



CyberGlove[®] II Wireless Data Glove



User Guide

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Introduction

Product Description

The CyberGlove® II wireless data glove is a lightweight, comfortable, fully instrumented glove that provides up to 22 high-accuracy joint-angle measurements. It uses proprietary resistive bend-sensing technology to transform, with high accuracy, hand and finger motions into real-time digital joint-angle data. Using 2.4 GHz wireless technology provides the freedom to capture finger movement within 30 feet from the host computer.

CyberGlove II Features

The CyberGlove II wireless data glove has the following features:

- Up to 22 high-accuracy joint-angle measurements
- Freedom to capture finger movement within 30 feet from the host computer
- 2.4 GHz wireless technology
- Real-time digital joint data
- Long battery life
- Lightweight comfort
- High accuracy and high resolution

System Requirements

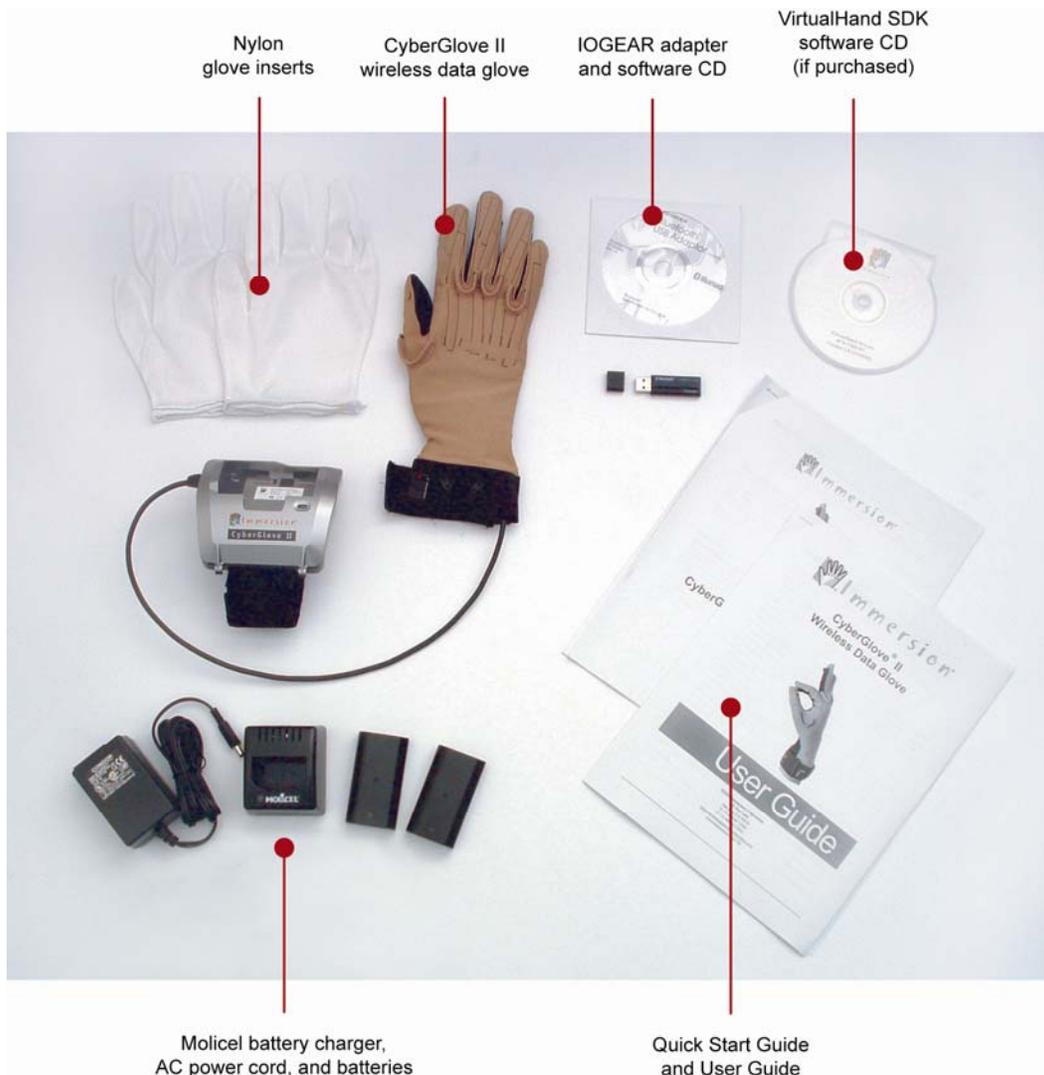
The CyberGlove wireless data glove requires a host computer that has the following minimum requirements:

- Microsoft Windows 2000 SP 4 or XP SP 2 compatible
- Pentium III 800 MHz CPU
- 512 MB RAM
- 60 MB of disk space
- Available USB port (version 1.1 minimum)
- High-end graphics card

Packing List

The CyberGlove II wireless data glove comes with the following items:

- CyberGlove II wireless data glove
- Nylon glove inserts (2)
- IOGEAR USB Bluetooth Adapter 2.0 + EDR and software CD (referred to throughout this document as the “IOGEAR adapter”)
- Molicel battery charger and AC power cord
- Molicel rechargeable batteries (2)
- Quick start guide
- This user guide
- CyberGlove Systems VirtualHand® software CD (if purchased separately)



(Packaging may slightly differ from photo)

Installation and Setup

Unpack and ensure all parts are accounted for. You may have additional CDs or documentation if you purchased additional software packages with your CyberGlove II system.

Setup Procedure

To prepare your CyberGlove II system for use the first time, four steps are necessary:

- Battery charging
- Battery installation
- Device Manager and Device Configuration Utility (DCU) installation
- IOGEAR adapter and software installation

Battery Charging

The CyberGlove II system comes with a Molicel MQC-1821B Li-ion charger and two MCR-1821J lithium-ion rechargeable batteries.



Before you can use your CyberGlove system you will need to fully charge one of the two batteries provided. Please note the proper charging and safety precautions below. While the battery is charging, which takes about five hours, proceed with installation of the IOGEAR adapter and software.

