ADINSTRUMENTS
making science easier

Human NIBP

Non-invasive hemodynamics

Quick Start

Get set up and start recording

Overview

This guide will help you to quickly set up the Human NIBP Controller. For detailed installation and set up instructions and troubleshooting information, please refer to the Owner's Guide (also available at *www.adinstruments.com/support/manuals*).

The Human NIBP System contains the following:

- Human NIBP Controller and Wrist Unit
- Height Correction Unit
- 2 finger cuffs (small, S, medium, M, or large, L) and cuff size guide
- LabChart Pro® and Human NIBP Device Enabler software CDs
- USB cable and power cable
- Screwdriver

The Human NIBP Controller is manufactured by Finapres Medical Systems (FMS) B.V. *(www.finapres.com)* for distribution by ADInstruments, and for use with ADInstruments software. Two finger cuffs are included with the Human NIBP System. They can also be purchased separately:

- Finger Cuff (Large, for finger circumferences 65-75 mm)..... MLE1059
- Finger Cuff (Medium, for finger circumferences 55-65 mm)..... MLE1058
- Finger Cuff (Small, for finger circumferences 45-55 mm)..... MLE1057

System Requirements

Windows

- Microsoft Windows 8, 7, Vista SP1, or later.
- Microsoft .NET Framework 4.0, or later.
- Microsoft Internet Explorer 8.0, or later.
- USB Interface.
- Any PC desktop or laptop computer with a recent Intel or AMD processor and 2 GB or more of system memory.

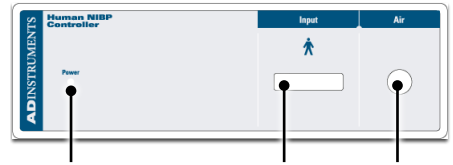
PowerLab not required

- An ADInstruments PowerLab is not required to use the Human NIBP Controller with LabChart, but you can record data simultaneously into LabChart using a PowerLab and the Human NIBP Controller.

What's in the box

The Human NIBP System consists of the following hardware components:

The Human NIBP Controller

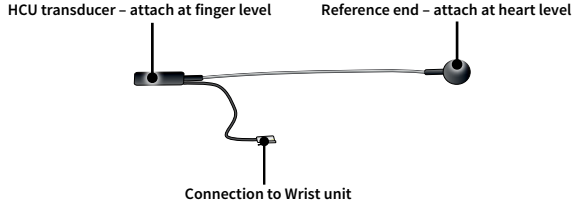


Power Indicator

Cable assembly to Wrist unit

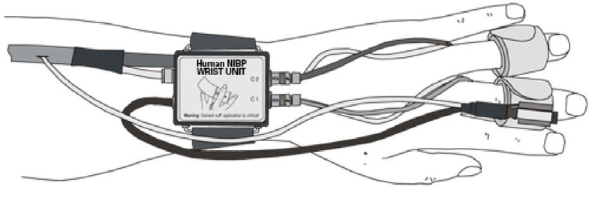
Air Connector tubing to Wrist unit

The Height Correction Unit (HCU)



- This corrects for hydrostatic pressure changes when the measured hand moves away from heart level. The HCU consists of a liquid-filled tube connected at one end to a pressure transducer.

The Wrist Unit and two Finger cuffs



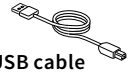
- The Wrist unit provides connection points for two finger cuffs, and for the HCU. It contains a pressure transducer and electronics for the finger cuffs and the HCU.

1. Unpack the box

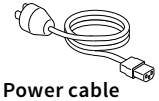
Connect tubing to front of device

1. Ensure the cable assembly is connected securely to the front panel of the Human NIBP Controller. Use the screwdriver provided.

Connect device to your computer



USB cable

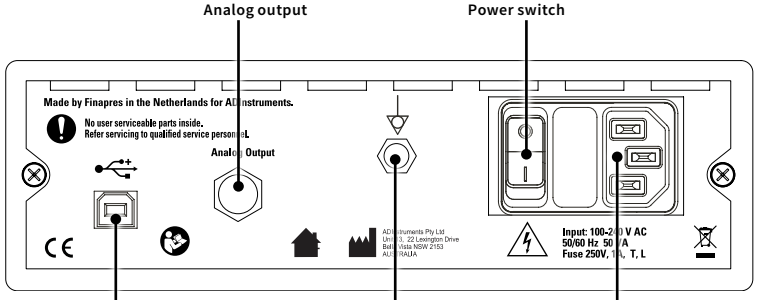


Power cable

2. Connect the Human NIBP Controller to your computer using the supplied USB cable.
3. Connect the power cord to a grounded power supply and to the rear panel of the Human NIBP Controller.

