

Labdisc physio

for physics



**Labdisc Physio
Plus GlobiLab Software**

Quick Start Guide

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1. Labdisc Hardware Overview

1.1 What's in the Pack

- ① **Labdisc** data logger
- ② **Labdisc** AC charger
- ③ USB cable
- ④ Quick start guide
- ⑤ Software flyer
- ⑥ Air pressure tube
- ⑦ Temperature probe
- ⑧ Banana cables



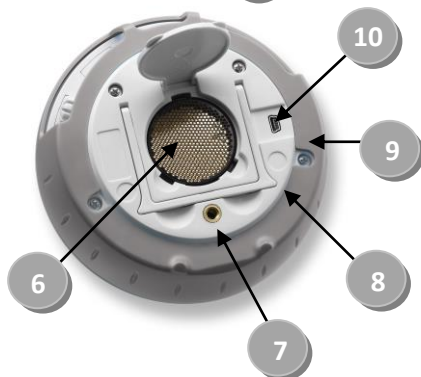
1.2 Ports and Controls

The picture below reviews the **Labdisc** ports, sensors, keypad and display:

- ① Select key
- ② On/Off and Escape key
- ③ Scroll key
- ④ Graphical display 128 x 64 pixels
- ⑤ Sensor selection keys



- ⑥ Motion Sensor
- ⑦ MS screw insert



- ⑧ Plastic leg
- ⑨ Rotating ring
- ⑩ USB Port
- ⑪ Accelerometer
- ⑫ Microphone
- ⑬ Current
- ⑭ Ext. temperature
- ⑮ Light & Univ. input
- ⑯ Voltage
- ⑰ Air pressure



1.3 Built-in Sensors

<i>Icon</i>	<i>Type</i>	<i>Range</i>	<i>Description</i>	<i>Max. Sample Rate</i>	<i>External Accessories (supplied with Labdisc)</i>
	Accelerometer	-8 g to +8 g	Measuring acceleration	100/s	Not required
	Air pressure	10 to 300 kPa	Measuring air pressure	10/s	 Plastic tube
	Ambient temp.	-10 °C to 50 °C	Measuring ambient temperature	1/s	Not required
	Current	-1 to +1 A	Measuring electric current	100,000/s	 Banana cable
	External temp.	-25 °C to 125 °C	General purpose stainless steel temperature probe	100/s	 Temp. probe
	Light	0 to 55,000 lux	Measuring light level	1000/s	Not required
	Microphone	Sound wave 0 to 5 V	Measuring sound waves	100,000/s	Not required
	Motion	0.4 to 10 m	Measuring distance	25/s	Not required

<i>Icon</i>	<i>Type</i>	<i>Range</i>	<i>Description</i>	<i>Max. Sample Rate</i>	<i>External Accessories (supplied with Labdisc)</i>
	Universal input	0 to 5 V	Connecting Fourier or Vernier analog sensors	100,000/s	Universal input adapter cable
	Voltage	-30 to +30 V	Measuring electric voltage	100,000/s	 Banana cable
	Low voltage	-500 to +500 mV	Measuring electric voltage	100,000/s	 Banana cable

1.4 Using the Labdisc

CHARGE THE LABDISC BATTERY BEFORE STARTING

Before working with the **Labdisc** for the first time, the unit should be charged for six hours with the supplied 6 V charger. The **Labdisc** charging input is located to the left of the **On/Off** key. Simply rotate the orange ring until the charging input on the **Labdisc** is exposed and then connect the

charger plug to the charging input.

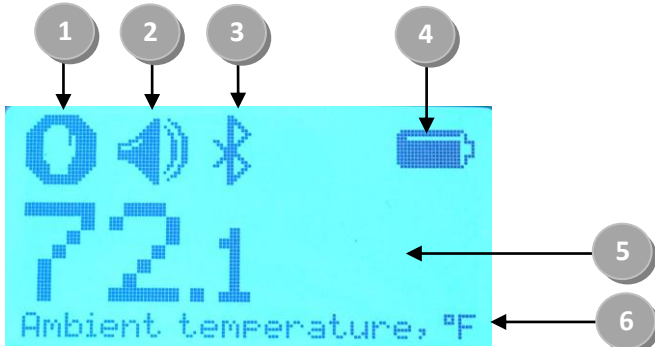
The **Labdisc** charger will accept any input voltage ranging from 100 to 240 VAC 50/60 Hz, making it functional worldwide.