The battery charger unit should only be powered by the AC adapter supplied with this unit. The rating for the AC adapter is 9V, 700 mA.

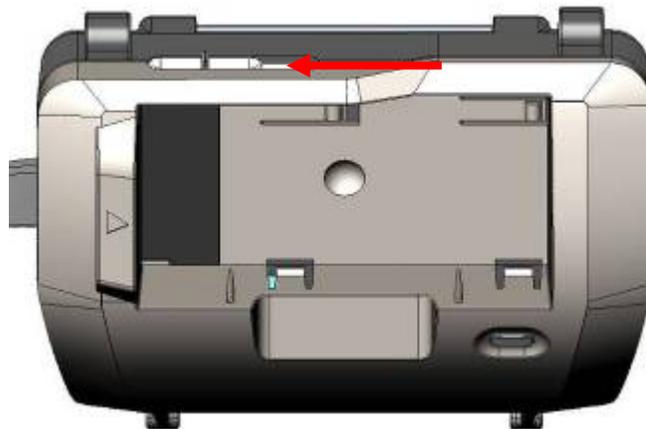
1. Plug the AC adapter into a standard wall outlet using the supplied power cable.
2. Plug the output plug of the AC adapter into the back of the charger. When power is correctly applied, the status indicator will be green.
3. The operation of the charger is fully automatic. Simply place the battery pack into the charger pocket. Ensure that the two gold contacts on the pack are placed face down into the charger pocket. The status indicator will change to red to indicate that the charger is charging the battery.
4. When the battery is fully charged, after approximately 5 hours, the status indicator will be green.
5. The status indicator turning off indicates the operating temperature is out of range.

Caution

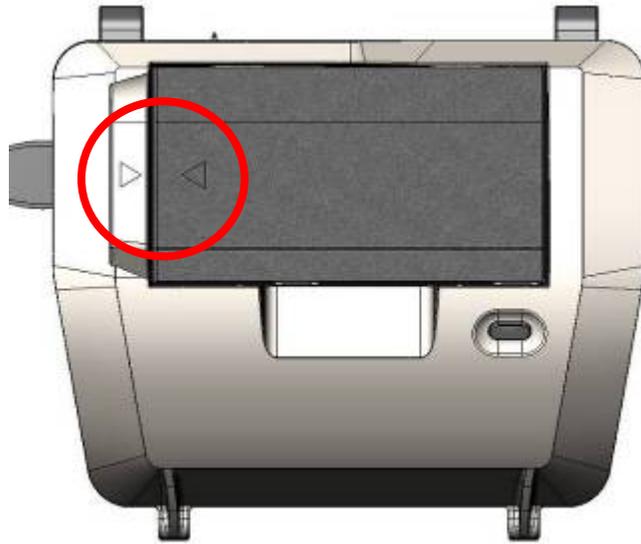
- Only use the charger for charging Molicel MCR-1821 lithium-ion rechargeable battery packs.
- Although the charger may become warm during charging, this is normal.
- Do not cover the vent holes in the back of the charger.
- For indoor use only. Do not operate in wet or damp environments.

Battery Installation and Removal

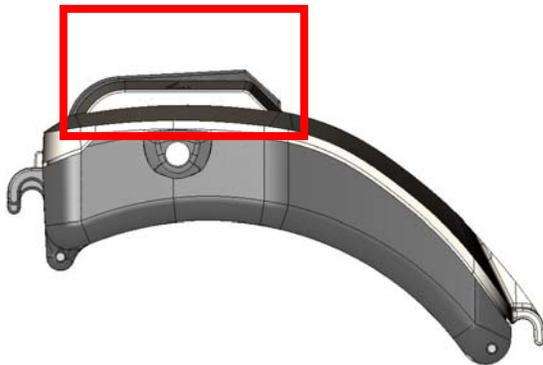
Before inserting batteries into the interface module, ensure that the battery locking slider is at the left-most position as shown here.



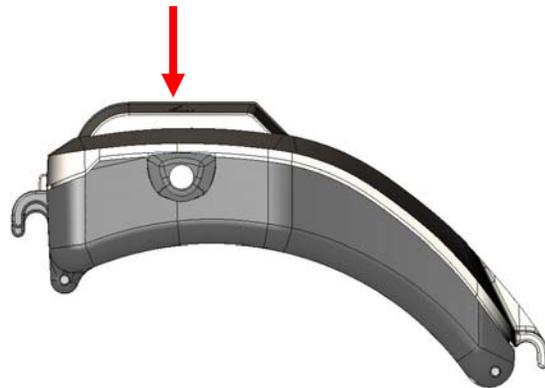
Insert the battery, aligning the arrow marker on the battery to the arrow marker on the case.



Ensure that the battery is completely inserted into the battery compartment. If not completely inserted, press gently on the battery until it snaps into place.

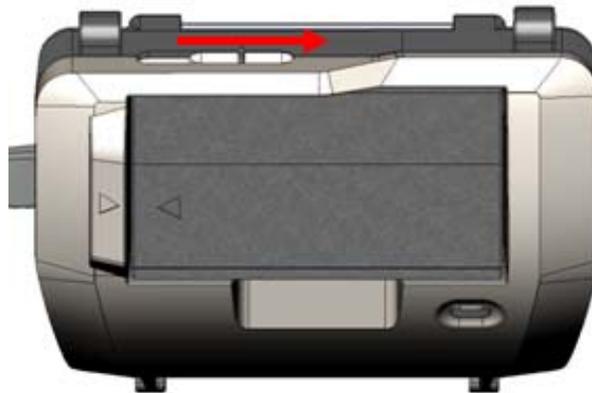


Incorrect Battery Installation



Correct Battery Installation

When the battery is fully seated, slide the battery locking slider to the rightmost position.



To remove the battery, power down your CyberGlove II system by pressing and holding down the single button on the interface module until the LED lights amber.



When power is off, slide the battery locking slider to the left-most position. Grab the battery on both sides. Tilt the battery, then pull it straight out. The latching mechanism prevents battery removal unless it is tilted first.