Power on the hardware

Turn on the Human NIBP Controller using the power switch on the rear panel.



Connect USB to computer

Grounding post (optional)

Connect to mains power

Notes:

- The Human NIBP Controller is designed as a stand-alone unit, to output signals via a USB connection to an attached computer.
- The analog output with BNC connector provides an optional connection to a PowerLab, or similar recording device.

2. Install software

The Human NIBP System consists of the following software components:

LabChart Pro®

1. Place the LabChart Pro CD in the CD drive of your computer.
2. Follow the on-screen instructions to install LabChart 8.
3. Launch LabChart by double-clicking on the desktop icon. Enter the activation code when prompted.
4. Check for updates (**Help > Check for Updates...**) and install the latest LabChart release.

Human NIBP Device Enabler CD

1. The Human NIBP Device Enabler is a software addition to LabChart. It is designed to allow LabChart to recognise the Human NIBP Controller, when it is connected to your computer, and to open LabChart with the appropriate settings to make non-invasive blood pressure measurements.
2. Place the Human NIBP Device Enabler CD in the CD drive of your computer.
3. The installer should auto-run. If it doesn't, see the Read Me on the CD.
4. Alternatively, use LabChart's Feature Manager (**Help > Feature Manager...**) to download the latest installer.

3. Start LabChart

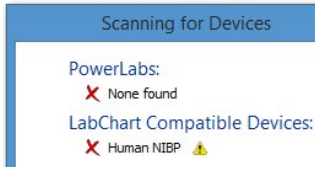
License Registration

1. When you start LabChart for the first time, a dialog will appear asking you to enter your license code. Your license code can be found on the LabChart CD case.
2. Enter your license details.

Device Discovery

On start-up, LabChart performs a Device Discovery process. It should automatically detect the Human NIBP Controller device. If it doesn't find the device immediately, click **Device Scan**, and then click **OK**.

Note: If this dialog persists, close down LabChart. Ensure the Human NIBP Controller is connected to your PC and powered on, then restart LabChart. If this doesn't resolve the problem, see the Troubleshooting section of the **Owner's Guide**.



License Activation

Activation is only required once per machine. If a supported PowerLab is already connected and turned on, your license will activate automatically. Otherwise, you may choose online or manual activation.

Welcome to LabChart!

LabChart's Welcome Center opens automatically when LabChart is launched.

1. In the Getting Started tab of the Welcome Center, double-click to open the **Human NIBP** settings file.
2. You should see the device name appear at the top of the new document.
3. The Start button should be enabled and you are now ready to start recording.

4. Before starting a measurement

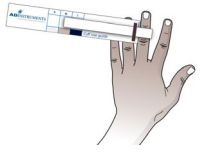
Apply finger cuff(s)

Warning! Finger cuffs will be damaged if allowed to inflate without a finger (or another, appropriately sized object) inside them.

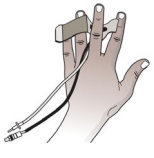
Proper finger cuff application is critical for success with the Human NIBP Controller. Select the proper finger cuff size. If in doubt, choose the smaller finger size cuff.

1. Open the finger cuff just enough to be able to see the LED and photodiode (or photocell, PC).
2. Place the middle, index or ring finger in the cuff. The LED and photocell should be symmetrically placed on each side of the finger's soft parts in the center of the middle phalanx.
3. Lead the cuff cable and air hose in between two fingers to the back of the hand. Here these connect to the Wrist Unit.
4. Make sure the finger cuff is placed centered between two knuckles, touching each knuckle.
5. Wrap the finger cuff tightly for best performance. A common mistake is to not wrap the finger cuff tightly enough.
6. If finger cuff switching is to be used, repeat steps 1–5 to apply a finger cuff to a second finger. Finger-switching is recommended for measurements of 1 hour or longer.