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1.4.1 Labdisc Display

The **Labdisc** LCD display allows users to see the different sensor readings and to setup or re-configure the Labdisc parameters.



① **Run/Stop icon** – shows  when the **Labdisc** is logging data, or  when the Labdisc is not logging sensor data.

② **Sound Status** – shows  active sound beep when the key is pressed and  when the sound beep is disabled.

③ **Communication Status** – shows  when Bluetooth communication is enabled, or  when the USB cable is connected from the host computer to the **Labdisc**.

④ **Battery Level** – shows battery capacity at 3 levels    , or  when the **Labdisc** is connected to the external charger.

⑤ **Sensor Value** – shows the selected sensor value.

⑥ **Sensor Name and Unit** - shows the selected sensor name and unit.

1.4.2 Labdisc keys

The **Labdisc** 10 keys are divided into 7 sensor keys and 3 control keys. Using the sensor keys users can select and view different sensor readings. The control keys are used to turn on/off the **Labdisc**, setup the device for the next logging session and configure all its parameters. The 3 control keys are:



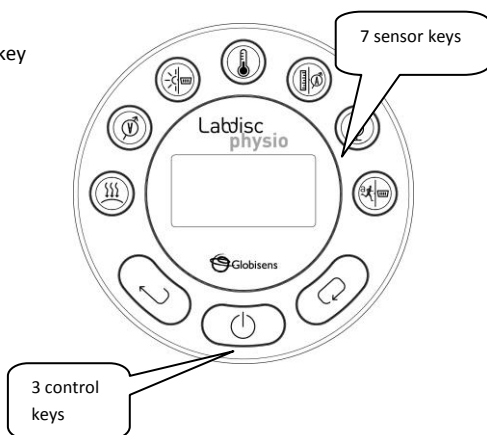
Select key



On/Off and **ESC** key



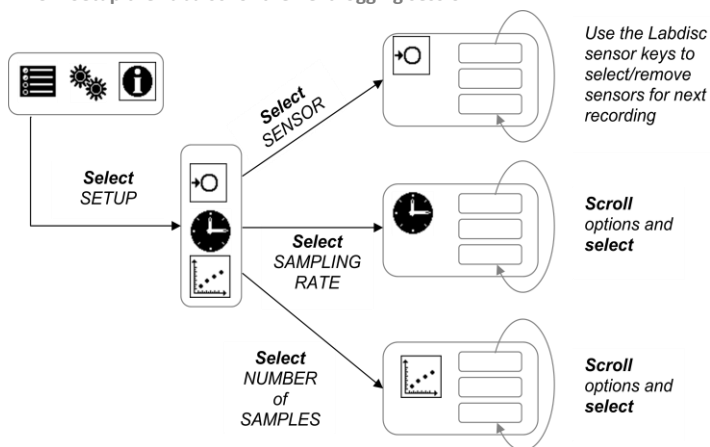
Scroll key



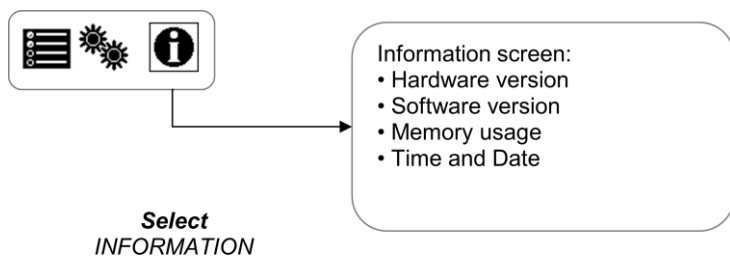
1.4.3 Labdisc menu

Press the **scroll** key to enter the Labdisc menu. Then use the **scroll** key to scan the menu options, the select key to choose a menu option and the **ESC** key to go one level up in the menu.

