

*"The Clinical Advantage"™*

# System 3 Enhanced Capabilities

BIODEX SYSTEM 3

*See what's new. The Biodex System 3 - the fastest way to identify, treat and document the physical impairments that cause functional limitations.*

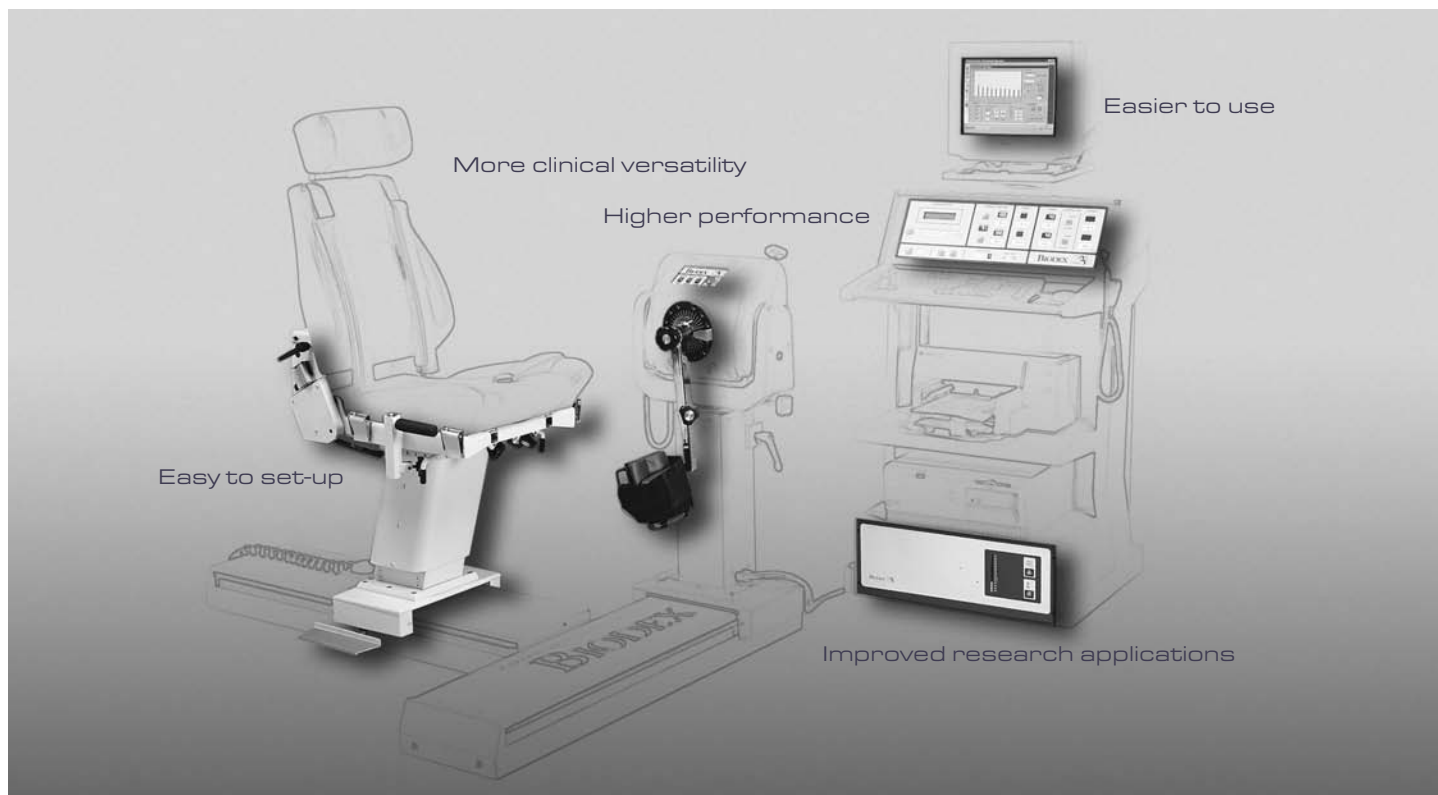


## BIODEX

Biodex Medical Systems, Inc.

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# BIODEX SYSTEM 3 ENHANCED CAPABILITIES



## Higher Performance:

- Passive speed to as low as .25 deg/sec and as fast as 300 deg/sec
- Very slow speeds are required for proprioceptive testing
- Software includes specific protocols for active and passive joint repositioning .
- Isotonic force to as low as .5 ft-lb (.7 Nm) = 6 inch pound; and to as high as 300 ft lb
- Allows for functional task simulation when using work simulation tools, e.g. turning a doorknob
- Eccentric torque up to 400 ft-lb (542 Nm)
- Accommodates demands of today's athletes and sports medicine researcher

## More Clinical Versatility:

- Optional accessories for: Work Simulation, Back Extension Flexion, Lift Simulation and Closed Chain exercise
- Increased applications and versatility, particularly in the area of occupational therapy