1. Select the correct cuff using the cuff size guide.

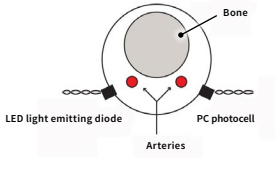


2. Wrap the cuff tightly, preferably around the middle finger, between the joints. Make sure the cable and tube point towards the wrist.



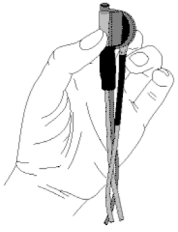
3. Center the LED and photocell symmetrically around the finger.

Finger cross-section



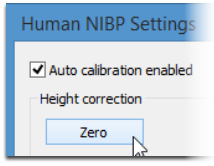
Instructions

Zero the HCU



Perform the height correction procedure before attaching the HCU Unit to the volunteer.

1. Hold the HCU transducer and the reference point at the same level.
2. In LabChart, click **Setup > Human NIBP Settings...**
3. In the Human NIBP Settings dialog, click **Zero**.

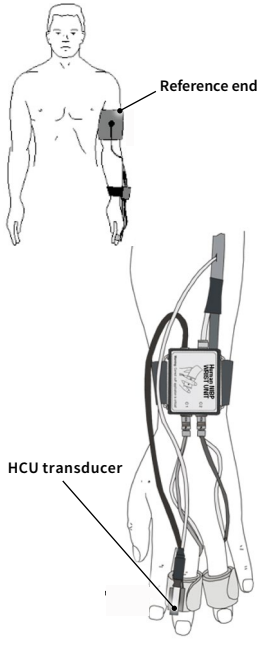


Once the HCU has successfully been zeroed a confirmation message is displayed.

Apply the Wrist Unit and HCU

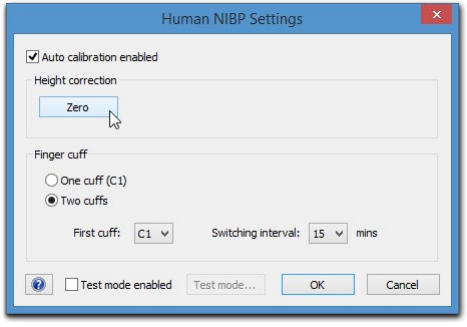
The Wrist Unit is connected to the Human NIBP Controller by a cable assembly.

1. Apply the Wrist Unit to the volunteer's wrist and fasten the strap firmly so that it cannot twist.
2. Guide the cable assembly along the arm and fasten the arm straps.
3. Insert the cuff cable and air hose connectors for each finger cuff into the Wrist Unit.
4. Ensure the HCU is connected to the rear of the Wrist Unit.
5. The HCU transducer should be attached to the finger cuff and the reference end should be attached at heart level.



5. Choose Human NIBP settings

In LabChart, click **Setup > Human NIBP Settings...** to open the Settings dialog. The default options are a good starting point.



1. **Auto-calibration (or AutoCal)** – is an ongoing calibration, which greatly improves the accuracy measurements.
   - AutoCal is performed frequently at the start of a measurement but – once the correct, unloaded diameter of the finger artery is established – is repeated only once every 70 heart beats.
   - If the volunteer is moving around a lot, such as during exercise, the AutoCal function does not improve accuracy and should be turned off.
2. **Finger cuff switching** – select between 4 switching periods (1, 15, 30 and 60 minutes), or choose **One cuff (C1)** to disable switching, depending on your protocol.
   - For measurements longer than 1 hour always select finger switching, since a prolonged measurement on one finger can be unpleasant for the volunteer.
   - The 1-minute interval is for testing purposes only.
   - During a measurement it is not possible to start or delay switching.
3. **Test mode** – perform a pressure-check on the Human NIBP Controller. See the **Owner's Guide**.

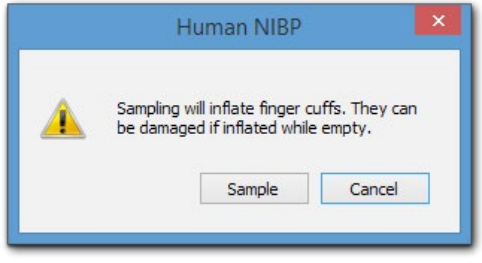
6. Start a measurement

To start a blood pressure measurement simply click **Start** in LabChart.

