VitalsBridge™

DIRECTIONS FOR USE

MODELS VB100, VB200, VB300

Table of Contents

Regulatory Information

Use statement: The VitalsBridge is for use in the United States, Canada and in CE marking countries.

Federal Communications Commission Statement: This device complies with part 15 Subpart B of the FCC rules.

Caution: Only use cables supplied with the VitalsBridge and accessories approved for use with the VitalsBridge. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Disposal/Recycling: Recycle and dispose of in accordance with all governing requirements and regulations. The VitalsBridge contains a Li-ion battery, which should be recycled.

LATEX   The VitalsBridge instrumentation and its associated cables are latex free.

Support

For technical assistance, contact VitalsBridge customer support.
e-mail: support@vitalsbridge.com
phone: 1-435-200-3402 1-801-484-3820

Disclaimer

Use of the VitalsBridge to train personnel should be conducted under supervision of suitably trained medical personnel with an understanding of clinical monitoring, patient simulation educational principles, and recognized medical protocols. As with all simulation training devices, there may be approximations, variations, and inaccuracies in the information being presented.

Global Warranty

The VitalsBridge has a 1 year limited warranty; see www.vitalsbridge.com or contact support@vitalsbridge.com for additional details and warranty options.

Manufacturer

The VitalsBridge™ is made in the USA and is manufactured by:

Dynasthetics, LLC
3487 W. 2100 S. #300
Salt Lake City, Utah, 84119
USA

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Warnings and Caution

The VitalsBridge is intended solely for use during patient simulation. It is not a medical device.

⚠️ *Warning*: Never connect the VitalsBridge to a patient.

⚠️ *Warning*: Never connect the VitalsBridge to a vital signs monitor that is connected to or in use by a patient.

⚠️ *Warning*: The VitalsBridge is not waterproof. Protect the VitalsBridge in damp conditions and keep away from liquids.

⚠️ *Warning*: The VitalsBridge contains a lithium ion battery, which, if damaged, could cause risk of fire or explosion.

Follow all cautions and warnings outlined with your patient simulator's Directions for Use.

Compressed Gases and Regulators (model VB300 only)

The VitalsBridge is supplied with a portable gas regulator that uses cartridges of highly pressurized CO_2. Take care when handling these cartridges as they pose a potential risk of injury if used improperly. Cartridges should be stored and operated at temperatures below 120° F (49° C) and punctures should be prevented. They should not be heated. Do not inhale the gas. Adequate training and expertise are required to work with compressed gases.

⚠️ *Warning*: Do not use compressed oxygen (fire hazard) or any other flammable substance with or near the VitalsBridge.

⚠️ *Warning*: compressed CO_2 cartridges may become extremely cold when discharging. Protect eyes and hands when installing and handling cartridges.

⚠️ *Warning*: Mishandled compressed CO_2 cartridges may become projectiles.

⚠️ *Caution*: Compressed CO_2 cartridges may **not** be transported by air.

Defibrillation Hazards:

During defibrillation the defibrillator and VitalsBridge may present a shock hazard. All standard safety precautions must be taken when using a defibrillator with a patient simulator and VitalsBridge.

⚠️ *Warning*: Models VB200 and VB300: Defibrillation on the ECG connectors of the VitalsBridge will damage the internal electronics and may cause personal injury.

⚠️ *Warning*: Never connect any cables from the VitalsBridge to the designated defibrillator connectors on your patient simulator.

Requirements Checklists

Cables and Accessories

Please verify the following have been included in your shipment. If you are missing any of these items, have damaged items, or need extras, please contact VitalsBridge™ customer support for replacements.

1. VitalsBridge power supply, 9V, with wall plug (all models)
2. Non-Invasive Blood Pressure (NBP) parts kit (array of adapters to connect VitalsBridge to NBP cable on patient monitor; all models)
3. SpO_2 adapter and probe kit (all models)
4. Temperature transducer cables, 2 (all models)
5. USB cable for optional serial (RS-232) communication with the VitalsBridge (all models)
6. Ethernet cable for optional hard-wire network communication with the VitalsBridge (VB200, VB300)
7. Invasive blood pressure transducer cables (VB300)
8. Portable CO_2 Regulator (VB300)

Computer and Software Requirements

1. VitalsBridge Connector Application: Windows 8, 8.1, or 10 operating system (see www.vitalsbridge.com/downloads/)
2. VitalsBridge Connector Mobile App: Android operating system (5.0 or Higher)
3. Software used to control your patient simulator or to simulate a standardized patient (optional)
4. Ethernet (LAN), wireless network (WLAN), Bluetooth, or serial (RS-232) communication capability

Additional Requirements

1. VitalsBridge instrumentation
2. Commercially available vital signs monitor
3. AC power source (i.e. a wall outlet)
4. Model VB300: source of compressed CO_2 (the supplied portable CO_2 regulator and cartridges, or another external CO_2 source, regulated to 15 – 20 PSI)

VitalsBridge™ Overview

The VitalsBridge is a device that allows simulated or digitized vital signs to be presented on real vital signs monitors. It is intended to increase the realism and effectiveness of simulations by allowing users to view, interact with, and control real patient monitors that are used in their clinical practice.

Vital signs can be easily controlled from the VitalsBridge Connector Software or mobile app. The VitalsBridge can also be connected to patient simulator software allowing for vitals sign changes in a patient simulator to be seamlessly updated on the real patient monitor.

Whether you are using a low-fidelity simulator, a high-fidelity simulator, or a standardized patient, the VitalsBridge presents increased opportunities for enhanced simulation experiences, heightened training and education on clinical monitoring, and improved patient information systems testing, just to name a few.

All VitalsBridge models are compatible with modern patient monitors and can be used with any manikin or standardized patient. Certain manikin instructor applications feature direct integration with the VitalsBridge. Each model also includes battery backup for increased portability.

Each model of the VitalsBridge supports different vital signs and device connection options detailed in the table below:

	VitalsBridge 100	VitalsBridge 200	VitalsBridge 300
Heart Rate	✓	✓	✓
Plethysmography Waveform	✓	✓	✓
SpO$_2$ (pulse oximetry)	✓	✓	✓
NIBP (non invasive blood pressure)	✓	✓	✓
Temperature	✓ 1 Measurement	✓ 1 Measurement	✓ 2 Measurements
ECG		✓	✓
Respiration via ECG		✓	✓
IBP			✓ 4 Measurements
Capnography (end tidal CO$_2$)			✓
Bluetooth Connection	✓	✓	✓
USB Connection	✓	✓	✓
Ethernet Connection		✓	✓
Wifi Connection		✓	✓

Overview of the VitalsBridge Setup

Upon initial setup, is best to configure the VitalsBridge in stages. Each step is listed below, but is described in detail in subsequent pages.

Power on the VitalsBridge

- See page 9.

Connect Patient Monitor Cables and Sensors to the VitalsBridge

- Step-by-step instructions start on page 11.
- Connect your VitalsBridge to your monitor using the pieces of the sensor and cable kit that was included with your VitalsBridge.

Install the VitalsBridge Connector Software

- Step-by-step instructions start on page 24.
- Install the software that sends simulated vital signs from a Windows PC or Android mobile device to the VitalsBridge.

Establish Communication with the VitalsBridge

- Step-by-step instructions start on page 27.
- Connect to the VitalsBridge using a Windows PC or an Android mobile device.
- Establish a connection and communicate with the VitalsBridge over Bluetooth, USB, WiFi (VB200 and VB300 only), or Ethernet (VB 200 and VB300 only).

Depending on your simulation equipment and scenario, some additional information may be helpful.

Use the VitalsBridge with a Patient Simulator

- Step-by-step instructions start on page 40.
- Communication between the VitalsBridge and Laerdal simulators is available through the VitalsBridge Connector software.
- The VitalsBridge can be used with a Standardized Patient.