## Improved Research Applications:

- Very clean analog signal output of torque, position, velocity and synchronized pulse that features four scales. +5 to -5 volts with very low signal noise range of 15-35 mv
- Ideal for EMG interface or raw signal acquisition, especially for low torque output muscle groups
- Research Tool Kit software for advanced specialized system control
- Valuable tool for researchers investigating neuromuscular performance  
The tool kit provides specialized control of the dynamometer through graphical user interface for very fine manual control as well as command line interface for automated control
- Network ready software
- Convenient data management for multi-site and hospital applications

# BIODEX SYSTEM 3 RESEARCH TOOL KIT

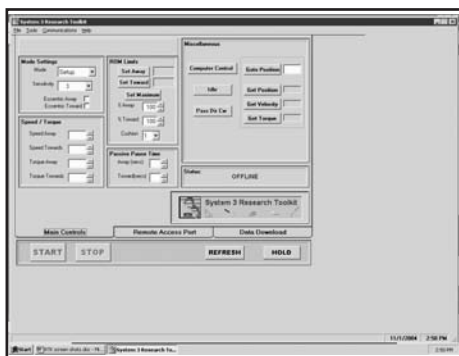
## WHAT IS THE TOOL KIT?

The System 3 Research Tool Kit gives the advanced System 3 user a more specialized, direct control of the system not otherwise available through the front panel of the unit or via the System 3 software application. The tool kit was developed with the researcher in mind and, in fact, researchers contributed directly in the definition of the features and functions the tool kit offers.

## WHAT ARE THE MAIN FEATURES?

The following features are available via the tool kit PC Windows based software:

- **Front Panel Controls** - Full set of controls as available on the front panel, with the addition of finer adjustments 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.
- **Data Download for Motion Control** - a user provided data file of positional data can be downloaded to System 3, 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.

- **Command Line Interface** - all the controls described above can be accomplished via a simple ASCII based command interface. A terminal or terminal emulation host can be used to type in commands and display the results, or a custom developed program can issue the control commands for specialized, automated control.



## WHAT DOES IT CONSIST OF?

The tool kits consists of an RS-232 serial cable for connecting up to the Auxiliary RS-232 port to a host, a PC Windows based program on CD, and a user manual. It requires a *tool kit enabled* System 3, which must be a Revision 2 model with the enhanced firmware. A 'host' system supporting an RS-232 interface is required to act as the controller.

## WHAT ARE THE REQUIREMENTS?

The requirements to install and run the PC Windows based tool kit 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 step you through the process.

*The tool kit can operate simultaneously with the System 3 application.*

830-108 Software Package,  
Research Tool Kit

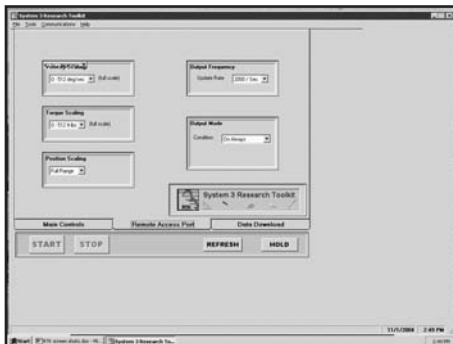
# BIODEX SYSTEM 3 ANALOG SIGNAL INTERFACE

## REMOTE ACCESS PORT CONTROL

The Remote Access port is 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.

## ANALOG SIGNAL RESOLUTION EFFECTED BY SCALE FACTOR

The analog signals range from 5 volts to +5 volts, resulting in a total range of 10 volts. The software 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-lb, the output resolution scale factor would look as follows:



128 ft-lb = 10 volts,  
1 ft-lb = 78.1 milli-volts  
78.1 milli-volts is well above the worst case of signal noise (15 – 35 mV), so increments as low as 1/4 to 1/2 ft-lb can be seen reliably. The original System 3 design had only a 0 to 5 volts range on the analog signals (e.g. half the resolution of System 3 Rev 2), therefore this example has 16 times the resolution of the original System 3!

- 830-105 Interface Card, EMG  
*For REV 1 systems requiring analog signal adapter board.*
- 830-107 Interface Kit, EMG  
*For REV 2 systems containing integral analog signal outputs. (no separate card required).*
- 830-109 Interface Software  
*For REV 2 systems containing integral analog signal outputs and pre-connected cable. REV 2 unit*

## SPECIFICATIONS

### ANALOG SIGNAL INTERFACE (REV.2) FOR SYSTEM 3:

This optional feature provides real time analog voltage representations of torque, position, and velocity signals from the dynamometer. These can be used as inputs to real time data acquisition systems.

#### 1.0 GENERAL:

Accuracy:	± 2%.
Resolution:	16 Bits.
Minimum Vout Increment:	152.5uv
Signal Noise:	15 mVrms [20KHz Bandwidth]. 35 mVpp [20 μS minimum, 150μS maximum width].
Response Time:	500μS.
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 29μs Pulse width Continuous Indicates voltage output update, [~2KHz], mode dependent

#### 3.0 CONNECTOR PIN DESIGNATIONS:

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	

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