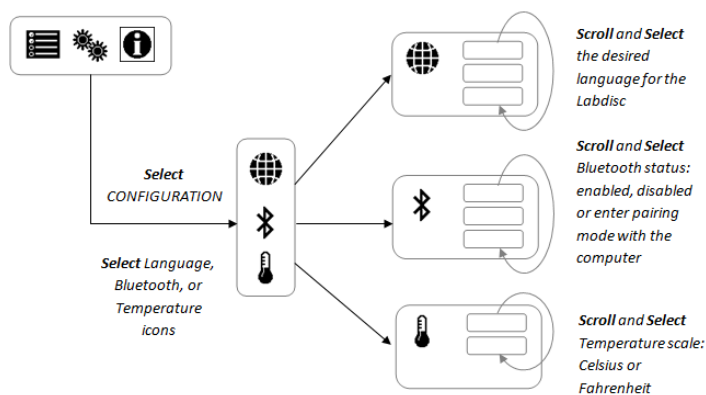
1.4.3.1 Setup the Labdisc for the next logging session



1.4.3.2 Labdisc information



1.4.3.3 Configuration of the Labdisc



2. GlobiLab Analysis Software

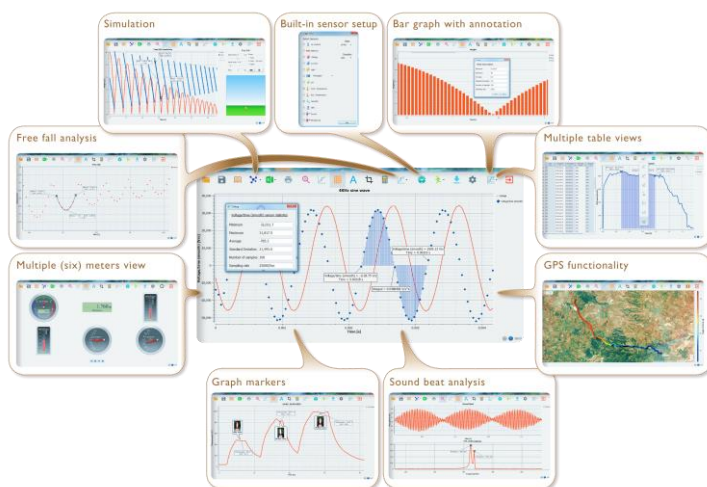
2.1 Software Installation

Our **GlobiLab** software is available on our WEB for free download. Simply go to: <https://globisens.net/support#2> and choose the software version you like to download.

- For PC: GlobiLab MSI installation 3.X for PC
- For Mac: GlobiLab version 2.X

Then follow the simple installation instructions. These instructions take the user through the installation of the **GlobiLab** software.

2.2 Software Functions



2.3 Software Popular Icons and their Functions

	Selecting the Open-project icon opens the stored activity *.XML files and displays all its graphs and graphical attributes.
	Selecting the Workbook icon opens the activities folder, where users can choose from a variety of PDF activities.
	Clicking the Display-options small triangle icon allows the user to select one of the following six display options:  Line graph – showing a line graph for each of the sensors. If there is more than one active sensor, you can set the scale on the left for different active sensors by <i>left</i> clicking on the sensor name in the legend in the upper right hand corner of the screen. A single <i>right</i> click on the sensor name will change the line to individual data points. A second <i>right</i> click will hide the sensor data from the graph. A third <i>right</i> click will return the sensor graph to a line. To change the color of a line, <i>left</i> click on the line and select a new color.  Bar graph – showing bar graph data from only one sensor at a time. To change which data is displayed, left click the sensor name in the upper left hand corner of the screen.  Data table – shows sensors data in a chart format. This can be used to view exact measurements for all sensors. You may use the table display to edit data points of the sensors.

	4.  Line graph and Data Table – shows both a line graph and a data table simultaneously. 5.  Meter view - shows changes in all sensors data values as are they are happening. There are several different options for meters including:  Right click on each Meter will allow you to change the Meter type or choose different sensor for this Meter.  Using the blue dots at the bottom of the screen allows you to sets the number of Meters displayed on the screen: 1,2,4 and 6. 6.  Google Map – this allows you to overlay a Google Map of the area where your experiment was conducted with the data from all sensors in that experiment. You must have an Internet connection for this display mode to work properly.
A	Selecting the Annotation icon activates the Annotation mode. Left mouse click opens a dialog box where users can enter text and images. Pressing the Annotation icon again exits the Annotation mode.

