




User Manual



Legend of Symbols

	Warning: Dangerous operations that may damage the devices or causes personal injury.
	Caution: Operations may cause the device/software to not operate normally and/or cause injury.
	Note: Important considerations.

This device complies with part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

USB connection for use with limited power source only. Must be connected to host computer certified for compliance with IEC 60950-1 or equivalent.

Declaration

IPECS LAB / MODEL: 104441-01

FCC ID: XXXYYYYYYYYYYY

IC: XXXXX-YYYYYYYYYYY

Minimum System Requirements for Software Installation

- Recommended 300 MHz or higher Intel® Pentium®/Celeron® family, or compatible processor
- Microsoft® Windows® XP with Service Pack 3; Windows® Vista; or Windows 7
- 128 MB of RAM or higher
- 1 GB of available hard-disk space
- 800 x 600, Super VGA or higher-resolution monitor
- CD-ROM/DVD drive or USB port

Intended Users

This User Manual is intended for use with the iPecs™ Lab System for clinical research by researchers and students.

Technical Support

Contact College Park Industries at 800-728-7950 or 586-294-7950 M-F 8:30-5:30 EST. Email: techsupport@college-park.com

Contents

01 System Overview

iPecs Lab System	5
Features	6
Pre-installation Checklist	7
Sensor Controls	8
Sensor Input/Output	9
Specifications	10

02 Software Installation

Windows® XP	12
Windows® Vista/7	14

03 USB Driver Installation

Windows® XP	17
Windows® Vista/7	18

04 Hardware Installation

Charging the iPecs Lab Sensor	21
Assembling Mounting Adapters to the Sensor	21
Using the Sensor Fixture	22
Endoskeletal Alignment	23
Using the Testing Dummy	23
Zeroing the Sensor Prior to Data Collection	24

05 Software Overview

Startup	26
Basic Operations	27
Pairing the Sensor and DCM	27
Setting System Preferences	29
Channel Preferences	30
Displaying Channel Values	30

06 Recording Data

Streaming Data to File	32
Streaming File Playback	33

07 Uninstalling Software

Windows® XP	35
Windows® Vista/7	36

08 Uninstalling USB Driver

Windows® XP	38
Windows® Vista/7	39

09 System Calibration

Calibration for External Data Acquisition	41
Calibration Procedure	42

10 Troubleshooting Guide

Possible System Issues	47
Frequently Asked Questions	48
Environmental Use	49
Intended Use	49

System Overview

01





iPecs™ LAB / User Manual

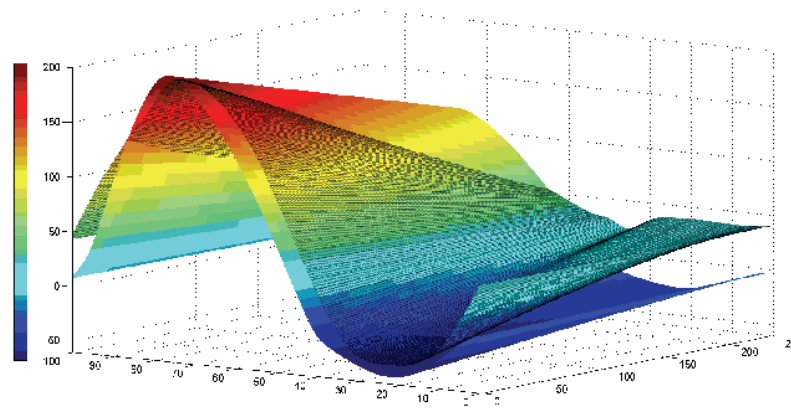
System Overview

iPecs™ Lab System

After four years of development and with the support of a NIH grant, it is our pleasure to introduce you to the iPecs Lab System from College Park Industries. Unlike any device on the market today, the iPecs Lab System is a portable research tool that provides accurate measurements of 3-axis forces and moments experienced by a lower limb prosthesis user – in any environment, without wires or the need for additional lab equipment.

Configuration and installation of the iPecs Lab sensor is to be performed by a researcher or clinician trained in the application of prosthetics. The iPecs Lab System consists of the sensor, DCM (Data Collection Module) and iPecs Lab software for PCs.

The following document gives detailed instructions for the operation of this system, software installation and use.



System Overview

Features

iPecs Lab Sensor

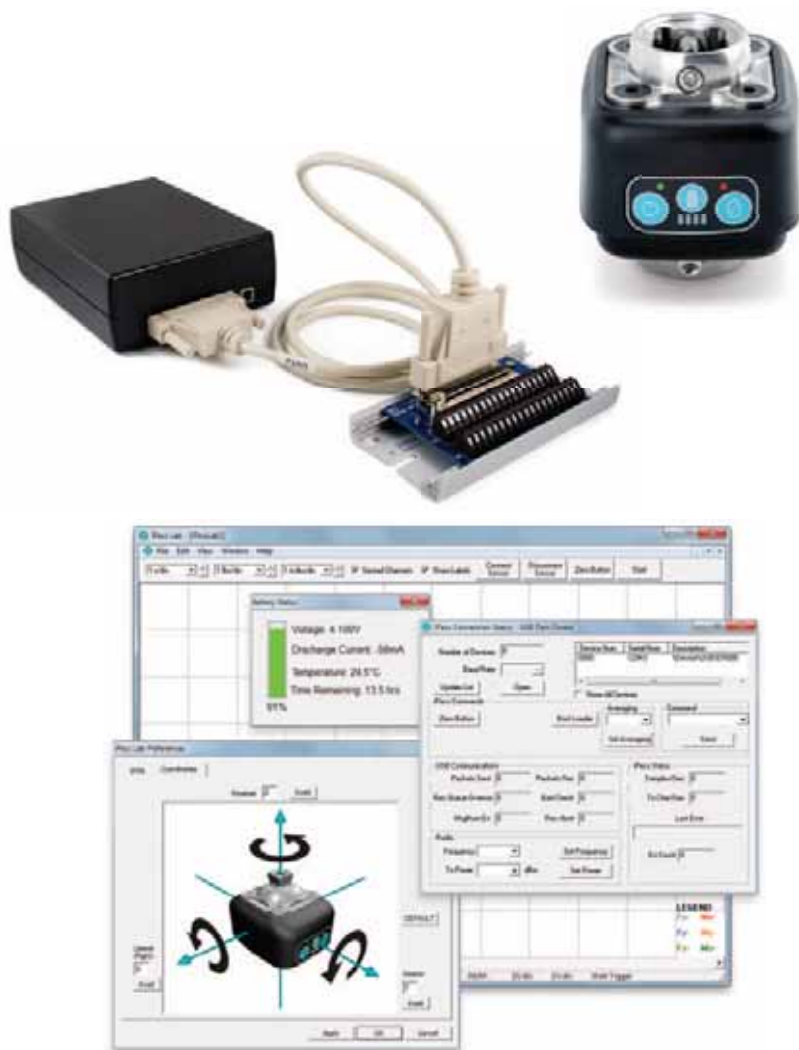
This sensor houses the electronic components required to detect and measure the forces and moments acting on the device and residual limb.

DCM (Data Collection Module)

The sensor communicates with the PC software through this module while operating in wireless mode.

iPecs Lab Software

This is an interface between the sensor and the researcher. It graphically represents the data collected by the sensor to aid analysis and has user-configurable parameters to aid research.





System Overview

Pre-installation Checklist

- A** Protective carrying case (*not shown*)
- B** iPecs Lab sensor
- C** iPecs Lab DCM (data collection module)
- D** iPecs Lab software (*not shown*)
- E** Connection protocol and cables for iPecs Lab DCM
- F** Flash memory-to-computer USB port adapter
- G** AC adapter¹ (*not shown*)
- H** 6ft USB-A to USB-B cable
- I** 6ft USB-A to USB-5 pin mini-B cable
- J** MicroSD card, 2GB (*not shown*)
- K** (2) 4-hole male adapters²
- L** (2) 4-hole female rotatable adapters²
- M** (16) M6x14mm mounting fasteners² (*not shown*)
- N** 4mm hex key
- O** Sensor fixture (*not shown*)

Optional Accessories






- Testing Dummy
- Additional endoskeletal adaptive components and fasteners²
- Annual calibration plan

- ¹ Use only the supplied AC adapter.
- ² College Park Industries requires that you use only the supplied endoskeletal adaptive components and fasteners for attachment to a prosthesis. Contact College Park to purchase additional components and fasteners.



