set Speed and Torque in Biofeedback then hit REFRESH. This will update the values on the Main Control screen.

Press STOP/START; the attachment should move.

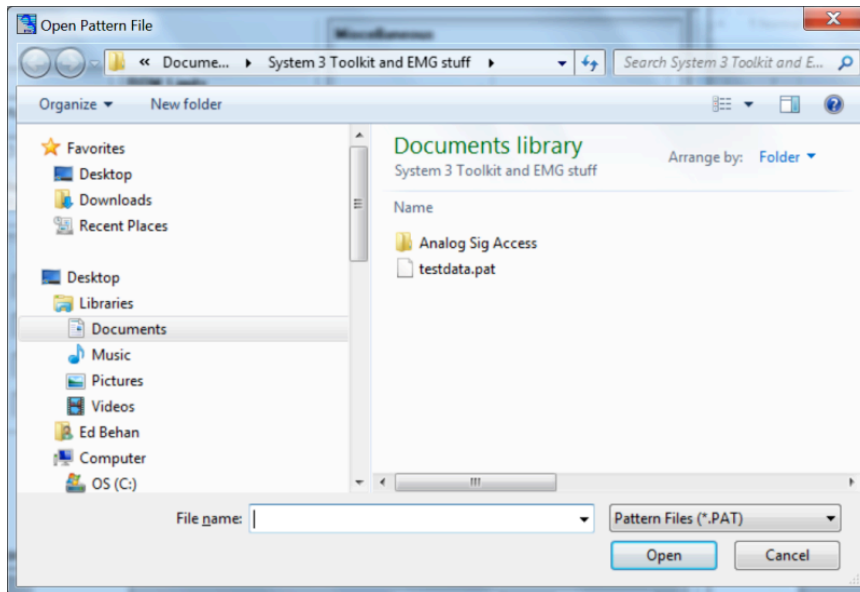
When at Horizontal, press STOP. This helps set up the Data Download.

We will use a demo curve pattern, but the steps will be the same for any process.

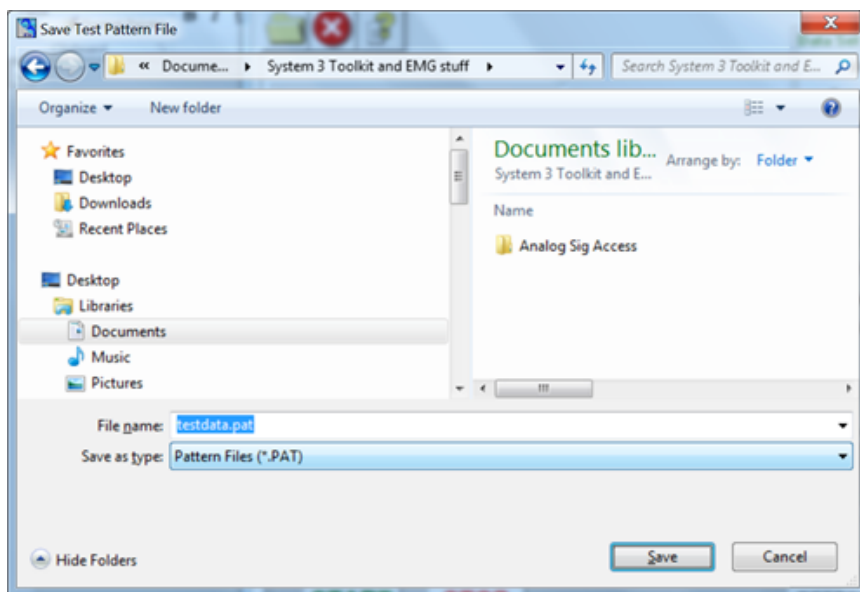
1. Go to File and select Load Pattern.



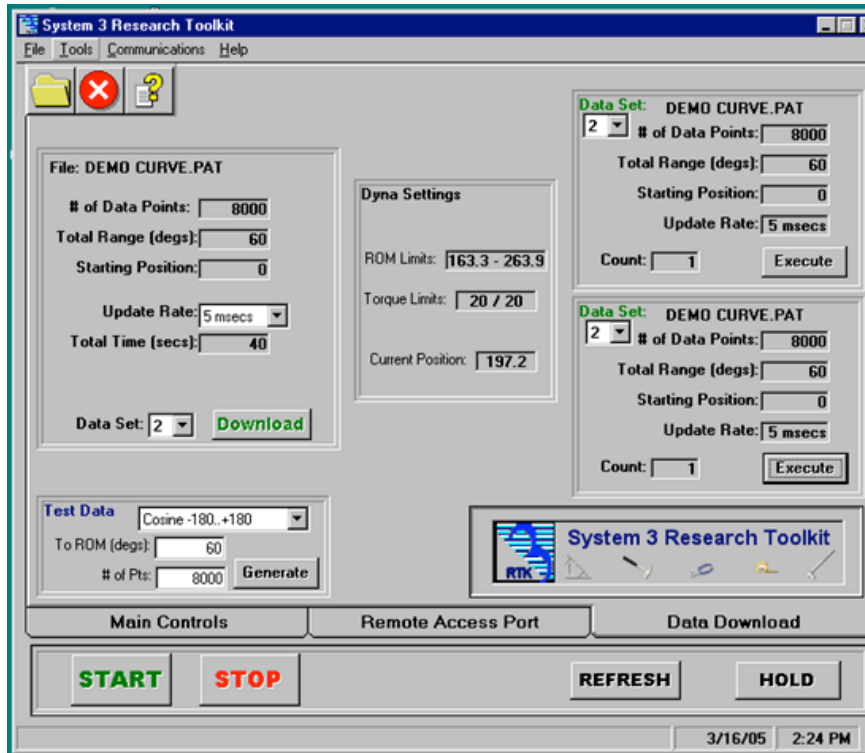
Open the testdata.pat file and select the pattern.