Pressing the **Function-options** small triangle icon allows the user to apply the mathematical functions listed below between the graph markers:



1.  Selecting the **Slope** will display a slope-line on the active sensor graph. Moving the mouse pointer will move the slope line along the graph. A small text box will show the slope value.
2.  Selecting the **Linear regression** will display the best linear line that fits the graph between the locations of two markers. Next to the line the software will open a small text box displaying the linear line equation: $Y = aX + b$.
3.  Selecting the **Quadric regression** will display the best parabolic line (2nd degree) that fits the graph between the locations of two markers. Next to the line the software will open a small text box displaying the parabolic line equation: $Y = aX^2 + bX + c$.
4.  Selecting the **FFT** will split the graphic display and show the original measurement on a time scale in the top graphic window, and its harmonics, on a frequency scale in the bottom graphic window.
5.  Selecting **Smooth** will make an average all data points on the graph. Every sample is an average of the 2 readings before and 2 readings after. This function is useful in case the graph is very noisy.
6.  Selecting **Derivative** will create a derivative

	graph on the active sensor data. 7.  Selecting Integral will calculate the area under the sensor graph (Sensor value x Time).
	Selecting the Run icon launches a new data collection session.
	Selecting the Stop icon ends the current data collection session.
	Selecting the Selective download icon opens a table listing all stored recordings. Selecting one of the lines on the table and pressing download will download this specific recording to the computer.
	Setting up the Labdisc is done by selecting the Setup icon. The software will open a dialog box, where users can select/remove sensors, set the sampling rate and the amount of samples for the next data recording.
	Selecting the EXCEL icon saves the file in a *.CSV format, prompts the user for a file name and then automatically opens EXCEL and exports the experiment data into the spreadsheet.
	GlobiLab status bar, is located at the bottom right corner of the software. It includes 3 icons: 1. USB indicator – where blue indicates a USB communication between the computer and the Labdisc. 2. Bluetooth indicator – where blue indicates a

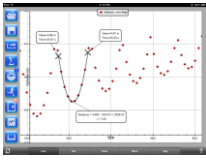
	Bluetooth wireless communication between the computer and the Labdisc. A right mouse click on this icon will open a list of recognized Labdiscs, click on one to connect. 1. Memory info – shows how many experiments are stored in the Labdisc memory, out of a maximum of 127. In the example above there are 7 stored experiments out of 127. A right mouse click on this section will allow users to erase all stored data or just the last recording.
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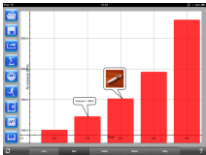
2.4 GlobiLab Software for iPad

The **GlobiLab** software for iPad (iPad, iPad 2 and 3rd generation iPad models) is available in the App Store and makes K-12 science experiments mobile, convenient and immediate. **GlobiLab** wirelessly integrates between the **Labdisc** data logger and the iPad. Allowing full **Labdisc** management (setup of all data logging parameters, online display of current measurements and download of the **Labdisc** sample memory), together with graph manipulations (markers, zoom, crop, text and image annotation) and data analysis (statistics and curve fitting etc.).

GlobiLab software for iPad was specifically designed to engage students and help visualize complex science concepts by harnessing the iPad built-in accelerometer sensor, data display, multimedia and multi-touch features. The following steps provide a guide on the installation and implementation of the **GlobiLab** App for iPad.

	Download and install of the GlobiLab application • Tap the iPad App Store icon  • Search for "GlobiLab" • Press the FREE green key to install the application
	Set wireless communication between the Labdisc and the iPad • Go to <i>iPad Setting - Bluetooth</i> and select your Labdisc from the Devices list • The iPad should immediately connect to your Labdisc and change its status to "connected" • Close the setting and open the GlobiLab software
	Meter view • Tap Meter view  to see the current values of the Labdisc sensors • Tap one of the Meters and scroll the sensor wheel to select a different sensor type for an existing Meter • Select a different Meter type   from the horizontal line of icons

	Data collection - Tap the SETUP icon  and enter the SETUP screen. This dialog box allows you to select the Sensors, Sampling rate and amount of samples for the next data recording. - Tap the RUN icon  to start recording and observe the graph build up on the screen - You may switch the display to a Bar Graph view by tapping the Bar Graph key  - You may switch the display to a Table view by tapping the Table key  - To stop recording tap the STOP icon 
	Download Labdisc stored measurements to the iPad The Labdisc can store up to 127 different experiments. This is very useful when conducting outdoor data collection or long measurements. - Tap the Download icon  - The iPad will list all Labdisc stored experiments. Each line on this list shows what sensors were recorded, at what sampling rates and for how many samples. In addition it indicates the date and time of the recording. - Click on one of the lines in the list. The Labdisc transfers the data to the iPad. - After all data is transferred, the iPad will show a graph of the collected measurement
	Data analysis (markers, curve fitting) Tap the open icon  and select "Free fall". This graph describes a real recording of a ping-pong ball bouncing on a table, as recorded by the Labdisc distance sensor. For more details see the Free Fall movie at: http://www.globisens.com/resources/experiment-videos