System Overview

Sensor Controls

FEATURE	DESCRIPTION
Power Button 	When the sensor is turned off, press and hold this button for 2 seconds to turn the sensor on. The green LED above the power button remains on indicating a power-on condition. With the sensor on, press and hold the power button for 2 seconds to switch off the sensor. The green LED turns off indicating power-off condition.
Battery Button 	This button turns on the amber LEDs that indicate current battery life. It also has a cross-hair depicting the center of the sensor and is considered the origin of the co-ordinate system used to measure forces and moments data.
Zero Button 	This button has the same function as the "Zero" button in the software. Reference the Pairing the Sensor and DCM in the Software Overview section for more information.
Battery Indicator LED 	These LEDs indicate the remaining life of the built-in battery pack. More 'ON' LEDs indicate a longer time before the batteries have to be recharged (using the Mini-B connector).
Error Indicator LED 	The red LED above the Zero button should be OFF under normal working conditions. If it turns ON, it indicates an error on the sensor. The error displays as a text message under Last Error field in the iPecs Status area in the DCM Connection Status window. The researcher can view this message and take appropriate action to correct/clear the error condition.

System Overview

Sensor Input/Output

The sensor is equipped with a variety of input/output options to aid in the collection of data.

- A MicroSD slot:** available for storing sensor data on removable flash memory cards.
- B Powered Mini-USB socket:** Used only for charging the sensor.
- C Auxiliary Port:** Enables connection of external sensors to the iPecs Lab sensor, allowing the test subjects data to be time synchronized with iPecs data and sent wirelessly to the iPecs Lab software or the analog outputs of the DCM. The physical interface is a Serial Peripheral Interface (SPI), electrically isolated from the iPecs. (Some firmware development is required for the iPecs Lab sensor).



For inquiries regarding firmware development, contact College Park Technical Support at techsupport@college-park.com or call 800.728.2950



System Overview

Sensor Specifications

Sensor Dimensions	46 mm x 70 mm x 82 mm 1.8" x 2.8" x 3.2"
Sensor Weight	285 g (10 oz)
Torque (mounting fasteners)	12 N·m (8.9 lbf)
Weight Limit (test subject)	125 kg (275 lbs)
Charging/Operating (temperature)	0–40° C (32–104° F)
Storage (temperature)	0–25° C (32–77° F)

DCM Specifications

Operating (temperature)	0–40° C (32–104° F)
Storage (temperature)	0–25° C (32–77° F)

Force and Moment Data

UNITS	F _x , F _y	F _z	M _x , M _y	M _z
Relative Range	+/- 890 N +/- 200 lbf	+/- 3558 N + 800 lbf	+/- 282 N·m +/- 2500 lbf·in	+/- 34 N·m +/- 300 lbf·in
Resolution	1.6 N 0.36 lbf	2.8 N 0.64 lbf	0.2 N·m 2.0 lbf·in	0.04 N·m 0.4 lbf·in
Accuracy (% full scale)	3.0%	3.0%	2.0%	2.0%
Hysteresis	+/- 0.2% full scale for all forces and +/- 0.02% full scale for all moments			
Non-linearity	0.45% full scale for all forces and moments			

* Maximum allowable single-axis overload values are 2–8 times rated capacities.

Power

Voltage (charger)	AC 100–240 V*
Frequency (charger)	50–60 Hz*
Current (charger)	<250 mA max*
Battery (sensor, built in)	Rechargeable lithium-polymer
Charge, full (sensor)	7+ hours, continuous use**
Charging	Via supplied AC adapter/PC USB

* Refers to AC adapter only (The iPecs Lab sensor is battery-powered and the DCM is powered through the user's PC).

** Sensor has an automatic low-power sleep mode for extending use.

Wireless

Radio Frequency	2.4 GHz ISM band
Sampling Rate	10–1,000 Hz per channel

Software Installation

02





DCM Software Install

The iPecs Lab software can be installed and used on a PC running Windows XP, Vista or Windows 7. The installation procedures are similar for Windows Vista and Windows 7 and hence, have been grouped together.

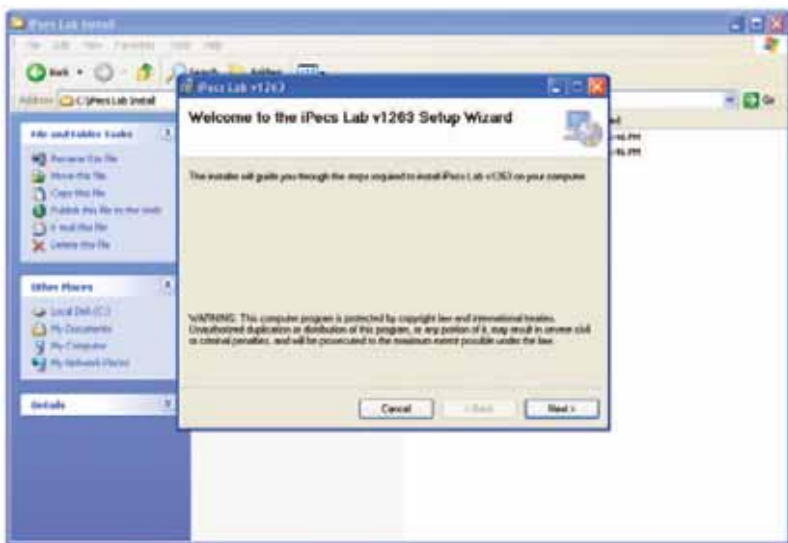
Windows® XP

Insert the CD containing the iPecs Lab software into a USB port on the computer. If Autorun is enabled on your computer, it will guide you through the following steps. If Autorun is not enabled, point to **Start**, click on **My Computer** and double-click on the **Install CD**.

The files on the CD are as follows:

- iPecs Lab Install Folder (*install file: setup.exe*)
- LM_USB_Drivers (*folder containing the USB driver files*)
- yymmdd Analog Interface Calibration.xls
- yymmdd iPecs User Manual.pdf
- Axx-Calibration-Matrix-yyymmdd.txt (*Matrix File*)

Double-click on **setup.exe** file to start the software installation wizard which will guide you through the installation steps. Click on **Next** to proceed.



DCM Software Install

Installation Wizard

The installation Wizard pops up the Welcome Screen. Select **Next** to continue.



Drive letters vary among different computers.
Check for specified files within drives.

Software License Agreement

The next screen will present a **Software License Agreement**. This license is also provided at the end of this User manual for your reference. Select **"I accept the terms of the license agreement"** if you agree to the terms listed and click on **Next** to advance to the next screen.

Select Installation Folder for the Software

In the next screen, a confirmation of your selections is requested. Click **Back** if you want to review any of your selections. Click **Next** to begin installation.



Installation Check/Progress.
Installation may take a few minutes depending on the configuration of your computer. Once installation is complete, the final screen confirming completion will be displayed.

Installation Complete

This screen concludes the installation of the software, but is incomplete without the PC to DCM drivers for the iPecs Lab DCM (Data Collection Module). The installation instructions for these are given in the next section.



DCM Software Install

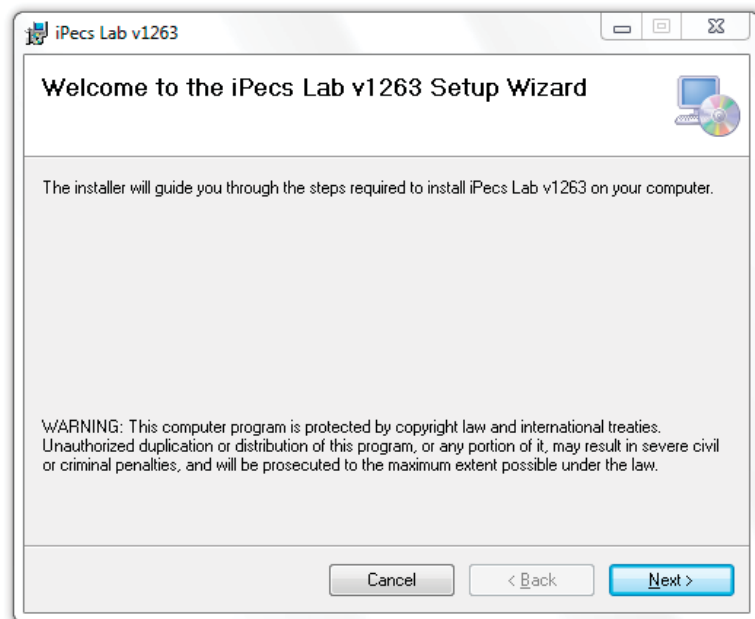
Windows® Vista/7

Insert the CD containing the iPecs Lab software into a USB port on the computer. If Autorun is enabled on your computer, it will guide you through the following steps. If Autorun is not enabled, point to **Start**, click on **Computer** and double-click the **CD**.

The files on the CD are as follows:

- iPecs Lab Install Folder (*install file: setup.exe*)
- LM_USB_Drivers (*folder containing the USB driver files*)
- yymmdd Analog Interface Calibration.xls
- yymmdd iPecs User Manual.pdf
- Axx-Calibration-Matrix-yymmdd.txt (*Matrix File*)

Double-click on **setup.exe** file to start the software installation wizard which will guide you through the installation steps. Before the Setup runs, Vista/7 will bring up an **Account Control permission** dialog requesting your permission to run the software setup. Click on **Allow** to continue installation.