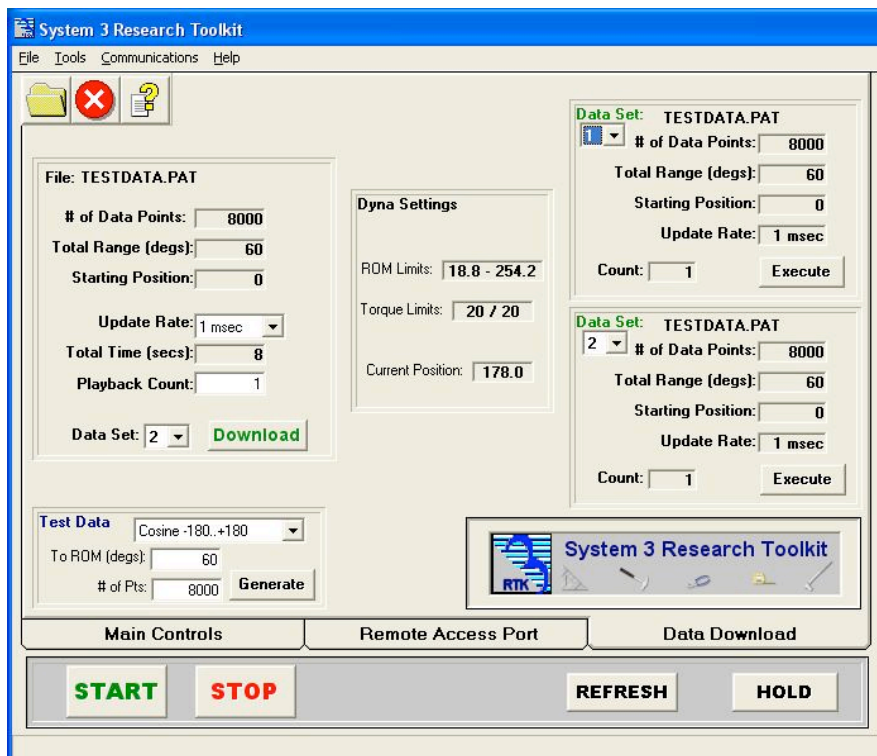
Click on Save and pattern will be ready to download.



Select Download and pattern will load into target data set.



Press Execute to run pattern.



5. Common Problems

1. Panel not in computer control
q Solution: Switch to computer control
2. ROM limits are not set appropriately for the ROM of the pattern to be executed.
q Solution: Go back to panel control, hit set-up twice, reset ROM, switch back to computer control
3. Zero position (where the motion will start) is set against or too close to the CCW stop.
Remember motion moves CCW first.
q Solution: Move arm to correct starting point
4. Torque limits too low so weight of limb exceeds torque limit and arm will not move.
q Solution: Go back to panel control, increase torque limits, switch back to computer control

6. FAQ's

1. How do I collect data?

Answer: Through the remote access port to an A/D device. The remote access provides a higher sampling rate.

2. Should I run the Biodex Application software?

Answer: You can, but only in the Biofeedback mode.

3. How do I get the pattern files?

Answer: You must generate them yourself using a math or modeling tool such as MATLAB (from The MathWorks), MathCad (from MathSoft) or Prism (from GraphPad Software). Be sure to make use of the curve fitting feature of the tool in order to produce a smooth data pattern with fine increments from point to point. A large or sudden difference between two adjacent points in the file will result in erratic, very rough behavior. Be sure all newly developed patterns are tested prior to using it on a patient.

Besides an off-the-shelf tool, a custom developed program can also generate the file using simple curve fitting techniques.

A Test Data Generator is available for use on the Data Download page of the toolkit software. It generates a file named: testdata.pat with the parameters as specified. It can be used to see a sample pattern data file, as well as running it on the System 3 to observe its behavior.

BIODEX

Biodex Medical Systems, Inc.

20 Ramsey Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (Int'l 631-924-9000), Fax: 631-924-9241, Email: info@biodex.com, www.biodex.com