Before you start a measurement...

1. Check that finger cuff(s) are applied and that these are not easy to rotate.
2. Make sure the HCU has been zeroed and is attached to the volunteer.
3. Ensure you have selected your settings for the finger blood pressure measurement in the **Human NIBP Settings** dialog.

The first time you click Start, the following Warning dialog will appear:



- To proceed, click **Sample**.
- To delay a measurement, click **Cancel**.
- This dialog will not reappear within the same LabChart session.

Warnings to prevent finger cuff damage:

- Don't apply air pressure to a finger cuff when it is not wrapped around a finger (or any other solid object!) as this will damage the finger cuff.
- Don't remove the finger cuff from a finger before stopping the measurement or before disconnecting the air hose from the Wrist Unit.
- Don't bend finger cuffs outwards into a flat shape.
- Don't attempt to repair defective finger cuffs as this will substantially affect measurement accuracy.

7. Stop a measurement

To stop a measurement, simply click Stop in LabChart. Once you have stopped a measurement, it is recommended to:

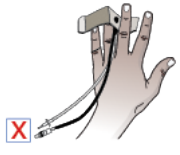
1. **Disconnect the finger cuff air hoses from the Wrist Unit** – this removes residual air pressure from the finger cuffs and protects them from accidental inflation and damage.
2. **Unwrap and remove the finger cuffs** (if you have completed your measurement).
3. **Inspect the finger after removing a finger cuff** – see if you can find the places where the LED and photodiode have pressed on the finger skin (see Figure below).

- Verify that the pressure points are correctly centered between the knuckles and symmetrically placed on opposite sides of the finger.
- The most common reason for inaccurate finger blood pressure readings is incorrect cuff application.
- If a cuff is applied too tightly, an unrealistically low reading may result.
- Conversely, if the cuff is applied too loosely, unrealistically high blood pressure readings may occur.

Cuffs are used to measure blood pressure at the finger. Correct sizing and positioning are important to obtain reliable measurement results.

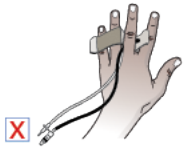
Incorrect

Cable and tube point in the wrong direction



Incorrect

Cuff is rotated



Incorrect

Cuff is too close to the hand

8. Troubleshooting

1. **If the Human NIBP Controller is returning error messages or failing to start a measurement, it is recommended to:**

- Disconnect the finger cuff air hoses from the Wrist Unit.
- Shut down LabChart.
- Turn the Human NIBP Controller off and back on.
- Unplug the USB cable, then reconnect it.
- Reapply the finger cuff(s).
- Restart LabChart before resuming a measurement.

2. **Operating conditions**

- The Human NIBP Controller has a narrow temperature operating range (10–40 °C) and should be placed apart from other equipment for optimal operation.
- It is best to perform measurements at room temperature.
- It is important to keep the hand warm during ambulatory measurements.
- If blood pressure is measured on cold fingers, the measurement can be difficult or even impossible.

3. **Height correction**

- The height reference level should be selected carefully. If the subject is walking or sitting it is best to place the reference part on the chest at the level of the right atrium in the mid-axillary line.
- In the recumbent (lying) position it is best to place the reference ending at mid-chest level.
- If the experiment focuses on the dynamic response of the hemodynamic system after a change in posture it is usually best to keep both the transducer and the reference ending at the level of the right atrium to avoid a dynamic response of the height correction system.
- As a general rule, try to keep the cuffed fingers approximately at heart level, even with a connected height correction unit. The HCU pressure should not exceed ±20 mmHg.
- The HCU tubing should be free of bends and unobstructed in any way.

Further resources

Statement of intended use

All products supplied by ADInstruments are intended for use in teaching and research applications and environments only.

ADInstruments products are NOT intended to be used as medical devices or in medical environments. That is, no product supplied by ADInstruments is intended to be used to diagnose, treat or monitor a subject. Furthermore no product is intended for the prevention, curing or alleviation of disease, injury or handicap.

This product meets the IEC60601-1 standard, under the principle that:

- it is a more rigorous standard than other standards that could be chosen.
- it provides a high safety level for subjects and operating personnel.