DCM Software Install

Installation Wizard

The installation Wizard pops up the Welcome Screen. Select **Next** to continue.



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Check for specified files within drives.

Software License Agreement

The next screen will present a **Software License Agreement**. This license is also provided at the end of this User manual for your reference. Select "**I accept the terms of the license agreement**" if you agree to the terms listed and click on **Next** to advance to the next screen.

Select Installation Folder for the Software

In the next screen, a confirmation of your selections is requested. Click **Back** if you want to review any of your selections. Click **Next** to begin installation.



Installation Check/Progress.
Installation may take a few minutes depending on the configuration of your computer. Once installation is complete, the final screen confirming completion will be displayed.

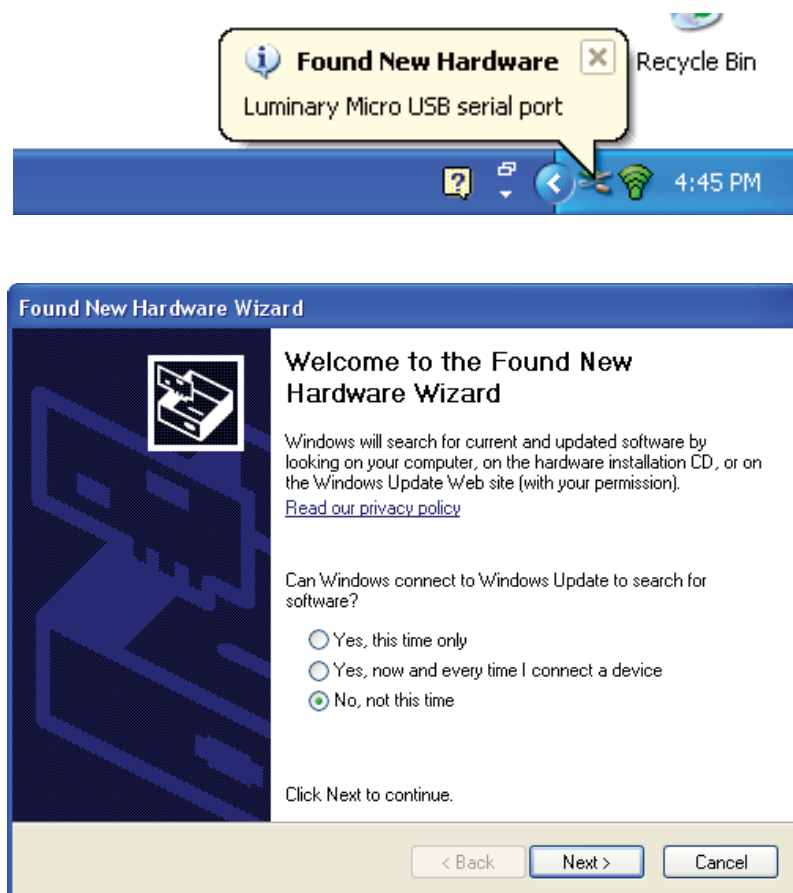
Installation Complete

This screen concludes the installation of the software, but is incomplete without the PC to DCM drivers for the iPecs Lab DCM (Data Collection Module). The installation instructions for these are given in the next section.

USB Driver Installation

03





USB Driver Installation

Windows® XP

Connect the iPecs Lab DCM to the PC via the USB cable provided and observe the green LED light up momentarily. This brings up a *Found New Hardware* balloon at the bottom right corner of your desktop and a *Found New Hardware Wizard* window.

Found New Hardware

NOTE: It is important to select *No, not at this time* to disallow connection to the internet. Insert the iPecs Lab Installation CD and click *Next*. In the next screen select *Install from list or a specific location (Advanced)* and click *Next*.

Installation Options

The wizard will then search for the software in the CD and installs the required drivers.

Locating Drivers on the CD

During this operation you might receive a warning message. Click *Continue anyway* to proceed with the installation.



Clicking on **Stop Installation** will **NOT** install the driver and render the iPecs Lab sensor dysfunctional.

Warning Message

The installation will take a while, depending on the configuration of your system. When completed, the *Installation Complete* window will be displayed.

USB Driver Installation

Windows® Vista/7

Connect the iPecs Lab DCM to the PC via the USB cable provided and observe the green LED light up momentarily. This brings up a *Found New Hardware* notification window.

Found New Hardware

Select *Locate and install driver software (recommended)* to start the driver installation wizard and insert the iPecs Lab installation CD. In the next install window, Windows will read the CD to look for drivers.

Complete Installation

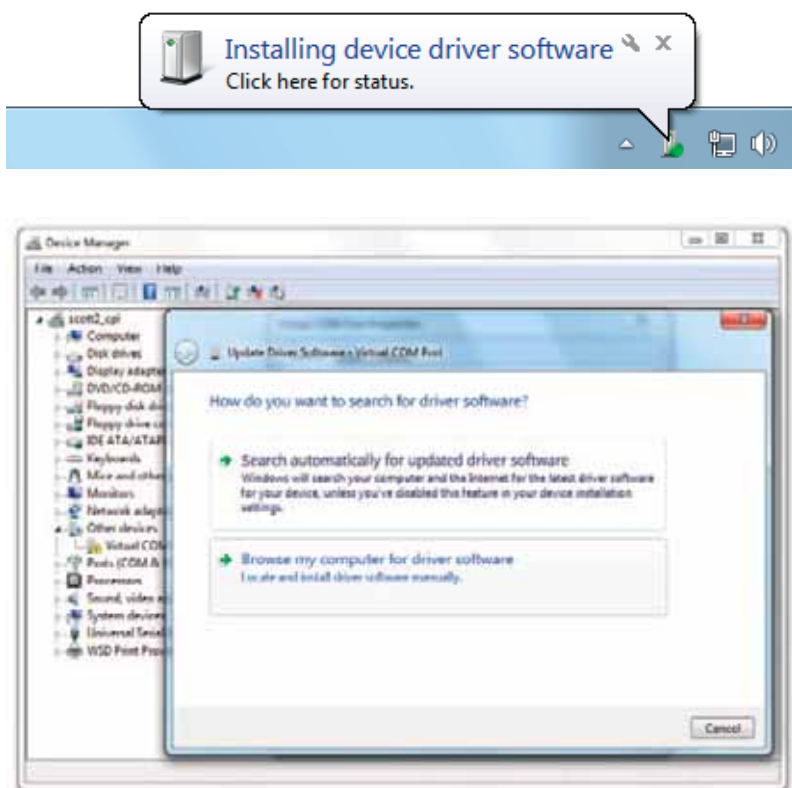
Windows will proceed to find and install the driver. The installation will take a while, depending on the configuration of your system. When completed, the *Installation Complete* window will be displayed.



If you click *I don't have the disk. Show me other options*, you will need to start the driver install over again.



If the *Found New Hardware* window does not appear or is missed, you will need to manually browse for the driver (explained in the next section).



USB Driver Installation

Browse Manually for the Driver

If you need to manually find the drivers, locate and proceed to the *Device Manager*. Under *Other Devices*, double-click on *Virtual COM* to bring up the *Update Driver Software* window.

The *Update Driver Software* window will ask how you want to search for the files. Select *Browse my computer for driver software (advanced)*, to bring up the next window.

Click on *Browse* and in the window that appears, select the CD. Remember to *check mark* the *Include subfolders* option in order to enable a complete search. To continue, click *OK* then *Next*.

Windows will then install the required driver files. A notice window will appear during installation, notifying the user *Windows can't verify the publisher of this driver software*. Click on *Install this driver software anyway* to proceed with the installation.

Complete Installation

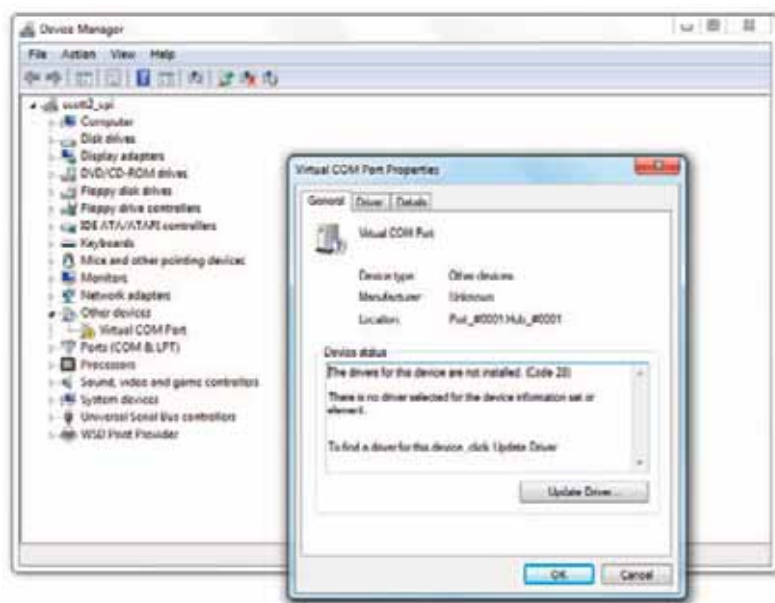
Windows will proceed to find and install the driver. The installation will take a while, depending on the configuration of your system. When completed, the *Installation Complete* window will be displayed.