Device Manager and Device Configuration Utility (DCU) Installation

CyberGlove Systems's VirtualHand SDK, which is purchased separately from a CyberGlove II system, includes the Device Manager and Device Configuration Utility (DCU). The DCU builds a registry of all CyberGlove Systems motion capture devices and their network connection architecture, allowing you to simultaneously integrate data from devices running on several computers. You may also integrate other devices such as Polhemus, Ascension, and InterSense trackers with the VirtualHand SDK.

Alternatively, CyberGlove Systems offers plug-in software, VirtualHand for MotionBuilder, which provides access to the CyberGlove II in AutoDesk's MotionBuilder software. Virtual Hand Motion Builder plug-in also includes the Device Manager and DCU as described above.

To install and authorize the SDK:

- Double click the 'setup' file on the CD.
- Once installed, authorize the SDK using the authorization utility by selecting Start Menu → Programs → CyberGlove Systems LLC → VirtualHand SDK -> Authorization Utility. A dialog box will display a Site Code number. Send this number to CyberGlove Systems at fyazadi@cyberglovesystems.com. CyberGlove

Systems will reply with the Site Key that will give you access. Enter the Site Key in the proper field.



Authorization Utility

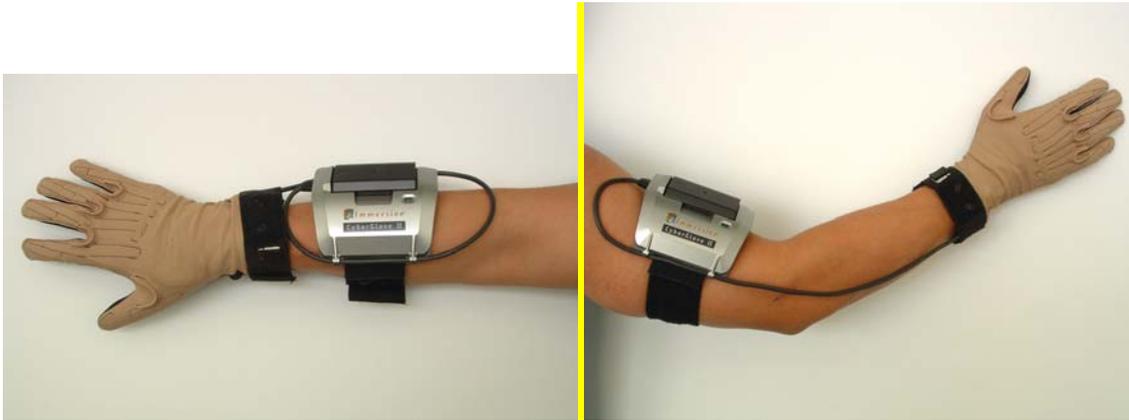
IOGEAR Adapter Installation

 <p>The screenshot shows the IOGEAR Bluetooth 2.0 EDR Adapter installation interface. At the top, there are four buttons: 'WINDOWS VISTA Installation', 'WINDOWS XP / 2000 Installation', 'INSTALL Guide', and 'Exit X'. Below these is the IOGEAR logo and a decorative background with flowers and a butterfly. The main title is 'Bluetooth 2.0 EDR Adapter' with the subtitle 'GBU221 DRIVER INTALLTAION (Version 1.1)'. A cartoon character is visible in the bottom right corner.</p>	<ol style="list-style-type: none"> 1. The IOGEAR Bluetooth 2.0 EDR Adapter drivers must be installed. Follow the steps after inserting the CD that accompanies the IOGEAR Adapter. <p>Note: The adapter should not be plugged in until prompted.</p>
 <p>The screenshot shows the 'Initial Bluetooth Configuration Wizard' window. The title bar reads 'Initial Bluetooth Configuration Wizard'. The main text says: 'Initial Bluetooth Configuration Wizard. Before you can begin using Bluetooth on this computer you must perform some initial setup. This wizard will help you to configure a basic Bluetooth environment. You can access the Bluetooth features on this computer through the Bluetooth icon on the desktop or in the system tray. This icon can also appear in the following locations. Select the locations you want the icon to appear and click Next.' There are three checked checkboxes: 'Add the icon to the Start menu', 'Add the icon to the Programs menu', and 'Add the icon to My Computer'. A Bluetooth icon is shown to the left. At the bottom are buttons for '< Back', 'Next >', and 'Cancel'.</p>	<ol style="list-style-type: none"> 2. Early on in the installation process, you will be prompted to plug in the adapter. ("No Bluetooth Device Found" message appears). Do so and click OK to proceed. 3. In the Bluetooth Configuration Wizard, accept all the default choices and click Next.
 <p>The screenshot shows the 'Initial Bluetooth Configuration Wizard' window at a later step. The title bar reads 'Initial Bluetooth Configuration Wizard'. The main text says: 'Initial Bluetooth Configuration Wizard. This wizard can help you setup connections to Bluetooth computers, phones, headsets, etc. To setup a connection now, put the other device in pairing mode, and then click Next. (See the other device's documentation for assistance in preparing it to accept a connection). To setup connections later, click Skip.' At the bottom are buttons for '< Back', 'Next >', 'Skip', and 'Cancel'.</p>	<ol style="list-style-type: none"> 4. When prompted to setup connections, click Skip. You will do this later. Once you finish the installation, you should see the Bluetooth icon in your system tray.

Operating Procedure

Mounting the Interface Module

Using an arm band, the CyberGlove II interface module can be mounted on either forearm or upper arm.



For forearm use, the excess cable is wrapped around the module and secured under the four cable hooks as shown.

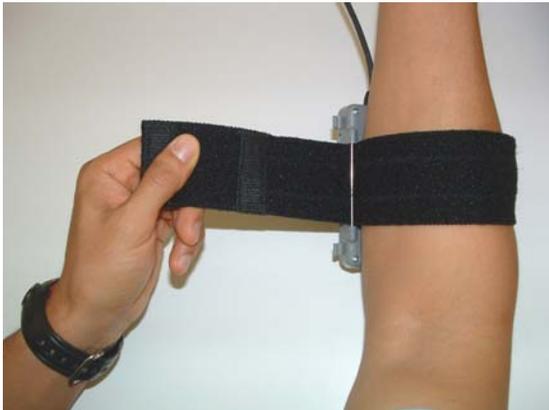


The interface module can be mounted in either direction to accommodate various arm lengths.