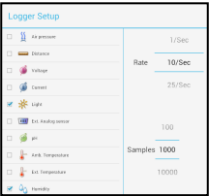
	• Long touch on the graph to add a Marker • Touch the Marker to cross and drag it with your finger. View the Marker text box data changing while the marker follows the graph line. • Tap the graph twice to view the actual sampling points • Long touch the graph to add a 2nd Marker • Place both the Markers on the beginning and end of a single ball jump • Tap the Curve Fitting icon  and select a Quadric Regression to get the mathematical equation representing the ping-pong ball jump. From this equation we can calculate earth gravitation.
	Graph Annotation • Use a long touch anywhere on the background (not on a graph), create an empty annotation. The edit annotation box opens automatically. From here: ○ Edit or write an annotation ○ Add an image using the camera or the image gallery ○ Remove the annotation
	Use of Map view in field trip (Environment) Recording GPS together with other Labdisc sensors, enables the GlobiLab software to plot these sensors over the Apple maps. • Make sure the iPad is connected to the Internet • Tap the Open icon  and select the “Walk in the park”. In this experiment we measured the different climate in a city park compared to a nearby cross road. For more details check the Microclimates movie at: http://www.globisens.com/resources/experiment-videos. • Tap the color scale on the left and select Amb. Temperature. Observe the dramatic temperature change while walking from the city cross-road to

	the park. • Tap the colored samples on the map to get a marker with the temperature value. • Pinch to zoom in/out the map • See the experiment data in a table, by tapping the Table View  and observe the GPS longitude and latitude values. • You may show other experiments under this category like "Trip to the Dead Sea" or "Flight from Tel-Aviv to Istanbul"
	Online help GlobiLab offers an online help for each of the 5 views: Line, Bar, Table, Meter and Map. • Open the relevant View  • Tap on the HELP icon  and observe a list of functions and controls

2.5 GlobiLab Software for Android

The **GlobiLab** software for Android 4 and above is available for download from the Globisens web site: <http://www.globisens.net/support#2> and from Google Play.

The software makes K-12 science experiments mobile, convenient and immediate. **GlobiLab** wirelessly integrates between the **Labdisc** data logger and the Android tablet, allowing full **Labdisc** management (setup of all data logging parameters, online display of current measurements and download of the **Labdisc** sample memory), together with graph manipulations (markers, zoom, crop and text annotation) and data analysis (statistics and curve fitting etc.).

	Set wireless communication between the Labdisc and the Android tablet • Make sure the Labdisc is paired to the Android (see section 3.2.4) • Turn on the Labdisc • Launch the application  • Tap the options icon in the top action bar  (rightmost, three vertical dots) • Tap Connect Labdisc and select the name of the Labdisc you would like to connect with (e.g. Labdisc_6588) • The App name (top right) will change to  GloLab (Labdisc_6588), indicating that the connection is established
	Meter view • Tap the Meter view METERS to see the current values of the Labdisc sensors • Tap one of the meters and scroll the sensor wheel to select a different sensor type for an existing meter • Select a different meter type   from the horizontal line of icons
	Data collection • Tap the SETUP icon  and enter the SETUP screen. This dialog box allows you to select the Sensors, Sampling rate and amount of samples for the next data recording. • Tap the RUN icon  to start recording and observe the graph build up on the screen • You may switch the display to a Bar Graph view by tapping the Bar Graph key BAR • You may switch the display to a Table view by tapping the Table key TABLE • To stop recording tap the STOP icon 

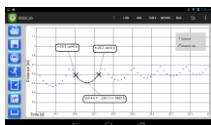
Download Labdisc stored measurements to the tablet

The **Labdisc** can store up to 127 different experiments. This is very useful when conducting outdoor data collection or long measurements.