Drive letters vary among different computers. Check for specified files within drives.



Clicking on *Stop Installation* will **NOT** install the driver and render the iPecs Lab sensor dysfunctional.



Hardware Installation

04





Hardware Installation

Charging the iPecs Lab Sensor

The iPecs Lab sensor is shipped with a partial-charged battery. Be sure to charge the battery completely before you begin. The sensor can be charged by using either the supplied AC Adapter or by connecting the sensor to an approved PC using the USB adapter.

- The sensor battery has a **6-hr charge time**.
- Periodic charging of the sensor battery is recommended.



Deep discharging before recharging, while recommended for Ni-Cd batteries, will actually shorten the life of the **Lithium-ion batteries in the iPecs Lab sensor**. Keeping the battery fully-charged is beneficial to the battery life.

Assemble Mounting Adapters to the Sensor

The sensor requires two 4-hole mounting adapters for assembly into a prosthetic limb. Four adapters are included:

- (2) 4-hole male adapters
- (2) 4-hole female rotatable adapters

STEP 1 Attach the selected mounting adapters at the proximal and distal ends of the sensor, using the provided mounting fasteners. Each mounting adapter requires four M6x14mm mounting fasteners.

STEP 2 Apply service-removable Loctite®242® to each fastener thread and torque evenly to 12 N·m (8.9 lbf).



Always use a calibrated torque wrench. Over- or under-torquing the mounting fasteners will damage the sensor.



Hardware Installation

Using the Sensor Fixture

A sensor fixture has been included for optional use. Its purpose is to hold the iPecs sensor in place while attaching and removing 4-hole adapters.



Do not place the sensor in a vice or use any type of rigid constraint. Doing so would over compress the outer cover and severely damage the sensor. Always attach to the sensor fixture.

- STEP 1** Place the fixture into a vice or rigid constraint with the prongs facing upward.
- STEP 2** Fit the iPecs sensor into place by aligning the hex socket heads of the attached 4-hole adapter fasteners over the fixture prongs. The side of the iPecs sensor that requires access should be facing upward.
- STEP 3** Once in place, tighten and loosen fasteners as needed in order to attach or remove the 4-hole adapter.

Hardware Installation

Endoskeletal Alignment

Attach the sensor to the prosthetic device and perform normal alignment procedures.



Use only the supplied endoskeletal components, torquing to the recommended specifications of 124 lbf-in (14 M-m). Any third-party components will damage the sensor and cause it to not function properly.



Endoskeletal alignment of a prosthetic device should always be performed by a certified prosthetist.



Using the Testing Dummy

The testing Dummy is an optional tool that allows you to temporarily align test subjects while retaining their height and selected mounting adapters. Use it in place of the sensor when there are multiple test subjects sharing one sensor.

The testing Dummy has the same dimensions and weight as an iPecs Lab sensor, and has the added benefit of acclimating a subject to the weight and dimensions of the sensor.

Hardware Installation

Zeroing the Sensor Prior to Data Collection

Prior to collecting data, you must zero out the iPecs Lab sensor with each new test subject. There are two methods for zeroing out an iPecs Lab sensor. Both methods will achieve similar results, but it is important to select one method and use it consistently. Switching back and forth between methods will result in inconsistent protocols and data.

Method 1 – Static Zeroing (weighted)

Zeroing out the unit once it is installed on the prosthesis (while the test subject is **not** wearing their prosthetic limb).

STEP 1 Stand the prosthesis vertically on a level surface, it cannot be leaning or on its side (this method may not be ideal for above-knee prosthetic limbs.)

STEP 2 Zero out the sensor using the iPecs Lab software.

STEP 3 The test subject can now don their prosthesis.

Method 2 – Dynamic Zeroing (unweighted)

Lifting the leg off of the ground vertically (test subject wearing their prosthetic limb).

STEP 1 Instruct the test subject to stand on level surface.

STEP 2 Have the test subject lift their prosthetic limb vertically, just enough to unweight it (it is important that they keep the leg in a vertical position when unweighting it).

STEP 3 Zero out the sensor using the iPecs Lab software.

STEP 4 The test subject can now lower their leg to the ground.

Software Overview

05



Software Overview

The iPecs Lab Software

The following pages list the instructions for optimal and acceptable usage of the iPecs Lab sensor, iPecs Lab DCM and related hardware/software.

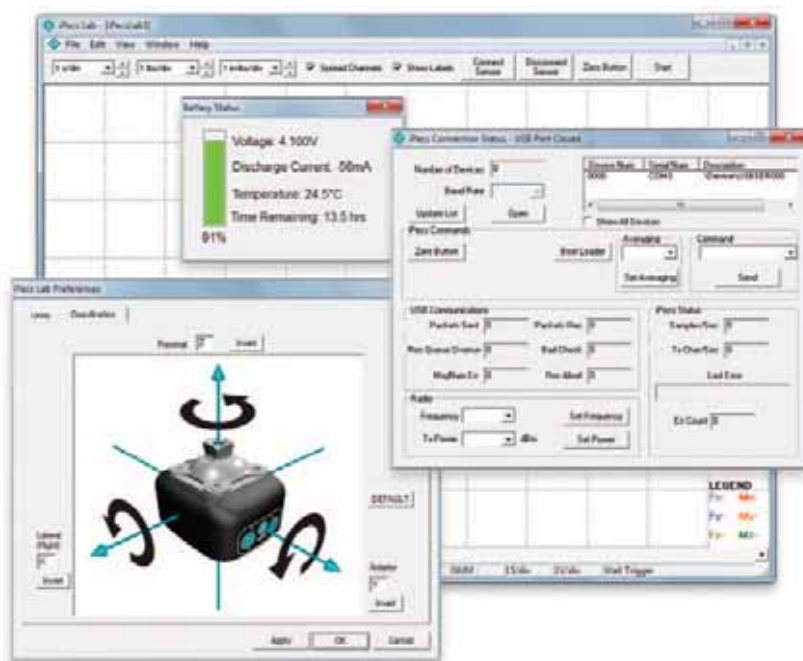
Startup

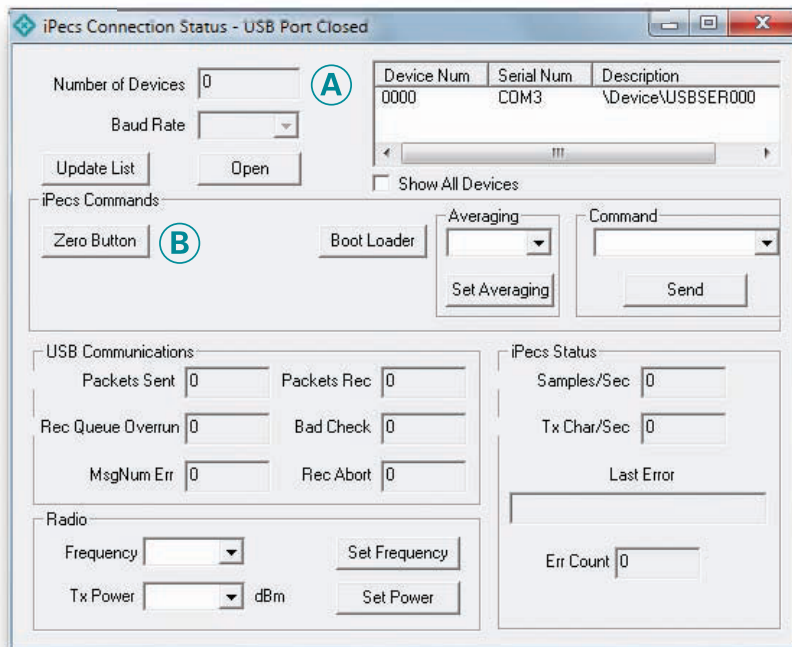
STEP 1 To start the iPecs Lab program go to *Start Menu > Programs > College Park Industries > iPecs Lab*.

STEP 2 The program opens with a Login screen. Choose User as the *Login Type*, leave the password field blank and click *OK* or click *Enter*.



STEP 3 Connect the iPecs Lab DCM (while keeping the iPecs Lab sensor turned OFF) to the PC and observe the green LED turn ON momentarily. This indicates that the USB Driver has been installed correctly.





Software Overview

Basic Operations

Turn on the iPecs Lab sensor by pressing and holding the power button for a couple of seconds until the battery level indicator LEDs and power LED turn on. At this point, observe the single green LED on the DCM turn on and stay on. This indicates that the iPecs Lab DCM is receiving radio data from the iPecs Lab sensor.