Be sure to mount the interface module before putting on the glove itself. Insert the users arm through the arm band.



Secure the arm band by pulling on the end as shown. Fold the strap back around and secure via the Velcro strips at the end of the strap.



Putting On and Removing the CyberGlove System Glove

Your CyberGlove II system comes with one or more thin nylon glove inserts, which should always be worn underneath the CyberGlove II system glove. The nylon glove inserts not only help keep your CyberGlove II system glove cleaner, they facilitate inserting and removing larger hands, though they may make the CyberGlove II glove feel slightly tighter. A brand new glove might feel slightly snug at first but will stretch and loosen with use.



1. Make sure your hands are dry, put on the nylon glove insert, and then insert your hand into the system glove slowly and gently.
2. Pull gently on the reinforced portion of the glove wristband, in the middle of the wrist opening on the palm side. You may also alternately gently pull on the thumb side and the little finger side of the wristband until the glove is fully on.

Caution

Do not pull on the middle portion of the wristband on the top of the wrist, as this may damage wires located directly below the Velcro position-sensor mount. Never over-stress the material or you may permanently damage it. DO NOT pull on the “U”-shaped abduction sensors.

3. For best performance, after the glove is on, push any fabric creating a web effect between your fingers toward your palm so that it conforms well to each finger.

Removing the Glove

- Remove the glove slowly and gently. Pull only on the reinforced fingertip tabs (the outer 1/2" of the fingertip of the glove that covers the fingernail). If you attempt to grab down further on the finger of the glove, you may grab on a sensor and damage it.



- Do not yank on the tabs, but rather gradually increase the tension to allow sensor wires inside the glove to adjust and slide relative to the stretching material.

- You may need to successively pull on each fingertip tab before you can insert your other hand into the palm opening and push the glove off. Take your time and do not over-stress the material.



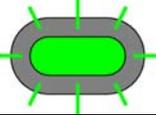
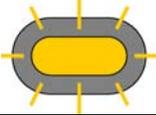
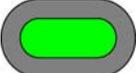
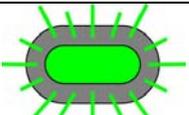
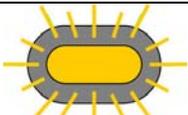
Powering Up the CyberGlove System

Install a charged battery, and then turn on the CyberGlove II system by pressing and holding the button on the interface module until the LED turns on. The LED should be a green color for a charged battery. If the LED color is amber, the battery is low or not properly installed.

To turn off the system, press and hold the button until the LED turns from green to amber.

NOTE: The IOGEAR adapter and software and the Device Manager and DCU must first be installed before you can wirelessly connect to the glove and gather data. See Installing the IOGEAR Adapter and Manager (page 8) and Installing the Device Manager and Device Configuration Utility (page 6).

The following LED legend describes system status:

LED	STATUS (Battery Normal)	STATUS (Battery Low)	STATE
SLOW FLASH			LED slow flashing (1 Hz) Wireless link not connected
STEADY LIGHT			LED full/constant Wireless link connected
FAST FLASH			LED fast flashing Wireless link connected; Wireless link collision

Ensure that the glove is in the “Wireless Link Not Connected, Battery Normal” state before connecting through the IOGEAR adapter.

Note that occasional flashing of the LED (once every few seconds or tens of seconds) is an indication of normal 2.4 GHz wireless data transmission load. Excessive flashing is a sign of excessive air traffic from other proximate devices in the 2.4 GHz frequency band, resulting in intermittent loss of CyberGlove II data transmission. When witnessing excessive flashing, identify and remove other proximate sources of heavy 2.4 GHz wireless air traffic.

Connecting to Bluetooth Wireless Network

After VirtualHand software and the IOGEAR adapter have been configured and the CyberGlove II system turned on, connect the CyberGlove II system to the 2.4 GHz network using these steps:

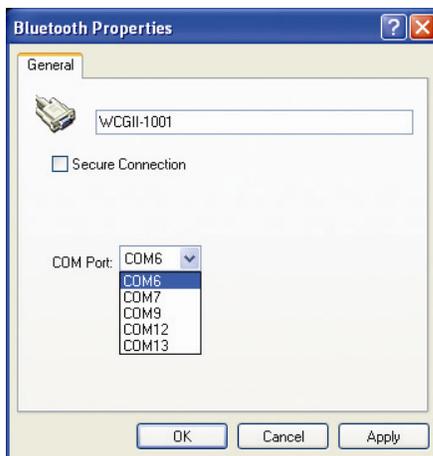
	<p>1. Right-click the Bluetooth icon located in the system tray and select Bluetooth Setup Wizard.</p>
	<p>2. The Bluetooth Setup Wizard will appear and ask you what you would like to do. Make sure the CyberGlove II system is turned on. Select the first option presented (“ I know the service I want to use and I want to find a Bluetooth device that provides that service”) and click Next.</p>
	<p>3. The Bluetooth Service Selection Wizard will appear. Choose Bluetooth Serial Port and click Next.</p>



4. In the Bluetooth Device Selection window, be sure to choose the Show all devices option in the drop-down menu. The wizard will now scan for all Bluetooth devices. Select the device corresponding to the serial number of your CyberGlove II (WCGII) and click Next.



5. In the Bluetooth Setup Wizard Completion Page, uncheck the box for Start the connection. Then click on Configure.

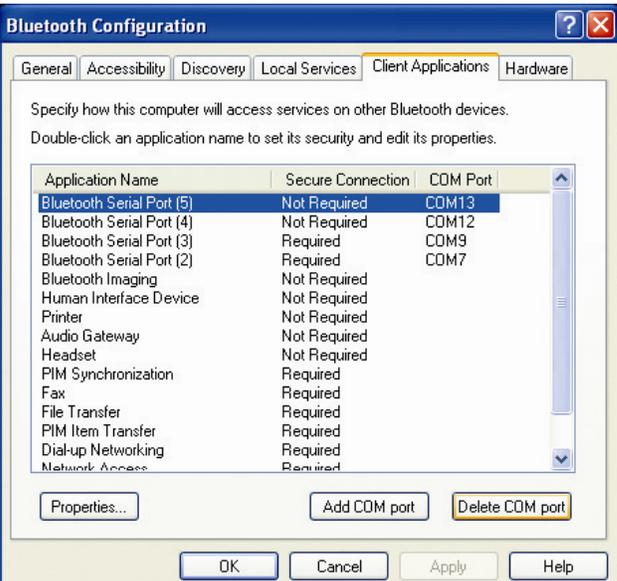


6. In the Bluetooth Properties window, uncheck the box for Secure Connection and choose a COM port from the drop-down menu. Click Apply and OK. Then click the Finish button on the Bluetooth Setup Wizard Completion Page.