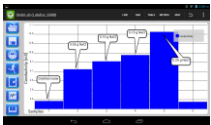


- Tap the Download icon 
- The application will list all **Labdisc** stored experiments. Each line on this list shows what sensors were recorded, at what sampling rate and for how many samples. In addition it indicates the date and time of the recording.
- Click on one of the lines in the list. The **Labdisc** transfers the data to the tablet.
- After all the data is transferred, GlobiLab will show a graph of the collected measurement

Data analysis (markers, curve fitting)

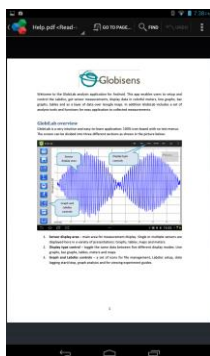


- Tap the open icon  and select "Free Fall". This graph describes a real recording of a ping-pong ball bouncing on a table, as recorded by the **Labdisc** distance sensor. For more details see the Free Fall movie at: <http://www.globisens.net/resources/experiment-videos>
- Long touch on the graph to add a marker
- Touch the marker to cross and drag it with your finger. View the marker text box data changing while the marker follows the graph line.
- Tap the graph legend and select "Dots" to view the actual sampling points
- Long touch the graph to add a second marker
- Place both the markers at the beginning and end of a single ball jump
- Tap the Curve Fitting icon , select a Quadric Regression to get the mathematical equation representing the ping-pong ball jump. From this equation we can calculate earth's gravitation.

	Graph Annotation - Use a long touch anywhere on the background (not on a graph), create an empty annotation. The edit annotation box opens automatically. From here: - Edit or write an annotation - Remove the annotation
	Use of Map view in a field trip (Environment) Recording GPS together with other Labdisc sensors enables the GlobiLab software to plot these sensors over the Apple maps. - Make sure the tablet is connected to the Internet - Tap the Open icon  and select “Walk in the Park”. In this experiment the different climate in a city park compared to a nearby cross road was measured. For more details check the Micro Climate experiment movie at: http://www.globisens.net/resources/experiment-videos - Tap the color scale on the left and select Amb. Temperature. Observe the dramatic temperature change while walking from the city cross-road to the park. - Tap the colored samples on the map to get a marker with the temperature value - Pinch to zoom in/out the map - See the experiment data in a table, by tapping the TABLE button Table View TABLE and observe the GPS longitude and latitude values
	Workbook section - Tap the Workbook icon  to view GlobiLab experiment guides - Tap on one of the experiments on the list and view a comprehensive PDF guide of that experiment.

Online help

GlobiLab offers a PDF quick start guide. To open the quick start guide, tap on the HELP icon .



3 Labdisc – GlobiLab Communication

3.1 USB Communication

Upon USB cable connection between the computer and the **Labdisc**, the **GlobiLab** software automatically detects the USB connection and begins communicating with the **Labdisc**.

3.2 Bluetooth Wireless Communication

Before wireless communication with a **Labdisc** for the first time, the **Labdisc** should be added as a device to the computer in a process called pairing. Pairing need be done only once for each **Labdisc**, after which the computer stores the connection information, including a unique name for each **Labdisc**. When no **Labdisc** is connected via USB, the computer will automatically try to wirelessly connect to the last connected **Labdisc**. To connect to a different or a new **Labdisc**, right click on



the Bluetooth icon in the **GlobiLab status bar**, located at the bottom right corner of the screen, then click on the **Labdisc** you want to connect to.

3.2.1 Pairing with a PC running Windows OS

1. Turn on the **Labdisc**. Make sure the **Labdisc** is not showing the sleep icon . If it does, please press any button to leave the sleep mode.
2. Start the GlobiLab software.
3. Right click the Bluetooth icon located on the status bar at the bottom

right corner of the screen 

4. From the new pop-up menu select **"Find more Labdiscs and sensors"**. The computer opens the **"add a device"** dialog box and starts searching for the Bluetooth device.
5. Your Labdisc will be displayed as **"Labdisc-xxxx"**, where "xxxx" are the last four digits of the Labdisc serial number sticker.
6. Select this device and press **"Next"**

7. On the Labdisc: Press and hold the SCROLL  key to put the Labdisc in Pairing mode. The Labdisc will produce a long "beep" while its screen shows **"BT pairing"**.