Pairing the Sensor and DCM

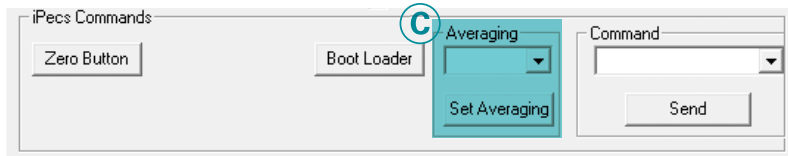
The sensor and DCM need to be paired to start data acquisition and display readings. Begin by clicking on the [Connect to iPecs](#) button just above the grid lines in the iPecs Lab software window.



By clicking the button, the [DCM Connection Status](#) window appears and the number in [Packets Rec \(received\)](#) box steadily increases indicating that the sensor is transmitting to the DCM.

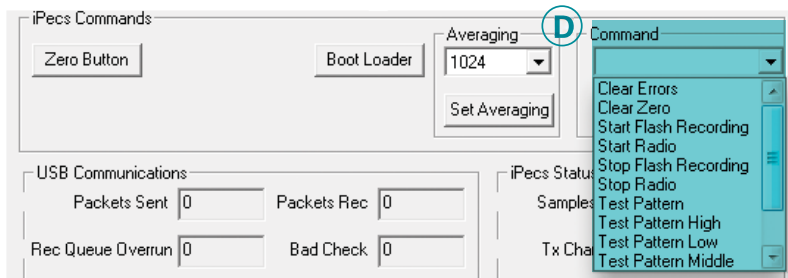
- A Device (connected):** Lists the hardware details of the serial devices connected to the computer.
- B Zero Button:** Indicates that the current reading represents zero forces and moments. After it is clicked, all future readings will be relative to the current values.

Software Overview



Set Averaging Table (Approx. Samples per second)

VALUE	1	2	4	8	16	32	64	128	256	512	1024
SAMPLES	1085	963	791	584	388	229	127	67	34	17	9
	High Frequency			Walking				Low			



c Set Averaging: The sensor is capable of sampling the data at a high rate of speed. It can sample each of the strain gages and send the data to the PC at over 1000 samples/sec. If the sample rate does not need to be that high, the sensor can average a number of samples together and send out the average. This can dramatically reduce noise.

The averaging can be set to 1, 2, 4, 8, 16 32, 64, 128, 256, 512 or 1024 samples.

To set the averaging rate, select the averaging rate from the pull-down menu and click on **Set Averaging**.

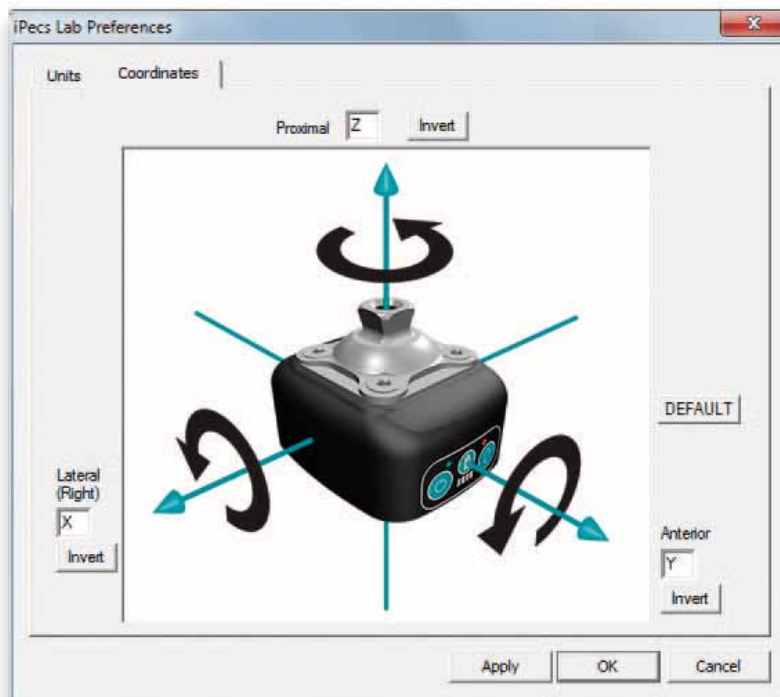
D Command /Send: This button is used to control certain functions of the iPecs Lab sensor remotely (from the PC) by the user. These functions are available in the pull-down menu:

COMMAND	DESCRIPTION
Clear Errors	Selecting this command and clicking on Send clears any errors (indicated by the red LED) on the iPecs Lab sensor.
Clear Zeros	This command clears any relative values set by the user and enables the iPecs Lab sensor to output raw voltages.
Toggle Spectrum Analyzer	This command brings up a new window depicting the Radio frequency spectrum between 2400 to 2483 MHz.
Zero	Sending this command to the iPecs Lab sensor has the same effect as pressing the zero-button on the iPecs Lab sensor.

Software Overview

Setting System Preferences

Click on [Edit](#) in the menu bar of the Main iPecs Lab software window and select [Preferences](#) to bring the window into view.



Units

Select how you want to measure and view the collected data.

UNIT	VALUE
Force	pound, Newton, kilogram-force
Moment	inch-pound, foot-pound, Newton-meter, kilogram-force meter
Distance	inch, foot, meter, centimeter, millimeter



Set the unit preferences before collecting data. Units cannot be changed in the iPecs Lab software after data collection begins.



Preferences default to **pound**, **inch-pound** and **inch** every time the software is re-launched.

Coordinates

Select the orientation of the sensor, based on the mounted unit.

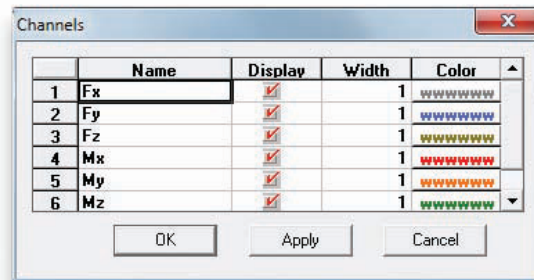
COORDINATE	VALUE
Lateral (test subjects right)	Values must be chosen based on the Cartesian Coordinate System ($\pm x$, $\pm y$, or $\pm z$)
Anterior	<i>It is not possible to enter or have two identical coordinates (i.e. x, $-x$, y)</i>
Proximal	

Software Overview

Channel Preferences

To modify the line-width of the signal plots, signal display color or scaling within the plot, select **Edit** from the menu bar and click on **Channels**.

This brings up the following **Channels** window where the user can select options to customize the appearance of the plots in the main iPecs Lab software window.



Channel	Ave. Value	Min. Value	Max. Value	P-P. Value	Std. Dev.
Fx	-8.9	-20.6	4.3	24.9	8.63
Fy	-18.9	-53.7	14.6	68.4	20.51
Fz	96.5	-10.8	190.9	201.6	76.65
Mx	199.1	-166.1	616.1	782.3	258.09
My	5.0	-27.1	80.1	107.2	23.94
Mz	26.2	-5.3	72.6	77.9	26.59

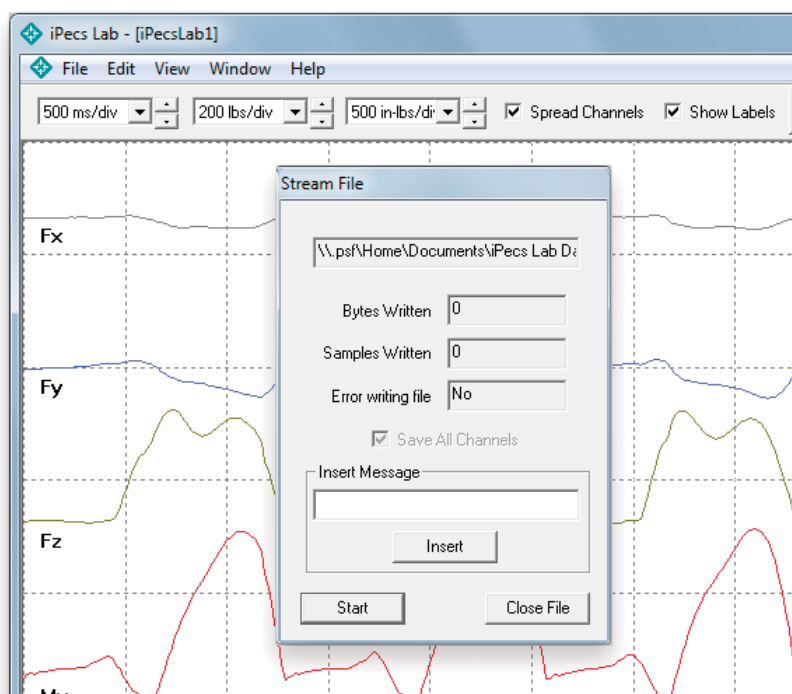
Displaying Channel Values

The values of the forces and moments can be displayed in a separate window. To do this, click on **View** in the menu bar and select **Show Channel Values**.