Power on the VitalsBridge

To power the VitalsBridge via wall power, simply connect the external power adapter and plug into any standard wall outlet.

⚠ *Warning*: Use only the <u>included 9V power supply</u>. Prior VitalsBridge models used a different voltage for their power supply. Using an incorrect power supply may damage the VitalsBridge and void the warranty.

The VitalsBridge is turned on by simply pressing the power button in the lower left corner of the top surface of the device (hold for 1 second). Once powered on, the VitalsBridge takes approximately 1 minute to initialize. The LED below the battery will flash when the VitalsBridge is initializing and become solid once initialized.

Check the status indicator lights on top of the VitalsBridge instrumentation to determine power and connectivity.

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The VitalsBridge instrumentation has 5 LEDS: Power, battery/charge, USB/Serial, Bluetooth and LAN/WiFi.

- Power indicator:
    - o No light: switched off, or switched on and the VitalsBridge is not plugged into an outlet
    - o Solid: switched on and power available to the VitalsBridge

- Battery/Charge indicator:
    - o No light: VitalsBridge is not running
    - o Solid: VitalsBridge is on, battery charge > 15%
    - o Flashing every 1 second: unit is running on low battery charge < 15%

- USB/Serial:
    - o No light: USB is not ready
    - o Solid: USB is ready

- Bluetooth:
    - o No light: Bluetooth is not ready
    - o Solid: Bluetooth is ready

- LAN/Wifi:
    - o No light: not connected to router
    - o Solid: the VitalsBridge is connected to the manikin's internal router or to an external router
      Note: If you have just reconfigured your VitalsBridge to connect to WiFi, the light will *not* turn on until you have first closed out of the VitalsBridge Connector software

Internal Battery

The VitalsBridge contains an internal, non-replaceable Lithium-Ion battery to allow for unplugged operation of the unit. When fully charged, this will allow for at least 1 hour of use (2 – 3 hours typical). To charge the battery, connect the external power supply. The power supply will charge a fully depleted battery in 6-12 hours. When the unit is switched on, the battery indicator on the top panel will flash when there is less than 10% of battery life remaining; if you need to continue using the VitalsBridge, connect the external power.

When plugged in and powered off, the VitalsBridge battery will be charged. When plugged in and powered on, the VitalsBridge battery will also be charged (at a slower rate).

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Connect Patient Monitor Cables and Sensors to the VitalsBridge

This section will describe how to connect the cables and tubing between the VitalsBridge and the vital signs patient monitor. The cable and sensor kit provided with the VitalsBridge is intended to be preconfigured with the vital signs monitor brand and model you plan to use. If more than one vital signs monitor will be used, refer to www.vitalsbridge.com on how to purchase additional sensor and cable kits.

Begin the connection process by setting up your patient monitor so that it would function normally if all sensors were connected to a real patient. Refer to your patient monitor documentation and instruction manuals as needed.

- Connect all appropriate sensor cables to the patient monitor and ensure it is powered on.
- Check to see if the patient monitor has a working non-disposable SpO_2 probe. Test its functionality by placing it on your finger and verify that a reading on the patient monitor is shown.

Pulse Oximetry (SpO_2) (All Models)

▶ Video Link: https://youtu.be/XF5gfQ2txwY

Pulse oximetry, or SpO_2, is used to determine the oxygen saturation of a patient's blood. It also will provide a pulse measurement. SpO_2 simulation by the VitalsBridge uses special circuitry in a custom SpO_2 adapter, cable and sensor kit which simulates the SpO_2 probe according to the SpO_2 value set for your simulation. The custom SpO_2 adapter has labeled cable connections to both the VitalsBridge and the patient monitor.

Configuring SpO_2

1. Locate the SpO_2 cable and probe connected to your monitor and the SpO_2 Adapter kit that came with the VitalsBridge.
2. In the SpO_2 Adapter kit, locate the grey cable with circular ends and seven pins.

3. Connect the grey cable to the labeled SpO_2 port on the VitalsBridge.
4. Connect the other end of the grey cable to the appropriate port on the Oximeter Adapter box.
5. Place the SpO_2 probe coming from the patient monitor in the Oximeter Adapter box. Below are written instructions and a diagram to help you complete this step.
   a. Hold the probe parallel with the ground. The half of the probe with the cable attached should be on top. The half of the probe without a cable attached should be underneath, closest to the ground.

   b. Locate the slot on the Oximeter Adapter box intended for the SpO_2 probe. You should see a white post that simulates a patient finger inside the slot.

   c. Slide the cable attached to the SpO_2 probe through the slot on the side of the Oximeter Adapter box.

   d. Open the probe slightly and push the probe firmly into the slot onto the white "finger," then release.

6. If everything has been connected correctly, a reading should appear on the fetal/maternal monitor after a few moments.

Patient Monitor

Patient Monitor

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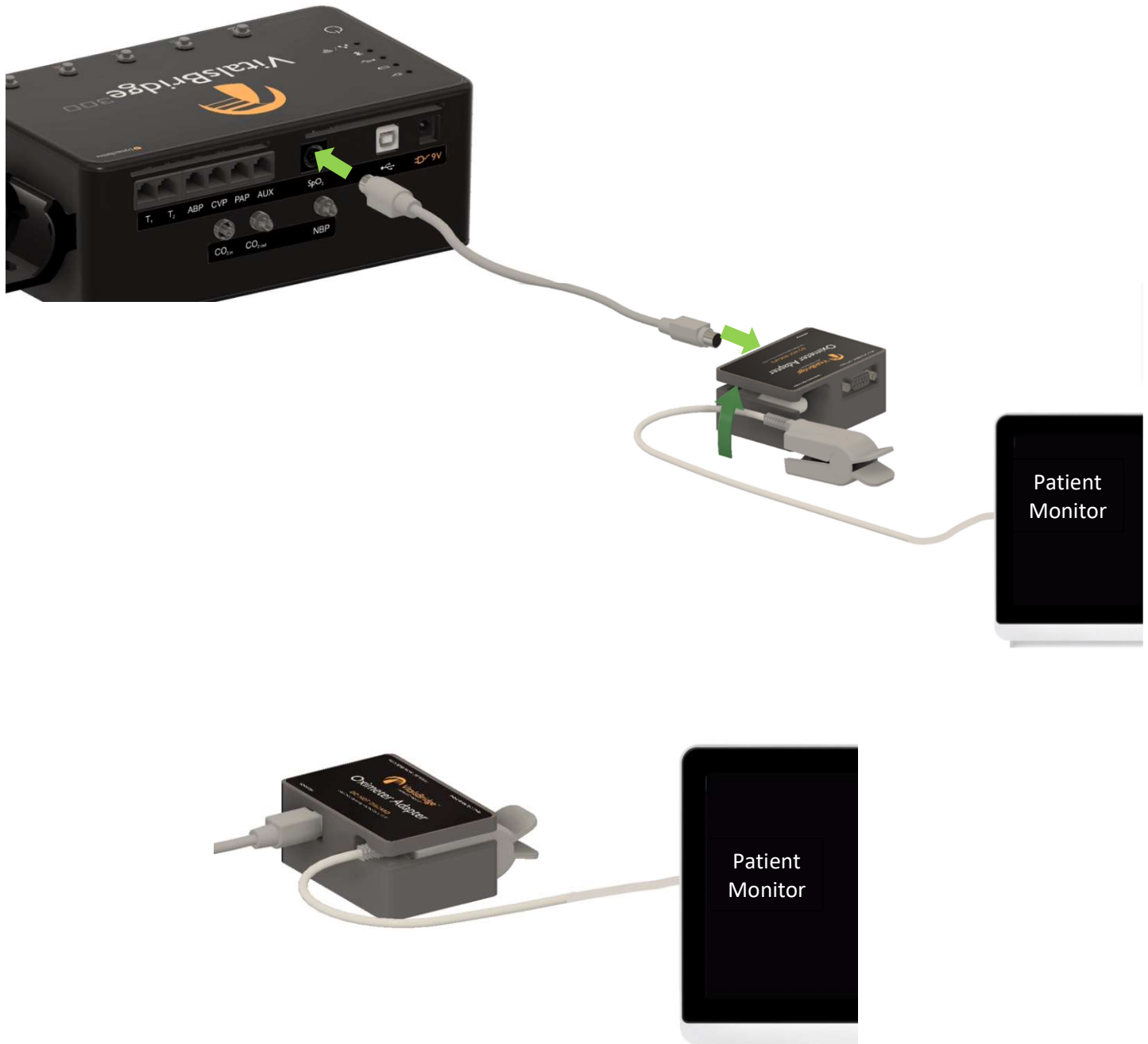
Mock SpO₂ Probe (Optional)