Note: The default configuration of Bluetooth provides only one COM port. If you need to overwrite this COM port choice or if you are working with multiple CyberGloves, please see the Configuring Multiple Bluetooth COM Ports section below.

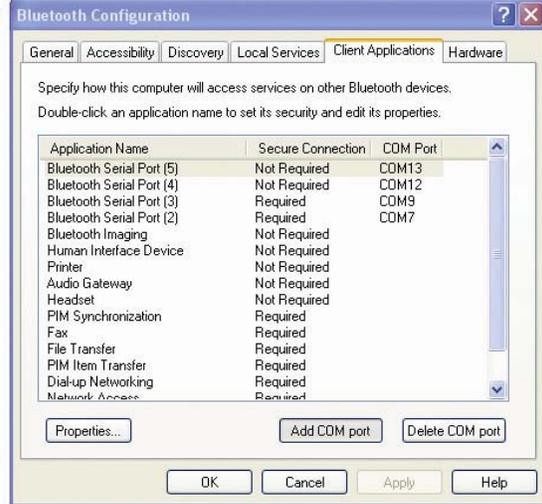
	<p>VirtualHand SDK supports COM ports up to 16. Please make sure the requested COM port is between 3 and 16.</p>
	<p>7. You are now ready to use your CyberGlove.</p> <p>Important: DO NOT double click (or right-click) to connect to your CyberGlove in My Bluetooth Places window. The connection needs to be initiated by the Device Manager/ DCU.</p>

Configuring Multiple Bluetooth COM Ports

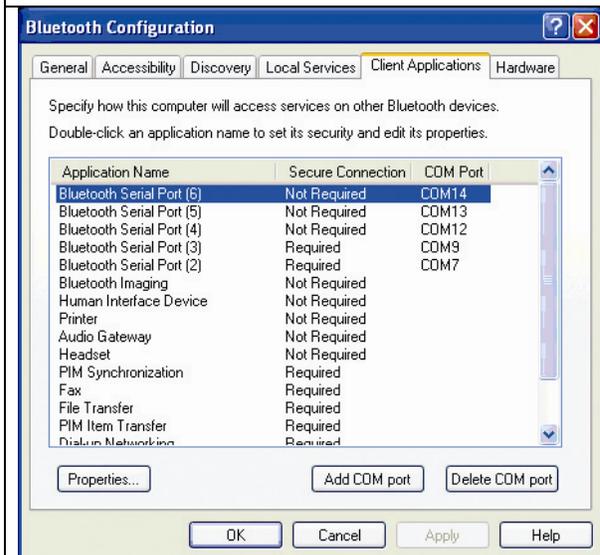
 <p>The screenshot shows a context menu titled "Explore My Bluetooth Places". The menu items are: "Bluetooth Setup Wizard" (highlighted in blue), "Advanced Configuration", "Quick Connect" (with a right-pointing arrow), and "Stop the Bluetooth Device".</p>	<p>1. Right-click the Bluetooth icon located in the system tray and select <i>Advanced Configuration</i>.</p>																																																
 <p>The screenshot shows the "Bluetooth Configuration" dialog box with the "Client Applications" tab selected. It contains a table of applications and their COM ports:</p> <table border="1" data-bbox="272 1444 824 1759"> <thead> <tr> <th>Application Name</th> <th>Secure Connection</th> <th>COM Port</th> </tr> </thead> <tbody> <tr><td>Bluetooth Serial Port (5)</td><td>Not Required</td><td>COM13</td></tr> <tr><td>Bluetooth Serial Port (4)</td><td>Not Required</td><td>COM12</td></tr> <tr><td>Bluetooth Serial Port (3)</td><td>Required</td><td>COM9</td></tr> <tr><td>Bluetooth Serial Port (2)</td><td>Required</td><td>COM7</td></tr> <tr><td>Bluetooth Imaging</td><td>Not Required</td><td></td></tr> <tr><td>Human Interface Device</td><td>Not Required</td><td></td></tr> <tr><td>Printer</td><td>Not Required</td><td></td></tr> <tr><td>Audio Gateway</td><td>Not Required</td><td></td></tr> <tr><td>Headset</td><td>Not Required</td><td></td></tr> <tr><td>PIM Synchronization</td><td>Required</td><td></td></tr> <tr><td>Fax</td><td>Required</td><td></td></tr> <tr><td>File Transfer</td><td>Required</td><td></td></tr> <tr><td>PIM Item Transfer</td><td>Required</td><td></td></tr> <tr><td>Dial-up Networking</td><td>Required</td><td></td></tr> <tr><td>Network Access</td><td>Required</td><td></td></tr> </tbody> </table> <p>Buttons at the bottom include "Properties...", "Add COM port", "Delete COM port", "OK", "Cancel", "Apply", and "Help".</p>	Application Name	Secure Connection	COM Port	Bluetooth Serial Port (5)	Not Required	COM13	Bluetooth Serial Port (4)	Not Required	COM12	Bluetooth Serial Port (3)	Required	COM9	Bluetooth Serial Port (2)	Required	COM7	Bluetooth Imaging	Not Required		Human Interface Device	Not Required		Printer	Not Required		Audio Gateway	Not Required		Headset	Not Required		PIM Synchronization	Required		Fax	Required		File Transfer	Required		PIM Item Transfer	Required		Dial-up Networking	Required		Network Access	Required		<p>2. Select the Client Application tab from the Bluetooth Configuration window. Then click on the Add COM port button.</p>
Application Name	Secure Connection	COM Port																																															
Bluetooth Serial Port (5)	Not Required	COM13																																															
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Dial-up Networking	Required																																																
Network Access	Required																																																