Recording Data

06





Recording Data

Streaming Data to File

The data displayed on screen in real-time can also be stored on a medium of the user's choice (the hard-disk of the PC on which iPecs Lab software is running). To do this, click on **File** in the menu bar and select **Stream Data to File**. This brings up a **Save File** window. Select the location and name of the file, to save the data points appearing on the screen. The default extension for the file is **.txt** (plain text file).

Once the file name is entered, click on **Save** to open the next window.

Clicking on **Start** in this window will start data recording while simultaneously, the **Bytes Written** and **Samples Written** fields count up rapidly.

To stop recording data, click on **Close File**. This closes the **Stream File** window and saves all the data recorded in the previously saved file.

Recording Data

Streaming File Playback

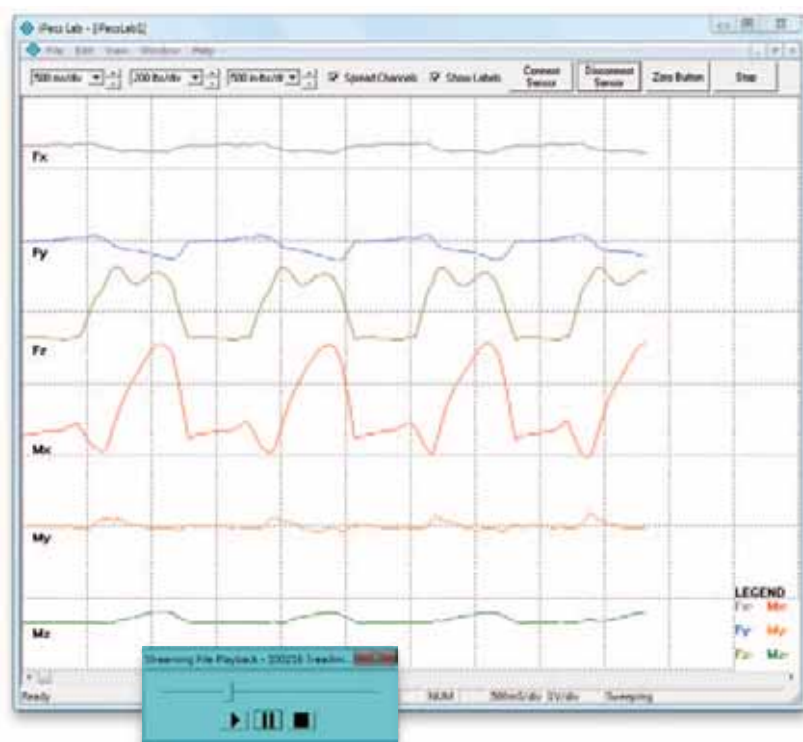
The data recorded by the iPecs Lab software can be played back when the iPecs Lab sensor is disconnected from the iPecs Lab DCM. In order to playback the recorded stream file, first, click on [Close iPecs](#) in the main program window, then select [File](#) in the menu bar and click on [Playback Streaming File...](#)

This will bring up a File Selection window where the user can select a file and this file will be played back at the same rate at which it was recorded.

The small window at the bottom right of the iPecs Lab software main window can be used to control playback when it is playing ([Go to Start](#), [Play](#), [Pause](#), [Stop](#), [Go to End](#)).



Closing window ends playback and closes streamed file.



Uninstalling Software

07



Uninstalling Software

This section provides the details steps to uninstall the iPecs Lab software. The uninstall procedures are similar for Windows Vista and Windows 7 and hence, have been grouped together.

Windows® XP

In order to uninstall the iPecs Lab software from a PC running Windows XP, click on the [Start menu](#) and select [Control Panel](#).

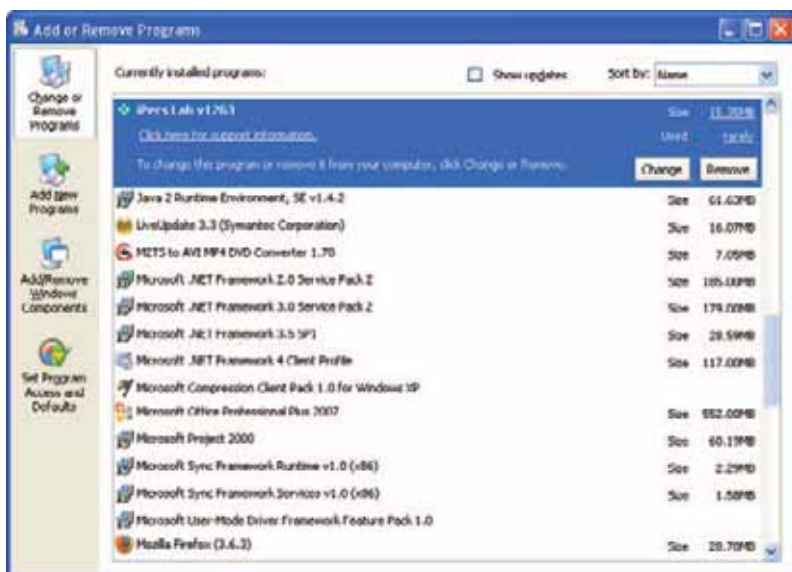
In the Control Panel, click on [Add or Remove Programs](#) link to bring up the list of programs installed on the PC. From this list, select [iPecs Lab](#) application and click on [Change/Remove](#).

Windows will show a dialog box requesting confirmation of the program uninstall operation. Select [Yes](#).



This remove operation will take a few minutes to complete depending on the configuration of the system.

The final window will display a verification of the successful software uninstall.





Uninstalling Software

Windows® Vista/7

In order to uninstall the iPecs Lab software from a PC running Windows Vista/7, click on the **Start Menu** and select **Control Panel**.

In the Control Panel, under **Programs** heading, click on **Uninstall a program** link. This will bring up the list of programs installed on the PC. From this list, double-click on **iPecs Lab** application.

Windows will show a dialog box requesting authorization for this action. Select **Continue**.

The next window confirms this action. Click **Yes**.



This remove operation will take a few minutes to complete depending on the configuration of the system.

The final window will display a verification of the successful software uninstall.

Uninstalling USB Driver

08



Uninstalling USB Driver

Windows® XP

To uninstall the USB Driver, connect the iPecs Lab DCM to the PC using the USB cable, click on the **Start Menu**, right-click on **My Computer** and select **Properties**.

From the System Properties window:

STEP 1 Select the **Hardware** tab at the top of the window.

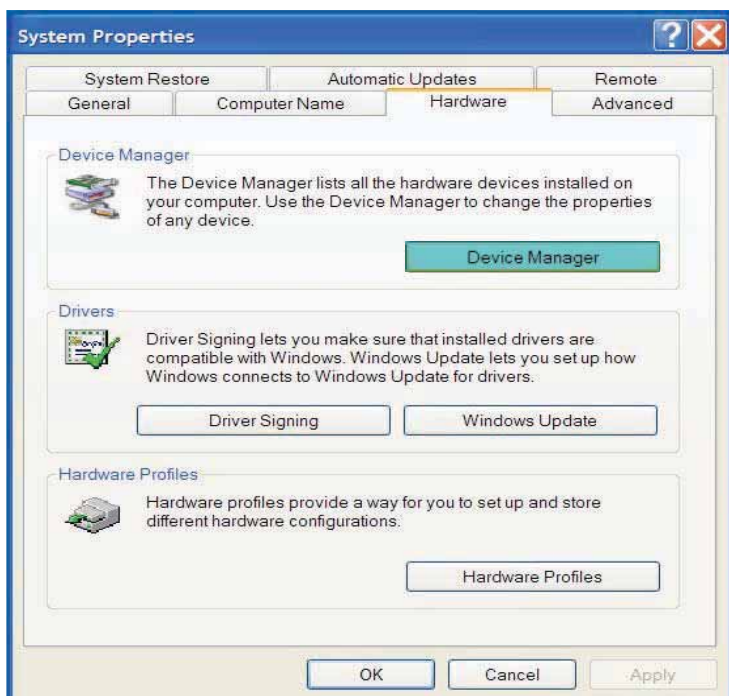
STEP 2 Click on **Device Manager** to see a list of Hardware Peripherals connected to your system (internal and external).

STEP 3 Under Ports (COM & LPT), right click on **Luminary Micro USB serial port (COM xx)** and select **Uninstall** from the drop-down-menu.



The number of the COM port varies among systems. Look for the name **Luminary Micro USB serial port**

STEP 4 Click **OK** in the resulting dialog box to uninstall.