You will see a port on the Oximeter Adapter box for a mock SpO$_2$ probe. If the mock probe included in the kit is connected to the Oximeter Adapter box, a reading will not appear on your patient monitor unless the mock probe is placed on a patient simulator's finger. We do not recommend connecting the mock probe until you ensure that the connection is working properly and are ready to run a simulation with a patient simulator. For more information on the mock probe, see the section on "Increasing Realism."

Mock SpO2 Probe (Optional)
(place on simulator's finger)

SpO2 Extension Cable

Connection to Vitals Bridge

Connection to SpO2 cable on patient monitor
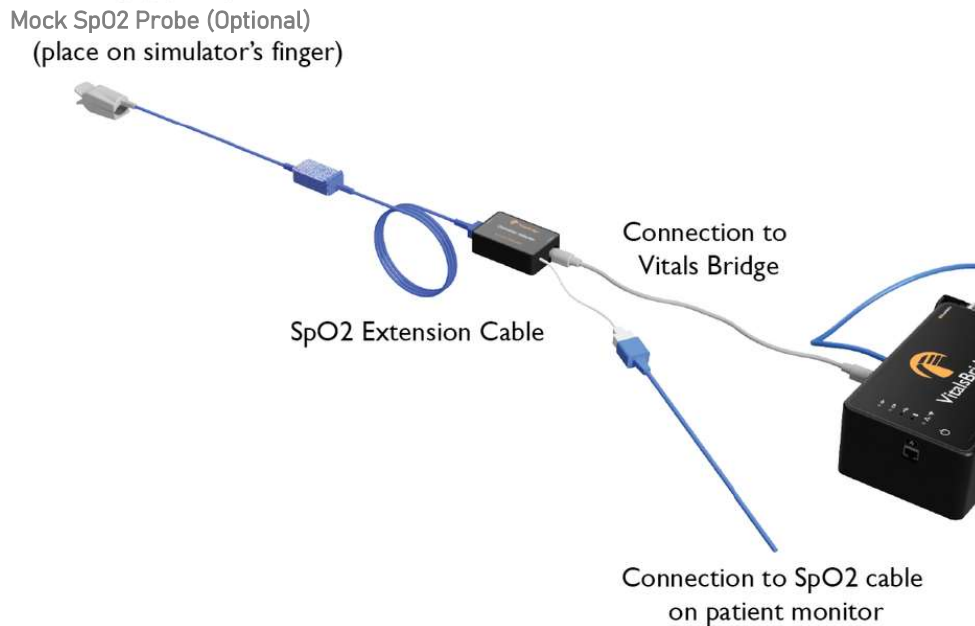
Non-invasive Blood Pressure (NBP) (All Models)

Video Link: https://youtu.be/7OznDRpDM3M

The VitalsBridge simulates non-invasive blood pressure by mimicking the pulsing of an artery. The NBP tubing from the patient monitor is connected to the VitalsBridge, and when the patient monitor initiates an NBP reading, the VitalsBridge simulates an appropriate magnitude of pulsing.

Configuring NBP

1. Locate your NBP cable that goes with the patient monitor.
   a. If a blood pressure cuff is still attached to the cable, carefully remove it.
2. Determine if your NBP cable needs configuring in order to connect to the VitalsBridge.
   a. Compare the fitting at the end of your NBP cable to the NBP port on the VitalsBridge. If they will fit together, skip down to step 3. If not, continue to part 2.b.
   b. Locate the NBP adapter bag. It contains tubing adapters and connectors for appropriate fitting(s) to connect the luer fitting on the VitalsBridge with the patient monitor's NBP tubing.

    i.   Determine which connectors your cable will need to connect to the VitalsBridge NBP port. If the NBP tubing coming from your monitor has 2 connectors, a 2-tube to 1-tube adapter fitting has been provided.

    ii.   Follow the instructions with the images below.

Select the appropriate tube and luer

Affix the tube and luer fittings to each other to provide an ending that can be attached to the

    c.   Connect the appropriate adapters and connectors to the NBP cable from the patient monitor if necessary.

3. Connect the NBP cable to the labeled NBP port on the VitalsBridge.

4. Run a blood pressure cycle on the patient monitor. If everything has been connected correctly, a reading should appear on the monitor once the cycle is complete.

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Temperature (All Models)
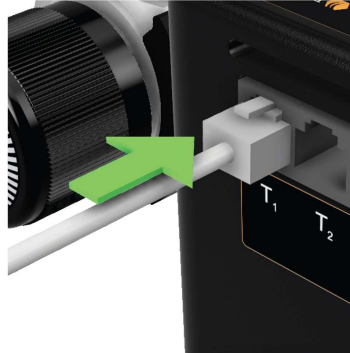
▶ Video Link: https://youtu.be/jf2nhK77Z1k

The VitalsBridge simulates the output of YSI 400-compatible temperature transducers.

Configuring ECG

1. Locate the temperature cables. They are short white cables that have an RJ-11 connector on one end and a transducer connector on the other.
2. Plug the RJ-11 connector end into the VitalsBridge.

3. Connect the transducer end to the temperature cable coming from the patient monitor.
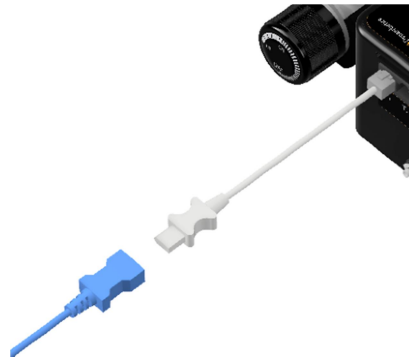
4. Once connected and with the VitalsBridge powered on and initialized, a reading should appear on the patient monitor after a few moments.

Electrocardiogram (ECG) and Respiration (VB300, VB200)

▶ Video Link: https://youtu.be/TYTOszkZuC8

The VitalsBridge has connections for up to 5 ECG leads (RA, RL, V, LL, and LA). In addition, a respiration by impedance signal is also produced by the VitalsBridge.

Configuring ECG

1. Using the ECG harness from the patient monitor, connect each lead to the VitalsBridge. Match the corresponding colors or labels on the leads to the snaps on the VitalsBridge.

2. Once connected and with the VitalsBridge powered on and initialized, a reading should appear on the patient monitor after a few moments.

Invasive Blood Pressure (IBP) (VB300 only)

▶ Video Link: https://youtu.be/LcbsGMnd5lQ

The VitalsBridge simulates up to 3 different invasive blood pressure waveforms. These include arterial blood pressure (ABP), central venous pressure (CVP), pulmonary artery pressure (PAP) or pulmonary capillary wedge pressure (PCWP). Note: contact Dynasthetics or visit www.vitalsbridge.com for assistance with purchasing a VitalsBridge-compatible invasive blood pressure monitoring cable (i.e., the cable that connects from the patient monitor to the VitalsBridge RJ-11 cable).