(see below)

3. Wait until Found New Hardware Wizard finishes copying drivers.



4. In the Bluetooth Properties window, uncheck the box for Secure Connection and then click OK.

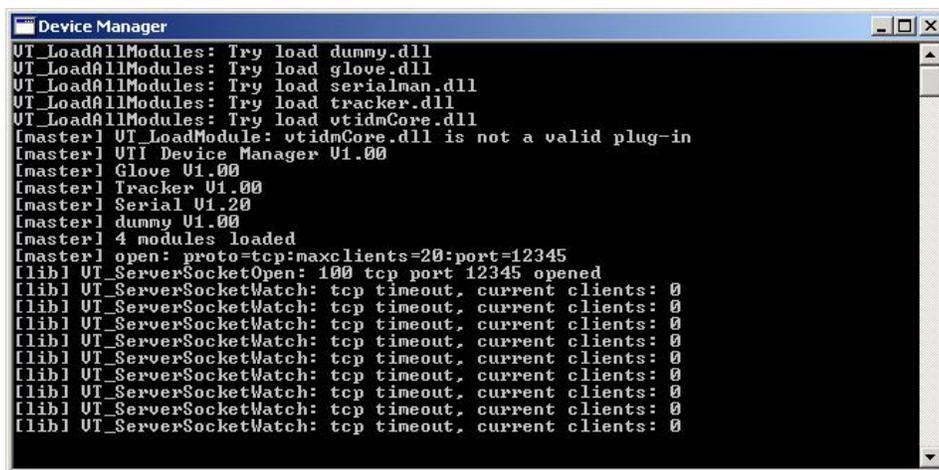


5. You should now see your new COM port listed in the Client Applications window and you are ready to use it.

Starting the Device Manager and Device Configuration Utility (DCU)

The DCU supplies a graphical user interface for the Device Manager, which provides a registry of all CyberGlove Systems motion capture devices, and Polhemus, Ascension, and InterSense tracker software, as well. There needs to be one Device Manager on each computer you are using for CyberGlove Systems products. One Device Manager can manage several products, and several Device Managers can work together to let you coordinate and integrate device data across a TCP/IP network of computers.

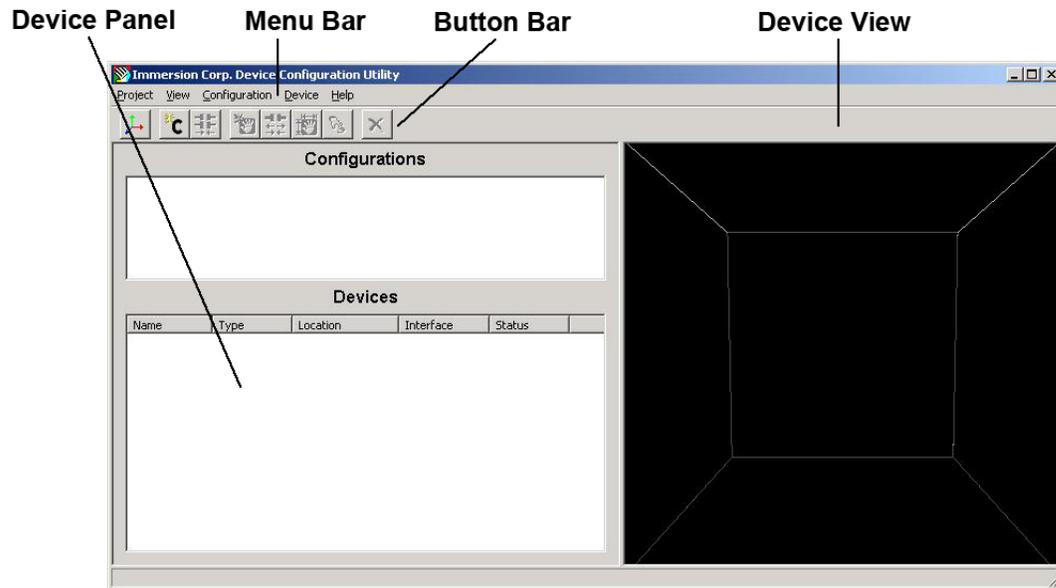
1) Click on the Windows Start menu button → Programs → VirtualHand SDK → Device Manager. The Device Manager console window will appear.



```
Device Manager
UT_LoadAllModules: Try load dummy.dll
UT_LoadAllModules: Try load glove.dll
UT_LoadAllModules: Try load serialman.dll
UT_LoadAllModules: Try load tracker.dll
UT_LoadAllModules: Try load vtidmCore.dll
[master] UT_LoadModule: vtidmCore.dll is not a valid plug-in
[master] UTI Device Manager V1.00
[master] Glove V1.00
[master] Tracker V1.00
[master] Serial V1.20
[master] dummy V1.00
[master] 4 modules loaded
[master] open: proto=tcp:maxclients=20:port=12345
[lib] UT_ServerSocketOpen: 100 tcp port 12345 opened
[lib] UT_ServerSocketWatch: tcp timeout, current clients: 0
```

Device Manager

2) Click on the Windows Start menu button → Programs → VirtualHand SDK → DCU. This will launch the DCU, consisting of the Menu and Button Bars, Device Panel, and Device Viewer.