Avoiding injury to subjects and personnel

- Finger cuffs shouldn't be applied to any body part other than the fingers.
- Do not over tighten the Wrist Unit strap as that will cut off circulation to the hand, leading to discomfort and measurement errors.
- Do not wrap finger cuffs around a toe or the wrist of an infant.
- For safe and reliable operation and optimal accuracy only use finger cuffs manufactured by ADInstruments and FMS.
- Physiological signals acquired by other devices, such as respiratory signals and ECGs, can be connected to the ADInstruments PowerLab system for recording while making blood pressure measurements using the Human NIBP Controller.
- Note that any connected equipment has to meet the IEC specifications (IEC601 for electromedical devices or IEC950 for data processing devices). The configuration has to meet the IEC system standard (IEC601-1-1). Connection of additional devices implies a responsibility to adhere to the IEC601-1-1 standard.
- If any of the components of the Human NIBP System appear damaged in any way, please contact your ADInstruments® representative.

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This Agreement is between ADInstruments Pty Ltd ['ADI'] and the purchaser ['the Purchaser'] of any ADI product or solution — software, hardware or both — and covers all obligations and liabilities on the part of ADI, the Purchaser, and other users of the product. The Purchaser (or any user) accepts the terms of this Agreement by using the product or solution. Any changes to this Agreement must be recorded in writing and have ADI's and the Purchaser's consent.

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Where a product meets IEC 60601-1 it is under the principle that:

1. it is a more rigorous standard than other standards that could be adopted and
2. it provides the most appropriate safety level for subjects and operators.

The choice to meet IEC 60601-1 is in no way to be interpreted to mean that a product:

1. is a medical device;
2. may be interpreted as a medical device;
3. is safe to be used as a medical device

ADI Product Hardware Warranty

ADI warrants that PowerLab Data Acquisition Units (PL prefix)[1] and Front-ends (FE prefix)[2] shall be free from defects in materials and workmanship for five (5) years from the date of purchase. Other PowerLab Data Acquisition Units[3], Front-ends[4] and Pods[5] shall be free of

defects in material and workmanship for three (3) years from their date of purchase. ADI also warrants that ADI Specialized Data Recorders[6] and Instruments[7] shall be free of defects in material and workmanship for one (1) year from their date of purchase. If there is such a defect, as Purchaser's sole remedy hereunder, ADI will repair or replace the equipment as appropriate, and the duration of the warranty shall be extended by the length of time needed for repair or replacement.

To obtain service under this warranty, the Purchaser must notify the nearest ADI office, or Authorized Representative, of the defect before the warranty expires. The ADI or Representative office will advise the Purchaser of the nearest service center address to which the Purchaser must ship the defective product at his or her own expense. The product should be packed safely, preferably in its original packaging. ADI will pay return shipping costs.

Hardware Warranty Limitations

This warranty applies only to the ADI hardware specified in this document and used under normal operating conditions and within specification. Consumables, electrodes and accessories are not covered by this warranty. Third party equipment may be covered by the third party manufacturer's warranty. To the extent that ADI has the right to pass through any third party manufacturer warranties to Purchaser it will do so to the extent it is able to do so. Copies of applicable third party manufacturer warranties, to the extent they exist, are available upon request. The warranty provided hereunder does not cover hardware modified in any way, subjected to unusual physical, electrical or environmental stress, used with incorrectly wired or substandard connectors or cables, or with the original identification marks altered. Tampering with or breaking of the Warranty Seal will also void the warranty.

Product Types & Warranty Term

ADI manufactured products covered by five (5) year warranty

1. Data Acquisition Units: PowerLab 35 series with PL prefix.
2. Front-ends: ADI Front-end Signal Conditioners with FE prefix.

ADI manufactured products covered by three (3) year warranty

3. Data Acquisition Units: PowerLab 26 series with ML prefix.
4. Front-ends: ADI Front-end Signal Conditioners with ML prefix.
5. Pods: The entire range of ADI Pod Signal Conditioners.

ADI manufactured products covered by one (1) year warranty

6. Specialized Data Recorders: Metabolic Systems (e.g. ML240 PowerLab/8M Metabolic System)
7. Instruments: Blood FlowMeter, Gas Analyzers, NIBP System (excluding transducers), STH Pump Controller.

Third Party Products (Including Transducers)

Products not manufactured by ADI are covered by the manufacturer's warranty.

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