1. Locate the invasive blood pressure adapter cables. They have an RJ-11 connector end and a transducer end, where the transducer style may vary depending on how the VitalsBridge was configured.
2. Connect the RJ-11 end of the cable to the VitalsBridge.

3. Connect the transducer end of the cable to the patient monitor's IBP cable.
4. If everything has been connected correctly, a reading should appear on the monitor after a few moments.

Notes: when using IBP, a connection to every waveform is not required for the VitalsBridge to function. Unused IBP ports on the VitalsBridge may be left unconnected. If your IBP adapter cable does not have the correct transducer style, please contact us at support@vitalsbridge.com.

Capnography (VB300 only)

Overview

Capnography is the measurement of the concentration of patients' exhaled CO_2. The VitalsBridge simulates the fraction of CO_2 exhaled from each breath by mixing appropriate amounts of air and CO_2. This mixture may be measured by the patient monitor using two different types of technologies: side-stream sampling and mainstream measurement. To use the VitalsBridge capnography function, ensure that your patient monitor supports capnography measurement.

A regulated source of compressed CO_2 is required for capnography. A portable CO_2 regulator is provided with the VitalsBridge. Alternatively, compressed CO_2 from another external source may be available at your facility (e.g., a wall source, a tank, etc.). Consult your facility's engineering department regarding external CO_2 sources and the appropriate regulators and adapters for proper setup and connection.

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Using the Portable CO_2 Regulator

The portable CO_2 regulator uses 16g threaded CO_2 disposable cylinders. The regulator may be detached by moving the regulator out of its bracket on the side of the VitalsBridge. The regulator's tubing has a luer lock fitting that will connect into the VitalsBridge and regulator knob to control the flow of gas. The regulator should be turned to the **OFF** position when it is not connected to the VitalsBridge via the luer connection. Only turn the regulator on when a tight secure connection to the VitalsBridge has been verified.

⚠️ *Caution:* The regulator's gauge should be positioned at the same level or above the attached CO_2 cylinder (i.e., keep cylinder level or upright). The cylinder is pressurized. Sudden release of pressure may cause injury. Turn regulator to **OFF** when not in use.

⚠️ *Warning*: CO_2 cartridges may become extremely cold when discharging. Protect eyes and hands when installing and handling CO_2 cartridges.

⚠️ *Warning*: Mishandled CO_2 cartridges may become projectiles.

Install or Remove the CO_2 Cartridge

▶️ Video Link Install: https://youtu.be/3Fu4dNAQD-k

▶️ Video Link Uninstall: https://tinyurl.com/VBCO2uninstall

1. If replacing an empty cartridge, temporarily remove the regulator from its bracket on the VitalsBridge instrumentation and remove the empty cartridge from the regulator by turning it counterclockwise. *(If this is the first time installing a cartridge, the regulator should already be separated from its bracket and there should be no cartridge attached to it.)*

2. Adjust the regulator knob to the "OFF" position by rotating it counterclockwise.

3. Attach the blue tubing to the blue luer lock ($CO_{2\ in}$) to the VitalsBridge. To ensure a secure connection between the regulator and the VitalsBridge, twist the luer fitting at least 180 degrees to the left before inserting the luer into the metal port on the VitalsBridge. Then twist to the right until it is tight.
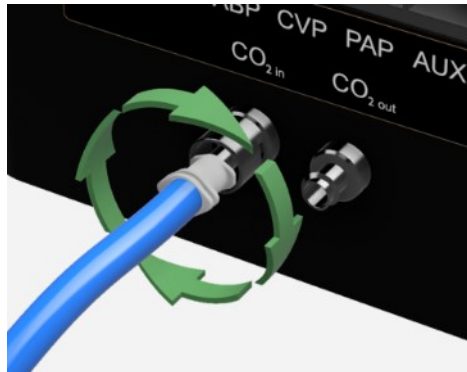
4. Orient the VitalsBridge so the threaded connection on the regulator can be seen. Hold the regulator in one hand, align the cartridge under the housing, and quickly turn it clockwise into the regulator. Do not stop until tight. Do not over-tighten; the cartridge only needs to be hand tight. It is normal for a small burst of gas to leak out during cartridge installation.

5. Replace the regulator back on the bracket that is attached to the VitalsBridge instrumentation.

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6. SLOWLY turn the regulator knob clockwise until the indicator on the gauge reads between 15-20 PSI. Do not set the regulator to a reading higher than 20 PSI.
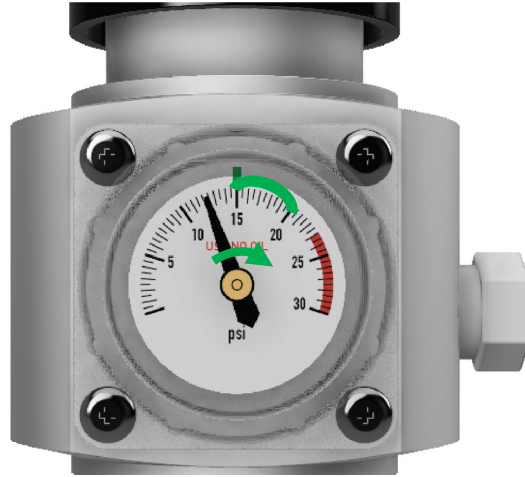
⚠ *Caution:* Ensure CO_2 has been fully released prior to disposing of the cartridge. This may be accomplished by: (i) turning the regulator to "OFF"**,** (ii) detaching the female luer fitting from the blue luer lock ring on the VitalsBridge, (iii) *slowly* turning the regulator knob clockwise (towards "HI"), and (iv) allowing the remaining compressed gas to expel in a controlled manner. The cartridge may be very cold. Point the outlet of the cartridge away from yourself and others. Wear eye protection. **Ensure that the knob is turned to the off position before a new cartridge is installed.**

⚠ *Caution:* When not in use turn the regulator to the off position and disconnect the regulator tubing from the VitalsBridge.

⚠ *Caution*: CO_2 cartridges may **NOT** be transported by air.

Capnography Configuration (Side-stream versus Mainstream CO_2)

There are two versions of the VitalsBridge 300:

- The **side-stream CO_2 only (serial # vb30xxxx)** VB300 does not support mainstream CO_2 patient monitoring; however, this version of VitalsBridge conserves CO_2 use and battery life (1 CO_2 cylinder will last 8+ hours).
- The **mainstream CO_2 (serial # vb35xxxx)** VB300 may be used for capnography monitoring of both mainstream and side-stream technologies. However, it requires more CO_2 use, increases mechanical noise slightly, and battery life may not be as long.

The serial # of the VitalsBridge is located on a label placed underneath the unit.

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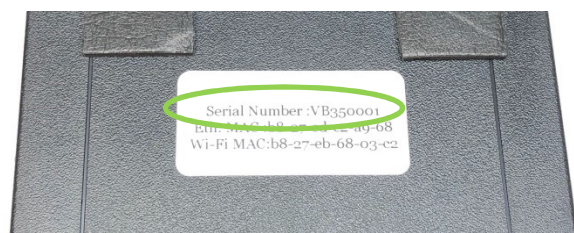
Because of the differences between side-stream and mainstream capnography, specific adapters are supplied with the VitalsBridge. It is important to understand which type of capnography technology is used and that the appropriate VitalsBridge 300 version is used to perform this measurement.

If you have additional questions about use of the VitalsBridge with side-stream and mainstream CO_2, please contact support@vitalsbridge.com.

Side-stream Only VitalsBridge: Capnography Connection (Serial # VB30xxxx)

▶️ Video Link Install : https://youtu.be/yxPfPMJwV9E

One or more capnography sampling lines have been included with the VitalsBridge. A sampling line is a small clear plastic tube with a female luer fitting on one end and a fitting to connect to the patient monitor on the other end.