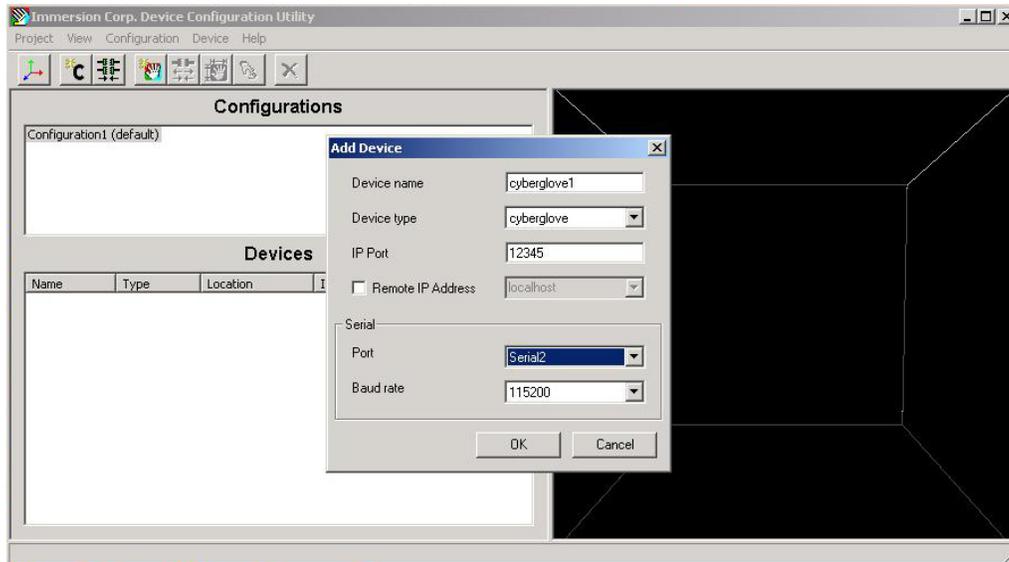
The Menu Bar provides access to all the functionality provided by the DCU.

The Button Bar provides access to all the functionality of the DCU through quick one-click buttons.

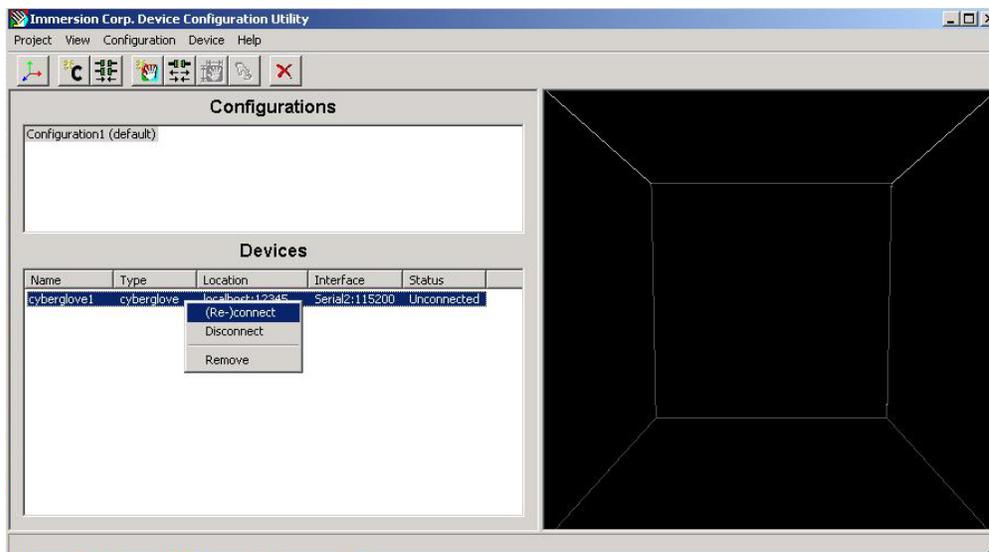
The Device Panel displays only the devices of the appropriate type that you have registered with the DCU. If you have multiple devices listed, you can right-click over the desired device and choose (Re)connect to connect that device.

The Device Viewer provides a 3D graphical representation of the selected device and allows you to visually inspect the data coming from this device for purposes such as calibration and connection verification.

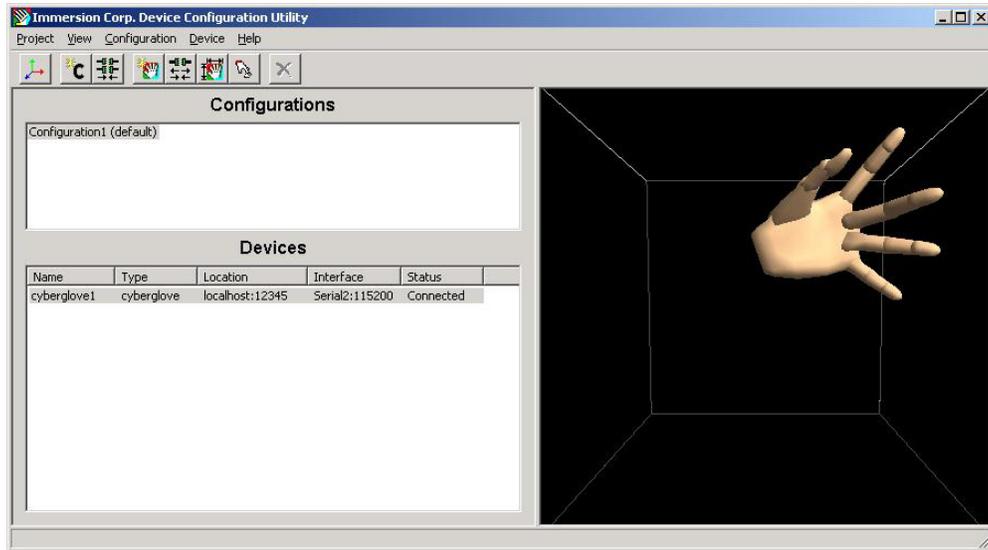
3) To add a new device or a new configuration (multiple devices), pull down Configurations → New. A new configuration will appear in the window. Pull down Device → Add. A dialog box will appear. Enter the serial port of the device as setup in the Bluetooth Settings Wizard and click OK.