Uninstalling USB Driver

Windows® Vista/7

To uninstall the USB Driver, connect the iPecs Lab DCM to the PC using the USB cable, click on the **Start Menu**, right-click on **Computer** and select **Properties**.

From the System Properties window:

STEP 1 Select the **Hardware** tab at the top of the window.

STEP 2 Click on **Device Manager** to see a list of Hardware Peripherals connected to your system (internal and external).



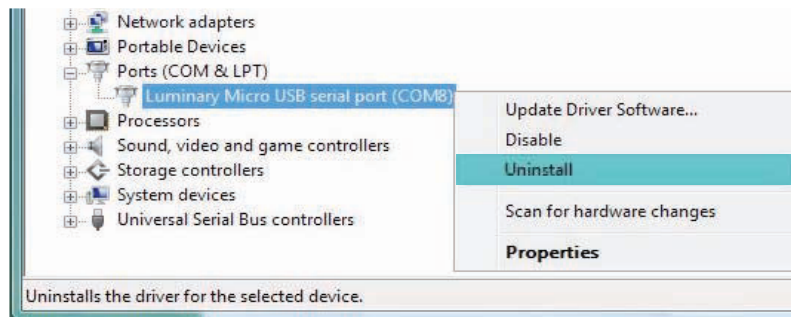
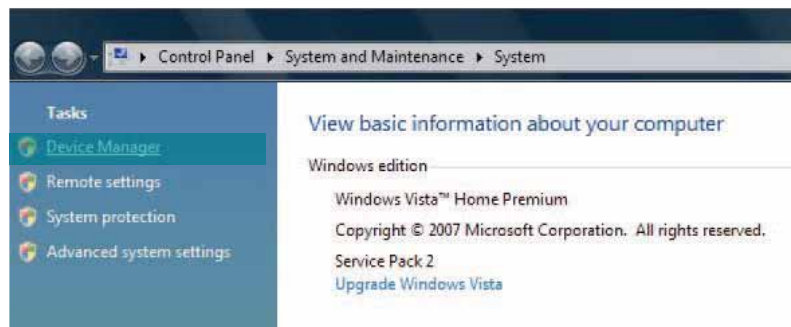
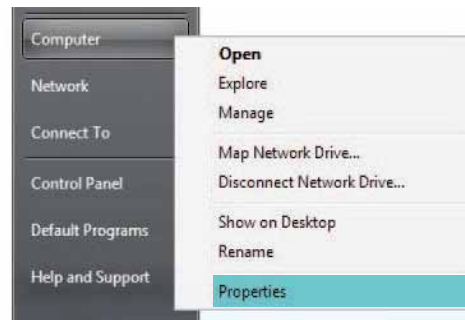
Before opening **Device Manager**, Vista/7 brings up a User Account Control permission dialog requesting your permission to run the software setup. Click on **Continue** to move ahead.

STEP 3 Under Ports (COM & LPT), right click on **Luminary Micro USB serial port (COM xx)** and select **Uninstall** from the drop-down-menu.



The number of the COM port varies among systems. Look for the name **Luminary Micro USB serial port**

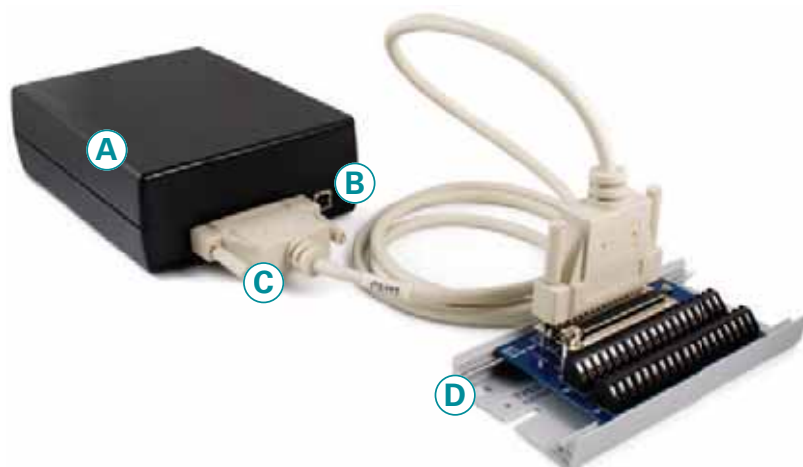
STEP 4 Click **OK** in the resulting dialog box to uninstall.



System Calibration

09





DCM Components

- A** iPecs Lab DCM (data collection module)
- B** USB Connector
- C** DB 37 Connector
- D** DB 37 Break Out Unit

System Calibration

Calibration for External Data Acquisition

The following instructions are used to complete the connection between the iPecs Lab System and pre-existing customer equipment. This connection is made through the analog signal input port.



This section can be ignored if the data is collected solely by the iPecs Lab application.

The iPecs Lab System is delivered with a unique calibration data file that is used by the iPecs Lab software to convert strain data received from the sensor to forces and moments. Because the system strain data is transmitted digitally to the DCM, the accuracy of calculated forces and moments is maintained.

When system strain data is transmitted in analog format to customer equipment, there is potential loss of accuracy. However, advantages to this approach are additional control of sampling rates, and synchronizing of strain data with data from other sources, such as force plates. In this case, the customer is responsible for calculating iPecs Lab System forces and moments from digitized strains using the calibration data provided with the unit. Calculation of forces and moments from strains is outside the scope of this manual.

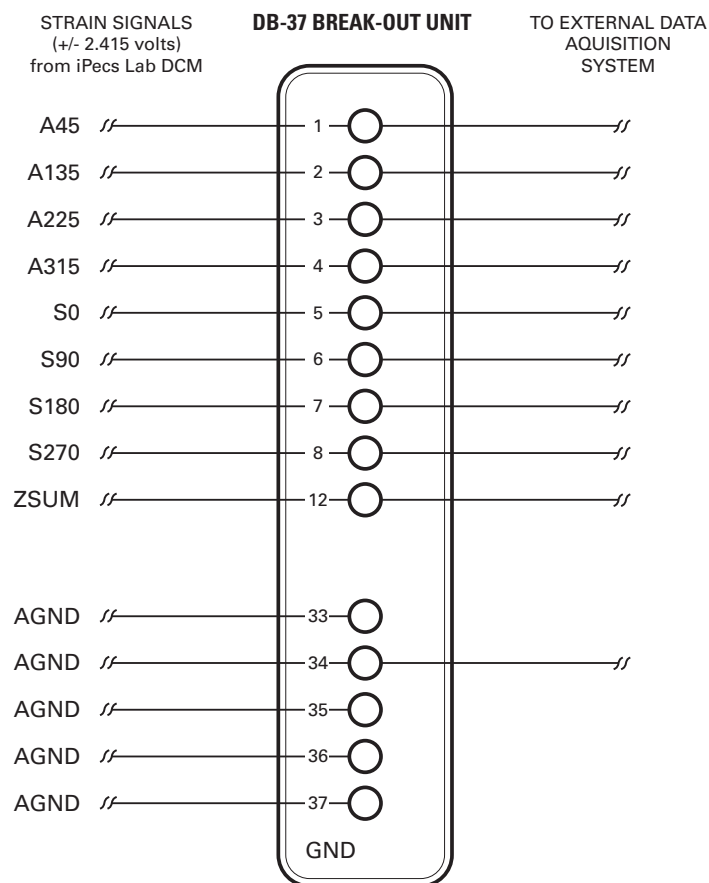
To allow collection of the iPecs Lab System strain data by a customer's existing data acquisition system, the DCM has an analog output signal port. With this port, the connection protocol and cables that are provided with the system may be used to make connections to customer equipment. To ensure that accuracy is maintained, the customer should perform a system calibration on this connection. The system calibration corrects for small errors

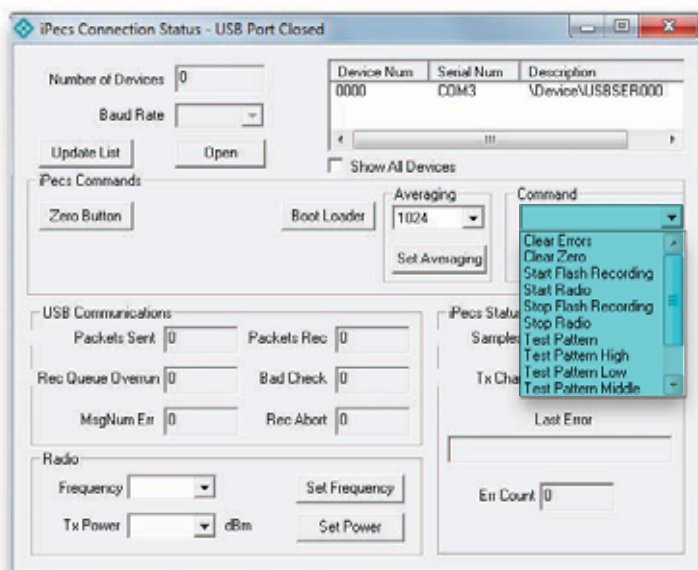
System Calibration

in DCM digital-to-analog conversion and customer equipment analog-to-digital conversions for each data channel. The DCM analog signal voltage range is slightly less than ± 2.5 volts.