8. On the computer dialog box select the 2nd option: **"Enter the device pairing code"** and click **"Next"**.
9. In the next dialog box enter "1234" as the pairing code, click **"Next"**
10. Wait for the computer to finish the process and announce **"Your device is ready to use"**.
11. Right click the Bluetooth icon on the status bar. Choose the Labdisc you've just paired and click on it.
12. The computer will connect to the Labdisc and turn the Bluetooth icon



3.2.2 Pairing with a Mac OS

1. Turn on the **Labdisc**. Make sure the **Labdisc** is not showing the sleep icon . If it does, please press any button to leave the sleep mode.
2. Open the Bluetooth menu from the Mac menu and select **"Set Up Bluetooth Device..."**
3. A dialog box opens. Your Labdisc will be displayed as **"Labdisc-xxxx"** where "xxxx" are the last four digits of the Labdisc serial number sticker.
4. Select this device and press **"Continue"**.
5. Mac will try a quick default attempt to pair. This attempt will not succeed as Labdisc requires a pairing code.
6. Press the **"Passcode options..."** button and select the option **"Use a specific passcode"**. Enter the passcode "1234", and don't press "OK" yet.



7. On the Labdisc: Press and hold the SCROLL key to put the Labdisc in Pairing mode. The Labdisc will produce a long "beep" while its screen shows **"BT pairing"**.
8. Press the **"OK"** button in the Mac dialog box.
9. Open the **GlobiLab** software.



10. Right click the **Bluetooth** icon located at the bottom right corner of the software.
11. Choose the **Labdisc** you've just paired and click on it. The computer will connect to the **Labdisc** and turn the **Bluetooth** icon blue



3.2.3 Pairing with an iPad

1. Turn on the **Labdisc**. Make sure the **Labdisc** is not showing the sleep icon . If it does, please press any button to leave the sleep mode.

2. Launch the iPad Setting
3. Open Bluetooth. Make sure the iPad Bluetooth is on.
4. From the devices list click the "**Labdisc-xxxx**", where the xxxx digits match the last 4 digits of your **Labdisc** S/N sticker on the **Labdisc** back cover.
5. On the **Labdisc**: Press and hold the SCROLL  key to put the Labdisc in Pairing mode. The Labdisc will produce a long "beep" while its screen shows "**BT pairing**".
6. The iPad will ask for a PIN code. Enter "1234" and click Pair.
7. The iPad will show **Labdisc-xxxx** connected.
8. Start the iOS GlobiLab application . The application will automatically connect to the Labdisc you have paired.

3.2.4 Pairing with Android OS

1. Turn on the **Labdisc**. Make sure the **Labdisc** is not showing the sleep icon . If it does, please press any button to leave the sleep mode.
2. On the tablet go to setting  and select "**Bluetooth**".
3. Make sure the Bluetooth radio is "ON", then turn on "**Search for Devices**".
4. On the **Labdisc**: Press and hold the SCROLL  key to put the Labdisc in pairing mode. The Labdisc will produce a long "beep" while its screen shows "**BT pairing**".
5. From the devices list on the tablet tap the "**Labdisc-xxxx**", where the xxxx digits match the last 4 digits of your **Labdisc** S/N sticker on the **Labdisc** back cover.

6. The tablet will open the **"Bluetooth pairing request"** dialog box and display **"Type the device's required PIN"**
7. Enter the pairing code **"1234"** and tap **"OK"**
8. Pairing process is complete and the **Labdisc** will appear on the tablet **"paired devices"** list.



9. Open the GlobiLab application on the tablet.
10. Tap on the options icon at the top Action Bar (rightmost, 3 vertical dots)
11. Tap on **"Connect Labdisc"**, and select the name of the **Labdisc** you'd like to connect (e.g. Labdisc_1052).
12. The App name will change to **"GlobiLab (Labdisc_xxxx)"**

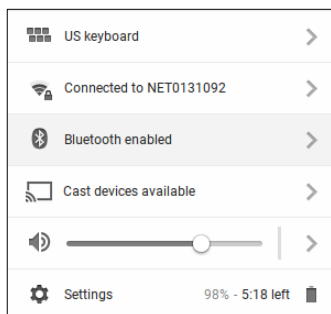


GlobiLab (Labdisc_6588)

to indicate connection.

3.2.5 Pairing with Chromebook OS

1. Turn on your Labdisc.
2. Click on the Chromebook bottom right menu bar . The below dialog box opens:



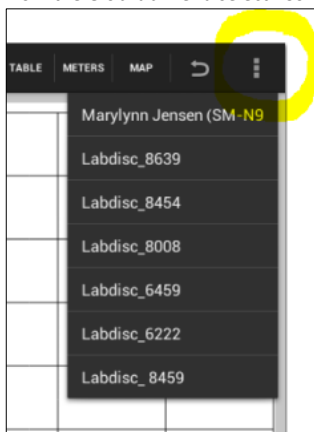
3. Click on the Bluetooth icon. Make sure that Bluetooth is enabled on your Chromebook. Click on **Manage Devices...** then click **Add Device**. The Chromebook start searching for new Labdisc devices.