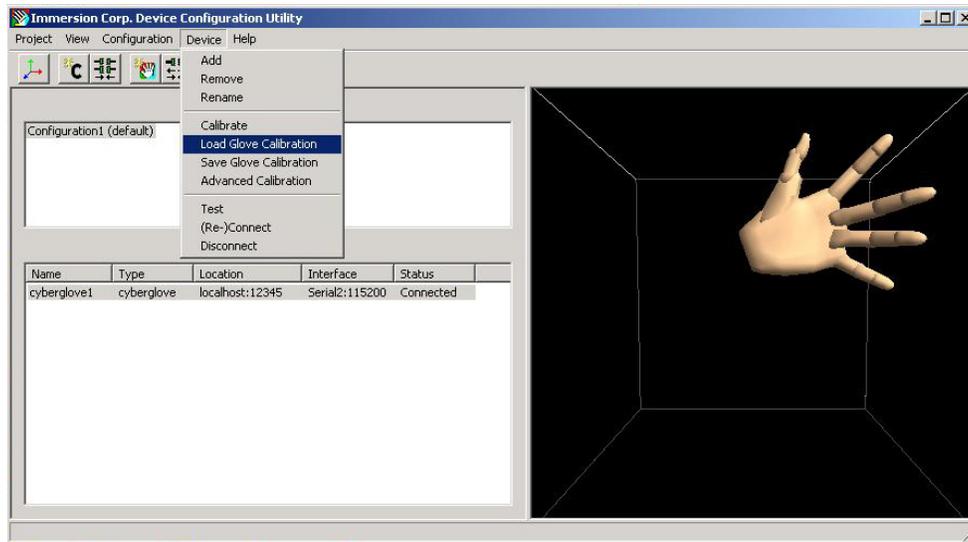
4) Right-click the device that now appears in the Device window and choose Reconnect to connect the CyberGlove II system or other device.



The CyberGlove should now be connected to the DCU.



To assure accurate hand motion rendering, one should calibrate the glove prior to first use for a given user. Choose the *Calibrate* option from the *Device* menu and follow the steps for a quick calibration procedure. You are now ready to use the CyberGlove system.



You can reconnect to devices that were added previously through the DCU. This can be done either by re-connecting to all devices in a configuration or re-connecting to individual devices.

CyberGlove System Care

The CyberGlove II is a precision instrument for measuring hand and finger movement. Handle with care. When handled properly, the CyberGlove system is designed to last for years.

- * The sensors in the CyberGlove are designed to withstand the normal bending of the human hand. Do not attempt to artificially bend a sensor. Bending a sensor with less than 1/4" (6mm) bend radius may introduce a permanent offset in the sensor output and reduce the sensor life. Under no circumstances should the sensor be creased. This will likely lead to premature sensor failure.
- * Do not put anything on over the glove. The thumb, middle, ring and little finger abduction sensors extend above the top surface of the glove and could be damaged. The thumb abduction sensor is particularly vulnerable to damage since it is often oriented such that if something were placed on top of the glove, the sensor would be creased.
- * When holding the glove, do not grip it, but allow it to rest lightly on the palm of your hand.
- * Do not expose the glove to direct heat (direct sunlight, heaters, etc.) for an extended period of time. This may prematurely deteriorate the glove material itself or for the sensors.
- * Do not attempt to wash the glove or immerse it in water. If the glove becomes damp, let it dry naturally, or place it in front of a cooling fan (not in front of a heater and not in direct sunlight).

Troubleshooting

If you are experiencing trouble with the CyberGlove II wireless data glove, refer to the following table for suggested actions. If the problem persists, contact CyberGlove Systems LLC for support: fyazadi@cyberglovesystems.com.

Problem	Suggestion(s)
Connection Lost	Power cycle the CyberGlove. Device Manager and DCU should be closed and restarted before trying to reestablish connection.
Limited Range/Low Update Rate	Move the IOGEAR adapter away from other electronics, using USB extension cable if necessary. Although line of sight is not strictly required for wireless connectivity, the best performance and reliable connection especially over extended distances is obtained when there are few obstacles between glove and adapter.

Technical Specifications

Number of sensors:	18 or 22
Sensor resolution:	< 1 degree
Sensor repeatability:	3 degrees (average standard deviation between wearings)
Sensor linearity:	maximum 0.6% nonlinearity over full joint range
Sensor data rate:	90 records/sec typical
Wireless interface:	2.4 GHz wireless technology
Operating Range:	49 ft (15m) radius from USB port
Gloves supported by each wireless receiver:	1 pair
Gloves supported by each computer	6 pairs have been tested (more may be possible)
Battery life:	3 Hours
Battery cycle life:	1 Year (degrades to 80% of original capacity)
Battery charger:	external
Weight:	70g (glove); 215g (interface module including battery)
Fabric:	nylon Lycra spandex
Operating Temperature	10-45 °C
Operating system and hosts	Windows 2000 and XP
Approvals:	FCC Part 15 Class A CE EN 301 489-17 EN60950-1 EN55022 EN 61000-4-2 EN 61000-4-3 EN 61000-4-8 EN 300328: v1.4.1 Japan Technical Regulations Conformity Certification of Specified Radio Equipment (ordinance of MPT N° 37, 1981) Certificate No. 07215153/AA/00 issued to CyberGlove Systems

MoliceL Lithium-ion Battery Charger Specifications

Input requirements:	9.2 – 12 VDC @ 600 mA min.
Charge output:	8.4 VDC @ 550 mA max.
Battery type supported:	MCR-1821 MoliceL
Short circuit protection:	Built-in protection against accidental shorting of

	output contacts
Operating temperature:	10°C (50°F) to 45°C (112°F)
Weight:	75g
External dimensions:	69 mm (W) x 46 mm (H) x 61 mm (D)
Approvals:	Charger CE Adapter UL, ULC

MoliceL Lithium-ion Rechargeable Battery Specifications

Capacity (Nominal):	2400 mAh
Nominal voltage:	7.4V
Energy:	18 Wh
Size:	20.5 x 71 x 39 mm

Weight:	107g
Energy density	
Volumetric:	325 Wh/l
Gravimetric:	165 Wh/kg

OPERATING SPECIFICATIONS

Operating voltage:	8.4V to 6.0V
Charge voltage:	8.4V ± 50 mV
Cutoff voltage:	5.0V
Temperature range:	
Discharge:	-20°C to 60°C
Charge:	0°C to 45°C
Maximum discharge:	2.4A
Maximum charge:	2.0A

STORAGE SPECIFICATIONS

Temperature range	-20°C to 60°C (Recommended < 25°C for extended storage periods.)
Recommended voltage range	8.4V to 6.0V

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.



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M01009, Rev B, July 2008