1. Connect the capnography line to your patient monitor.
2. Connect the female luer fitting on the other end of your capnography line to the luer fitting labeled "CO_2 out" on the VitalsBridge.

To side-stream CO_2 connection on vital signs monitor.
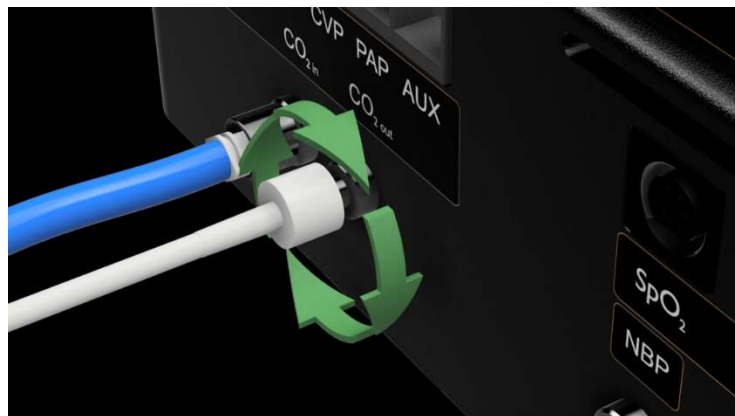
3. Once the sampling line is connected, the patient monitor is powered on, the VitalsBridge is powered on and initialized, and the CO_2 regulator is on and set to the properly regulated pressure, a CO_2 waveform will appear on the capnograph portion of the patient monitor.

Mainstream Capable VitalsBridge: Capnography Connections (Serial # VB35xxxx)
A mainstream capable VitalsBridge may be used with both mainstream and side-stream CO_2 patient monitors.

Mainstream Capnography
A mainstream adapter has been supplied with the VitalsBridge 300. There are two types of mainstream patient monitor adapters: Capnostat and Nihon Kohden (shown below). Consult the patient monitor's documentation to determine which adapter should be used (or if you are unable to determine, please contact support@vitalsbridge.com).


Capnostat Adapter

Nihon Kohden Adapter

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1. Connect the adapter to the patient monitor cable.
   If using a Capnostat adapter, slide the cable fitting around the clear plastic portion of the adapter.

If using a Nihon Kohden adapter, place the adapter so the two arrows are facing up. Then place the two monitor cables in the holes on either side of the adapter, arrows facing up. Each side should "click" when properly secured.
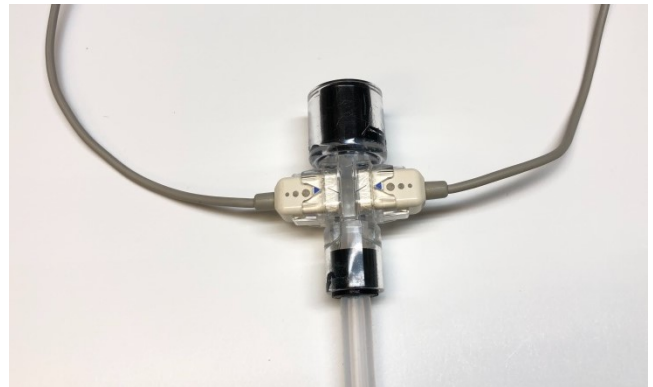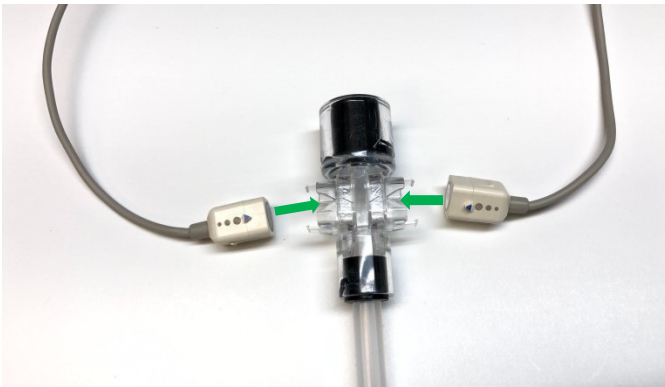
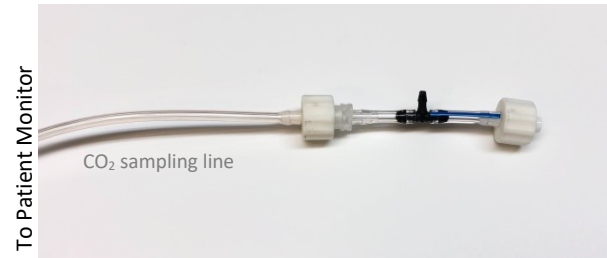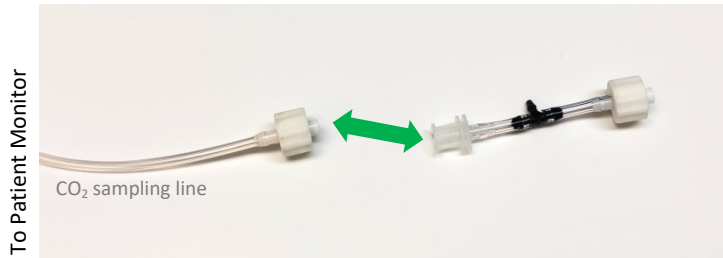2. Connect the female luer on the mainstream adapter to the luer fitting labeled "CO_2 out" on the VitalsBridge.

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3. Once the patient monitor line is connected, the patient monitor is powered on, the VitalsBridge is powered on and initialized, and the CO_2 regulator is on and set to the properly regulated pressure, a CO_2 waveform will appear on the capnograph portion of the patient monitor.

Side-stream Capnography with a Mainstream Capable VitalsBridge

A mainstream capable VitalsBridge also works with side-stream capnography units. A special adapter fitting (shown below) is required and placed between the CO_2 sampling line and the VitalsBridge.

1. Connect the sampling line (the longer clear tube) to your patient monitor.
2. Connect the female luer on the capnography line with the male fitting on the second cable.

3. Connect the remaining female luer on the assembled cable to the luer fitting labeled "CO_2 out" on the VitalsBridge.

4. Once the sampling line is connected, the patient monitor is powered on, the VitalsBridge is powered on and initialized, and the CO_2 regulator is on and set to the properly regulated pressure, a CO_2 waveform will appear on the capnograph portion of the patient monitor.

Install and Run the VitalsBridge Connector Software

VitalsBridge Connector (Windows PC)

PC Requirements:

- Windows 8, 8.1, and 10 operating system (see www.vitalsbridge.com/downloads/)
- Ethernet (LAN), wireless network (WLAN), Bluetooth or USB/serial (RS-232) communication capability

Installation

Software Download Link:

- www.vitalsbridge.com/downloads/

Download the appropriate VitalsBridge Connector installation software from vitalsbridge.com/downloads/. If necessary, copy the software to the computer on which it will be installed.

Note: Choose the appropriate VitalsBridge installation software carefully. There may be specific installation software that is compatible with a particular version of a patient simulator (e.g. a particular version of Laerdal's LLEAP) software.

Note: If it is intended for the VitalsBridge to be used in conjunction with Laerdal LLEAP patient simulator software, download the VitalsBridge connector software to the computer where Laerdal's LLEAP is installed. Otherwise simply download the connector software to the computer the VitalsBridge will be controlled from.