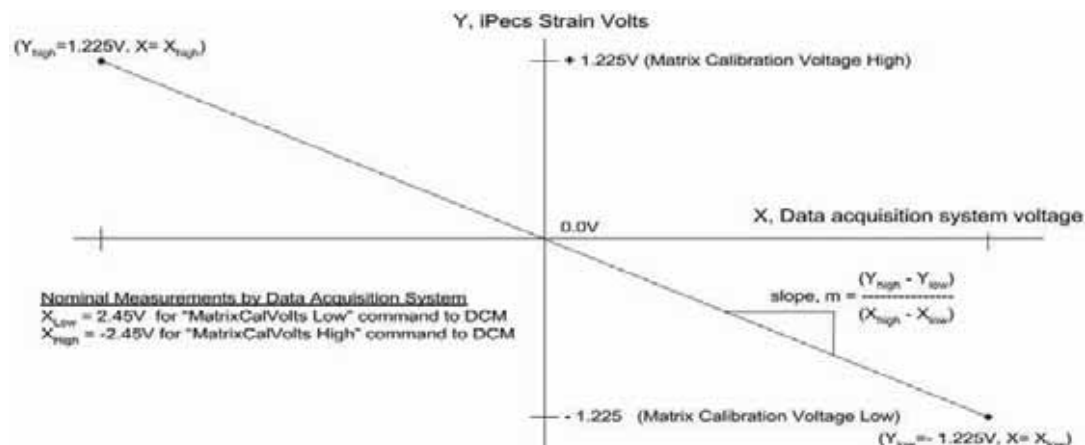
Calibration Procedure

STEP 1 Complete wire connections from the iPecs Lab DCM to the customer equipment using the provided connection protocol, cables and short jumper wires. Shielding these jumpers using GND is recommended ([SEE DIAGRAM](#)).





- STEP 2** Connect the USB cable connection between the DCM and PC that will run the iPecs Lab software.
- STEP 3** Turn the sensor **ON**. It is required for this procedure.
- STEP 4** Start the iPecs Lab application.
- STEP 5** In the iPecs Lab software main window, click the **Connect to sensor** button on the toolbar.
- STEP 6** Use the Command control to select **Test Pattern High** from the drop-down menu. Click the **Command** control button **Send** to cause the test selection to be sent to the DCM. The DCM output voltage should be set to approximately **negative 2.4 volts**.
- STEP 7** Record the voltage measured by the data acquisition system for 8 data channels in the calibration calculation workbook **xxxxxx Analog Interface Calibration.xls**, that was included in the install CD.



System Calibration

SECTION

01

02

03

04

05

06

07

08

09

10

44

SIGNAL NAME	DCM	Customer Pin/Wire	DCM System Analog Readings (Volts)		Scale Factor (Multiplier)	Zero Offset (Volts)
	J3 Pin		DCM Low Output	DCM High Output	iPecs A/D > DCM D/A > DAS A/D	
A135	2				1.0	0.0000
A225	3				1.0	0.0000
A315	4				1.0	0.0000
S0	5				1.0	0.0000
S90	6				1.0	0.0000
S180	7				1.0	0.0000
S270	8				1.0	0.0000
ZSUM	12				1.0	0.0000



Do not type in the grey shaded cells as they contain formulas. Customer data acquisition voltage measurements for the *Test Pattern High* should be placed in the column labeled *DAS High Output*. Similarly, measurements for *Test Pattern Low* should be placed in the column labeled *DAS Low Output*.



You may need to force Excel to *Calculate Now* to update *Scale Factor* and *Offset values*.



Remember to save your work.

STEP 8 Repeat Step 7 for Command control setting *Test Pattern Low* and press *Send*. The DCM output voltage should be set to *positive 2.4 volts*, approximately.

Important Note: Open the workbook in Excel and select the worksheet *Customer DAS Calib Overall* to see the form illustrated in the table above.

This should fill the cells corresponding to strains labeled A135, A225, A315, S0, S90, S180, S270 and ZSUM.

The **Scale Factor** should be approximately -0.5, and the offset should be near zero. Any differences between channels represent analog circuit errors.

System Calibration

- STEP 9** Select the *Command* control setting *Test Pattern Off*, and press *Send* to re-enable the iPecs Lab System data.
- STEP 10** Enter the scale factor and zero offset values into the researcher's data acquisition system.
- STEP 11** Turn the sensor *OFF* and exit the iPecs Lab software.
- STEP 12** To acquire forces and moments the 8 strain voltages need to be multiplied by the calibration matrix transposed. *See formula below*. The result will be 6-forces and moments in the order of FX, FY, FZ, Mx, My, Mz with units of lbs. and in-lbs.

$$\begin{bmatrix} n \times 8 \left(\begin{array}{c} \text{voltage} \\ \text{strain data} \end{array} \right) \end{bmatrix} \cdot \begin{bmatrix} 6 \times 8 \\ \text{Calibration Matrix} \end{bmatrix}^T = \begin{bmatrix} n \times 6 \left(\text{Fx, Fy, Fz, Mx, My, Mz} \right) \end{bmatrix}$$

Troubleshooting

10



Troubleshooting

Possible System Issues

Checking Battery Status	<p>Press the battery button on the sensor and observe the number of amber LEDs lit:</p> <ul style="list-style-type: none"> 0= No Charge/Dead Battery 1= Low Charge 2= Half Charge 3= $\frac{3}{4}$ Charge 4= Full Charge 	
Battery Charge is Low	Recharge the battery using the supplied USB cable from the PC.	
Sensor and DCM are not communicating	<p>While communicating with the DCM, the sensor uses a default frequency of 2412 MHz. If this frequency is shifted on only one of the two (sensor or DCM) they will not be able to communicate. When this happens, disconnect the DCM from the PC and press and hold the power and the zero buttons on the sensor until the red and green LEDs turn on and off. This resets the sensor's frequency to the default value and allows communication when the DCM is turned on.</p>	
Red LED (above the Zero button) is ON	<p>This indicates a general error in the sensor, shown also as a text message under <i>Last Error</i> field (in the <i>iPecs Status</i> area in the <i>DCM Connection Status</i> window). The error condition can usually be corrected/cleared by sending the <i>Clear Errors</i> command within the iPecs Lab software. Refer to the software function Command/Send (section 6).</p>	
	Supply Voltage Too Low	<p>The supply voltage needs to be corrected. Recharge the sensor, refer to Charging the iPecs Lab sensor (section 4).</p>
	Force or Moment Management Saturation	<p>You have exceeded the 800 lb load limit. To clear errors, refer to the software function Command/Send (section 6).</p>
	All other errors	<p>Contact College Park Technical Support at techsupport@college-park.com or call 800.728.2950</p>

Troubleshooting

Frequently Asked Questions

Question	Answer
The Sensor seems to have turned itself ON without actually pressing the power button	During times of inactivity, the sensor that is running will enter a lower power Sleep Mode to save battery power. If activity is detected in Sleep Mode, the sensor will reactivate, giving the appearance of turning itself ON spontaneously.
All other questions	Contact College Park Technical Support at 800.728.7950 or techsupport@college-park.com

Environmental Use



Do not expose the iPecs Lab System to the following: temperature extremes, moisture, corrosive materials or debris.



Recharging the sensor battery may only take place when ambient temperatures are within the charging temperature range of 0 – 40° C (32 – 104° F). Do not charge in enclosed vehicles or while the iPecs Lab sensor is exposed to direct sunlight.



Long term battery storage life may be shortened when the sensor is exposed to ambient temperatures above 25° C (77° F). Do not store in enclosed vehicles or where the iPecs Lab sensor is exposed to direct sunlight.



Battery performance may be affected when the sensor is exposed to ambient temperatures outside its specified operating temperature of 0 – 60° C (32 – 140° F). Do not operate in enclosed vehicles or while the iPecs Lab sensor is exposed to direct sunlight.

Troubleshooting

Intended Use



When recharging the sensor, use only the AC Adapter supplied with the system, or the USB power provided by a computer that complies with IEC 60950-1.



Due to risk of shock: Do not wear the prosthetic limb with the iPecs Lab sensor attached while it is being charged.



Due to risk of shock: Always disconnect the iPecs Lab sensor from the charging source prior to putting on the prosthetic limb.



Do not place the iPecs Lab sensor in a vice or use any other type of rigid constraint. Doing so would over compress the outer cover and severely damage the sensor. Use only the provided sensor fixture.



Do not disassemble the iPecs Lab sensor housing or attempt to remove the battery. The iPecs Lab sensor is a non-serviceable unit. Contact College Park Industries Technical Support for software and hardware issues.



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