4. Your Labdisc with its last 4 serial number digit will appear on the Chromebook screen as: **Labdisc-XXXX** - where the XXXX represent the Labdisc last four S/N digits.
5. From the Chromebook's list of devices, select your Labdisc. Make sure that the four digit code on the back of the Labdisc matches the one you have selected on your Chromebook. Click **Connect**.
6. On the Labdisc: Press and hold the SCROLL key to put the Labdisc in pairing mode. The Labdisc will produce a long "beep" while its screen shows **"BT pairing"**.
7. On the Chromebook use the PIN code "1234" to pair your Labdisc to your Chromebook.
8. Your Labdisc should be added to the Chromebook list of paired devices. On some Chromebooks you might see an error message. You may ignore it, as long as you see the Labdisc on the Paired devices list.



Connect the Labdisc to a Chromebook Laptop Using a Bluetooth Connection:

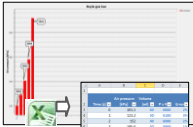
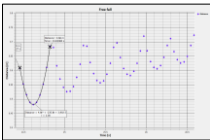
1. Open the GlobiLab software and turn on the Labdisc.
2. Make sure that your Labdisc has been paired with your computer. (see above) You will only have to pair the Labdisc at the first time you use your Labdisc with the Chromebook.
3. From the Globilab menu select "Connect Labdisc".



4. Select the Labdisc that you want to connect to from the pop up menu. Make sure the 4 digit code matches the one on the back of the Labdisc.

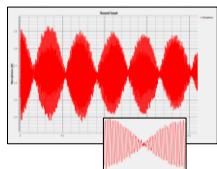
4. Experiment Samples

The GLOBILab software includes experiment samples, for teachers and students to view, analyze, modify or repeat. In this section some interesting GLOBILab recorded experiments are reviewed. To open a recorded experiment, simply press the **Open** icon in the GLOBILab software and select the files below:

	<u>Boyle's Gas Law</u> Verifying the ideal gas law: $P \times V = \text{CONSTANT}$. Using a 100ml syringe connected to the air pressure sensor. Manually recording air pressure while decreasing the syringe volume by 10ml at a time. • Sensors selected: Air pressure • Sampling rate: Manual • Amount of samples: 10 • Communication: Online, preferably via wireless Bluetooth • Data Analysis: Use Bar-Graph view to see air pressure values. Use Annotation to add the volume for each bar and Export to Excel to calculate $P \times V$ multiplication.
	<u>Free Fall</u> A classic activity for Newton's 2nd Law. Measuring the free fall acceleration of a ping pong ball bouncing on a wooden surface, with the distance sensor located 1.5 m above it: • Sensors selected: Distance • Sampling rate: 25/sec • Amount of samples: 1000 • Experiment duration: Seconds • Communication: Online, preferably via wireless Bluetooth • Data Analysis: Use Markers and Crop functions to focus on the ball bounces. Then use quadratic regression on a single bounce, to get the bounce equation and extract the free fall acceleration.

Sound Beat

Sound wave recording of 2 tuning forks, producing slightly different harmonics, of 440 Hz and 435 Hz.



- **Sensors selected:** Microphone
- **Sampling rate:** 25,000/sec
- **Amount of samples:** 10,000
- **Experiment duration:** < 1 second
- **Communication:** Offline, data downloaded at recording's end
- **Data Analysis:** Use **Zoom** to see the sound sine wave and **Markers** to measure amplitude and frequency.



The FCC Wants You to Know:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- a) Reorient or relocate the receiving antenna.
- b) Increase the separation between the equipment and receiver.
- c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- d) Consult the dealer or an experienced radio/TV technician.

FCC Warning

Modifications not expressly approved by the manufacturer could void the user authority to operate the equipment under FCC Rules.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

INSTRUCTIONS CONCERNING HUMAN EXPOSURE TO RADIO FREQUENCY ELECTROMAGNETIC FIELDS

A distance of at least 20 cm. between the equipment and all persons should be maintained during the operation of the equipment.



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GlobiLab supports Android versions 4.0 and up.

Made for
iPad (3rd generation)
iPad 2
iPad

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