Once downloaded, navigate to the installation software file and open it. Follow the on-screen installation instructions. Upon successful installation, a VitalsBridge icon will be created on the PC's desktop.
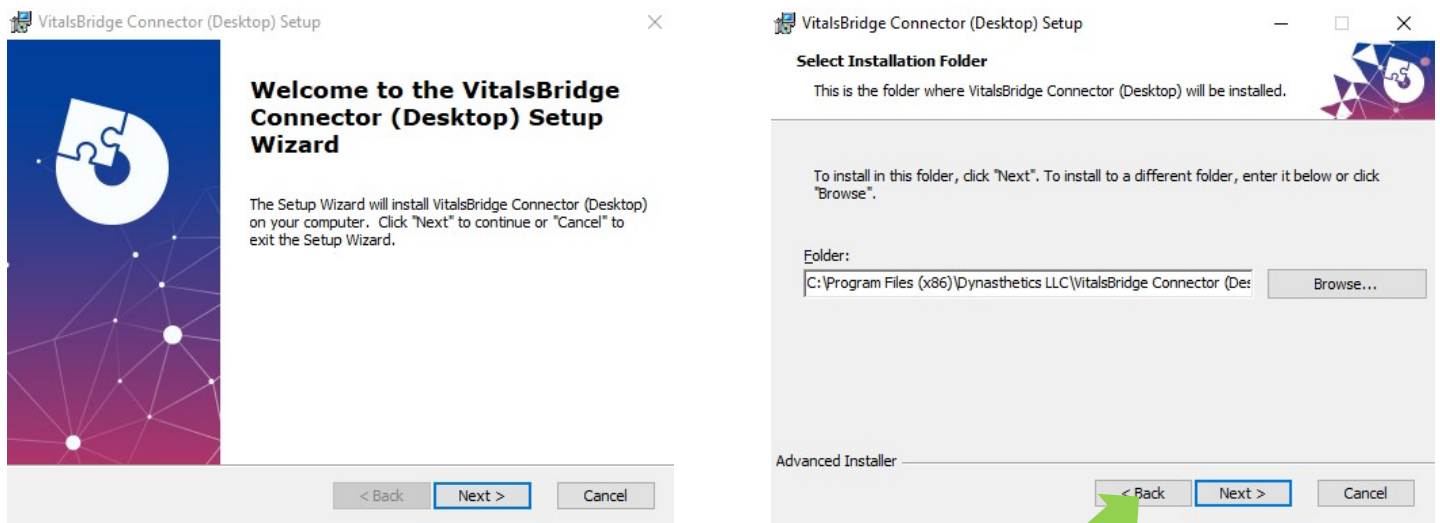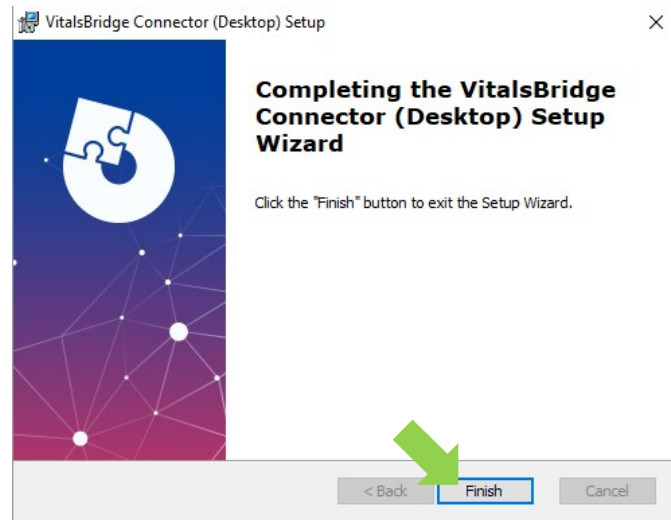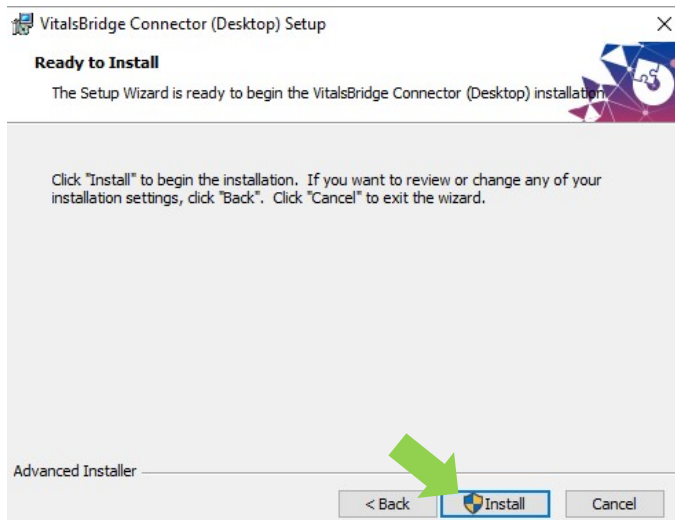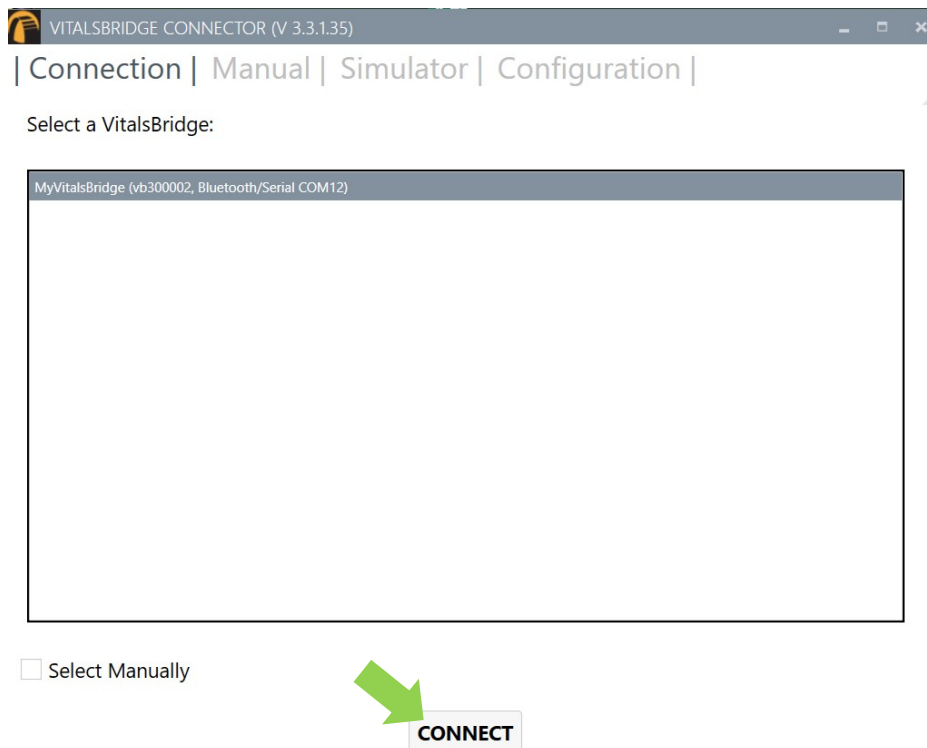
Run the VitalsBridge Connector Software

If using a PC, double click on the VitalsBridge Connector icon, labeled VitalsBridge Connector, located on the computer's desktop. Alternatively, the software may be located by searching for "VitalsBridge" using the Windows search function (i.e., ⊞+S "VitalsBridge").

Connect the VitalsBridge to the Connector Software

Once the Connector Application is running, any available VitalsBridge units will appear in the Connection tab (any units connected via Bluetooth, Serial, or Ethernet/Wifi for 200/300 units only). Select the correct VitalsBridge unit and press CONNECT. **Note**: If the VitalsBridge is being setup for the first time, additional configuration is needed to communicate with the VitalsBridge. See page 31.

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VITALSBRIDGE CONNECTOR (V 3.3.1.35) MYVITALSBRIDGE

| Connection | Manual | Simulator | Configuration |

Connected to MyVitalsBridge (vb300002, Bluetooth/Serial COM12)

## VitalsBridge Connector App (Android Mobile Device)

The VitalsBridge Connector Android App is available for download on the Google Play Store. Using an Android mobile device, navigate to:

- https://play.google.com/store/apps/details?id=com.dynasthetics.vitalsbridge

Alternatively, open the Google Play Store App on the Android mobile device, and search for 'VitalsBridge'. Select 'Install'.
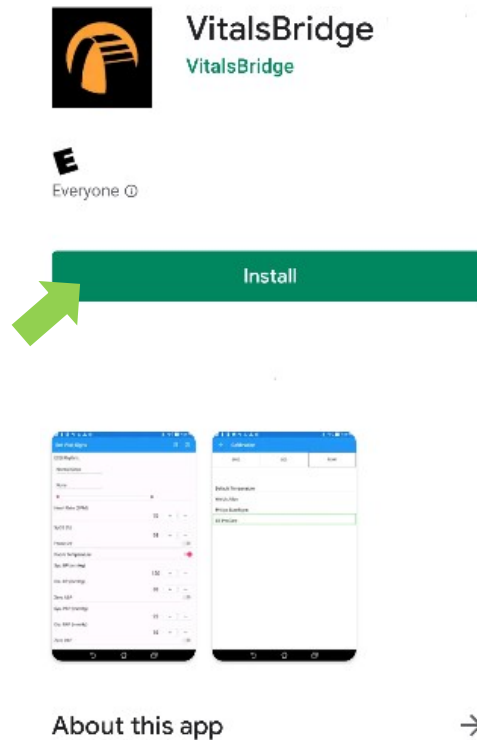
Establish Communication with the VitalsBridge

Overview:

The communication options between the PC and VitalsBridge are:

1. USB (RS-232)
2. Bluetooth
3. Ethernet
4. WiFi*

The communication options between the Android mobile device and VitalsBridge are:

1. Bluetooth
2. WiFi*

Please select the connection method that best suits your needs.

* The WiFi connection option is not available during initial set-up. Please select one of the other connection methods for the first connection.

Note: Only *one* connection is needed at any given time.

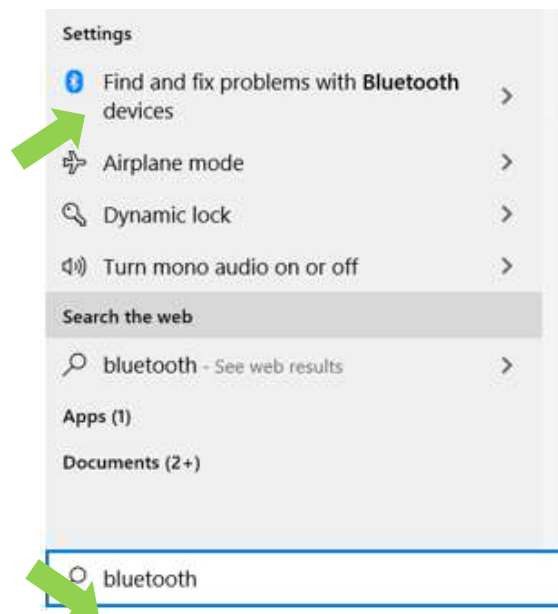## Establishing the VitalsBridge – PC Connection

Bluetooth

The PC communicates with the VitalsBridge using the radio frequency communication (RFCOMM) protocol. Consult your PC documentation and specifications regarding your PC's Bluetooth capabilities. When pairing the PC with the VitalsBridge, the PC will create an emulated RS-232 (COM)serial port. RFCOMM conforms to the Bluetooth specification version 1.1 and should be readily available on all modern Windows PCs that are equipped with a Bluetooth radio.

Here are instructions on how to pair with the VitalsBridge using Windows 10.

Video Link: https://youtu.be/oFNvyviuWZk

1. Open the Bluetooth Settings (⊞+S "Bluetooth")
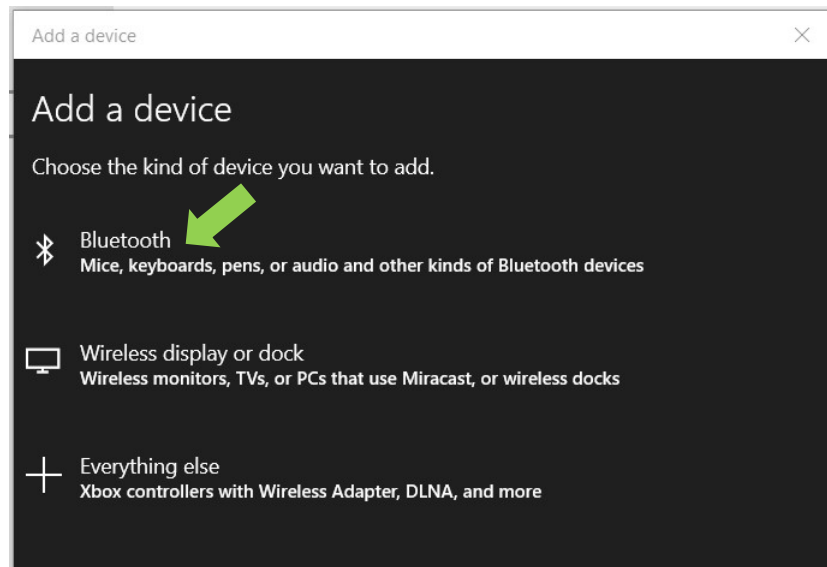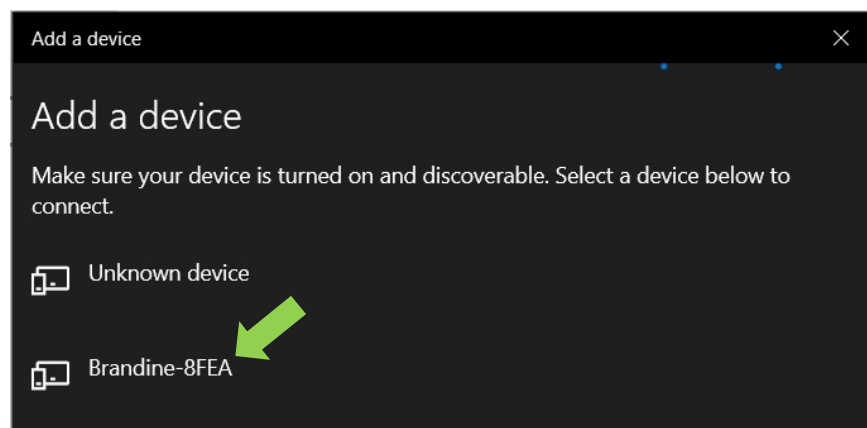
2. Choose "Add Bluetooth or other device" (ensure that Bluetooth is toggled on).
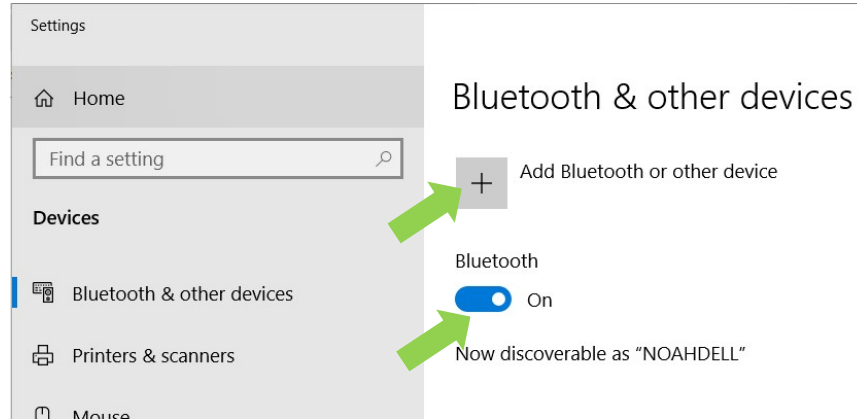
3. When prompted to add a device, choose Bluetooth.

4. Choose the VitalsBridge. When first connecting, the name of the device will be a unique name followed by a string of 4 characters/numbers (e.g., "Todd-03E0" or "Brandine-8FEA"). The name may be changed, see page 39.

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5. The VitalsBridge will provide a 6-digit pin, which will need to be confirmed/acknowledged during the pairing process. Select "Connect" when the appropriate screen appears (it is unnecessary to verify this pin number).
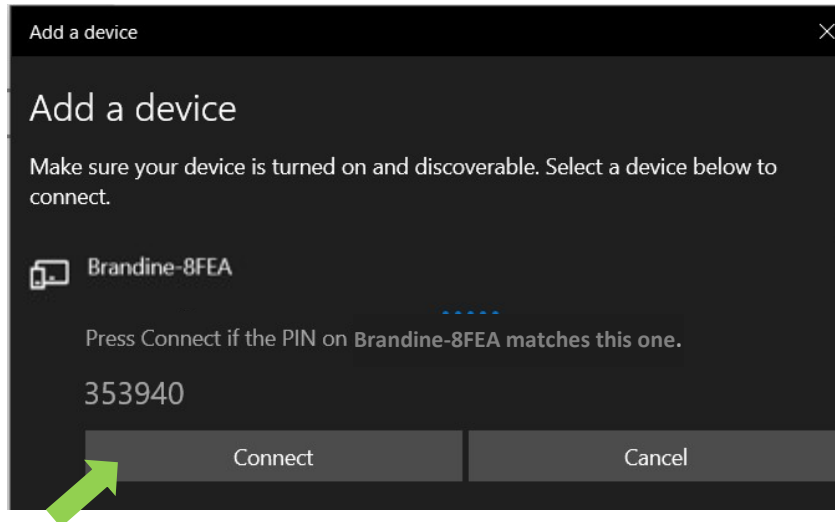
6. Select "Done" and wait 2 minutes.
7. Launch the VitalsBridge Connector software.

Note: If you are having difficulty pairing a previously paired VitalsBridge, follow these steps:

1. Power off the VitalsBridge .
2. Open Windows Control Panel (⊞+S "Control Panel").
3. Choose "View Devices and Printers".
4. Select the VitalsBridge device you wish to remove.
5. Choose "Remove device".
6. Restart the PC.
7. Restart the VitalsBridge.
8. Follow the pairing instructions above to (re)pair the Windows PC to the VitalsBridge.
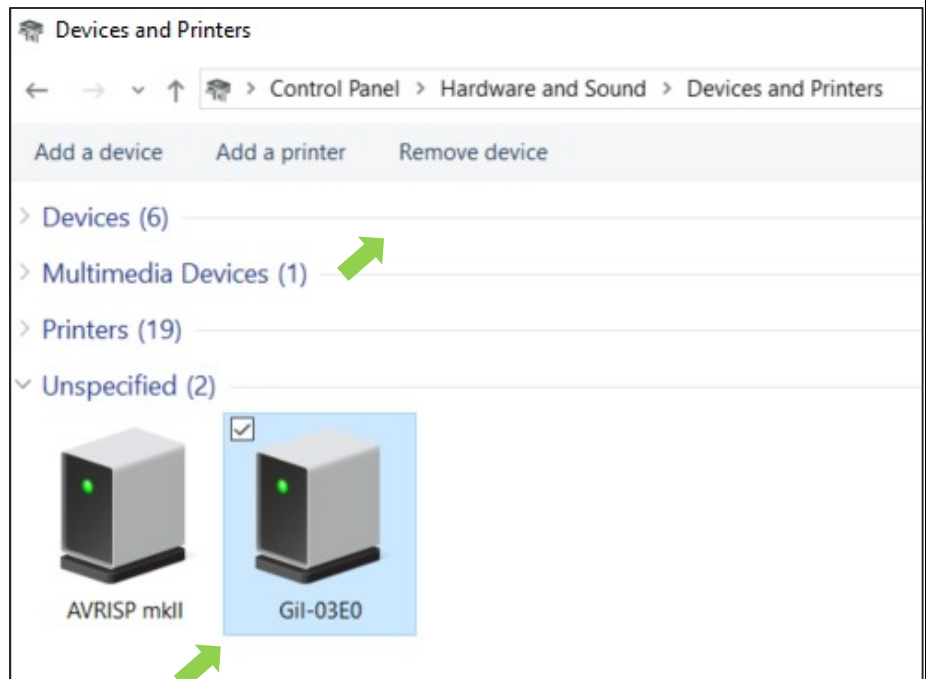
USB cable

▶️ Video Link: https://youtu.be/Kk3TU3nHpd0

1. With the supplied USB cable, connect the VitalsBridge to the Windows PC.
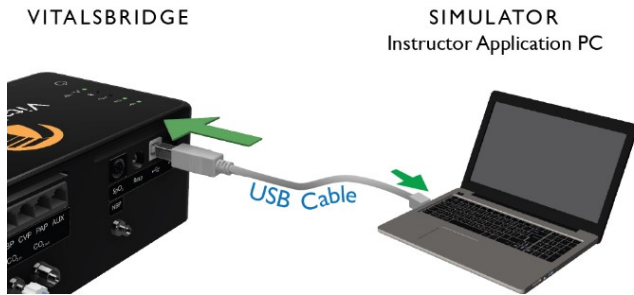
Standardized Patient Setup
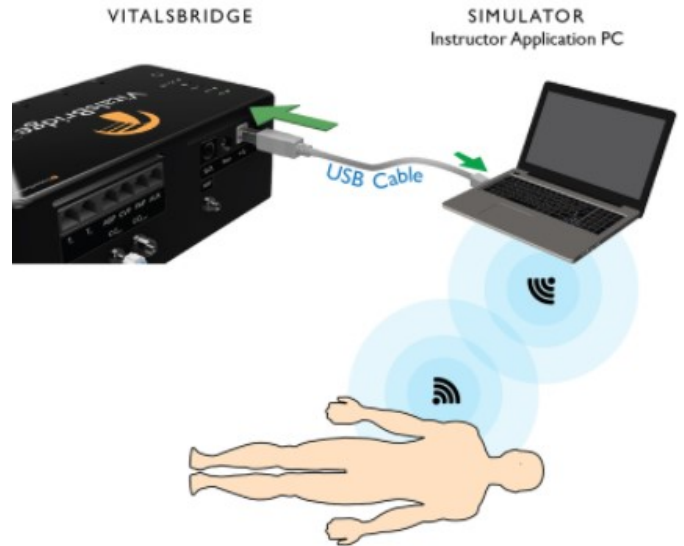
Running the VitalsBridge using a Serial Cable
With a patient simulator

2. Windows will automatically install the appropriate drivers for RS-232 communication over USB. Please wait approximately two minutes for the appropriate drivers to be installed. Alternatively, consider restarting the computer prior to launching the VitalsBridge Connector application.
3. Launch the VitalsBridge Connector software.

Ethernet/WiFi

The VitalsBridge may be connected to a router by an Ethernet cable or by WiFi (2.4 GHz 8.02.11b/g/n). If applicable, the VitalsBridge Connector software is intended to run on a PC that is on the same network as the VitalsBridge and patient simulator. The VitalsBridge requires a router that assigns IP addresses using DHCP. If a reserved IP address is needed, consult your router documentation or network administrator. The VitalsBridge MAC addresses for Ethernet and WiFi are printed on a label, located on the bottom of the VitalsBridge.

For details about connecting via these methods, see below.

Ethernet

▶️Video Link: https://youtu.be/gfPWRhEgsxM

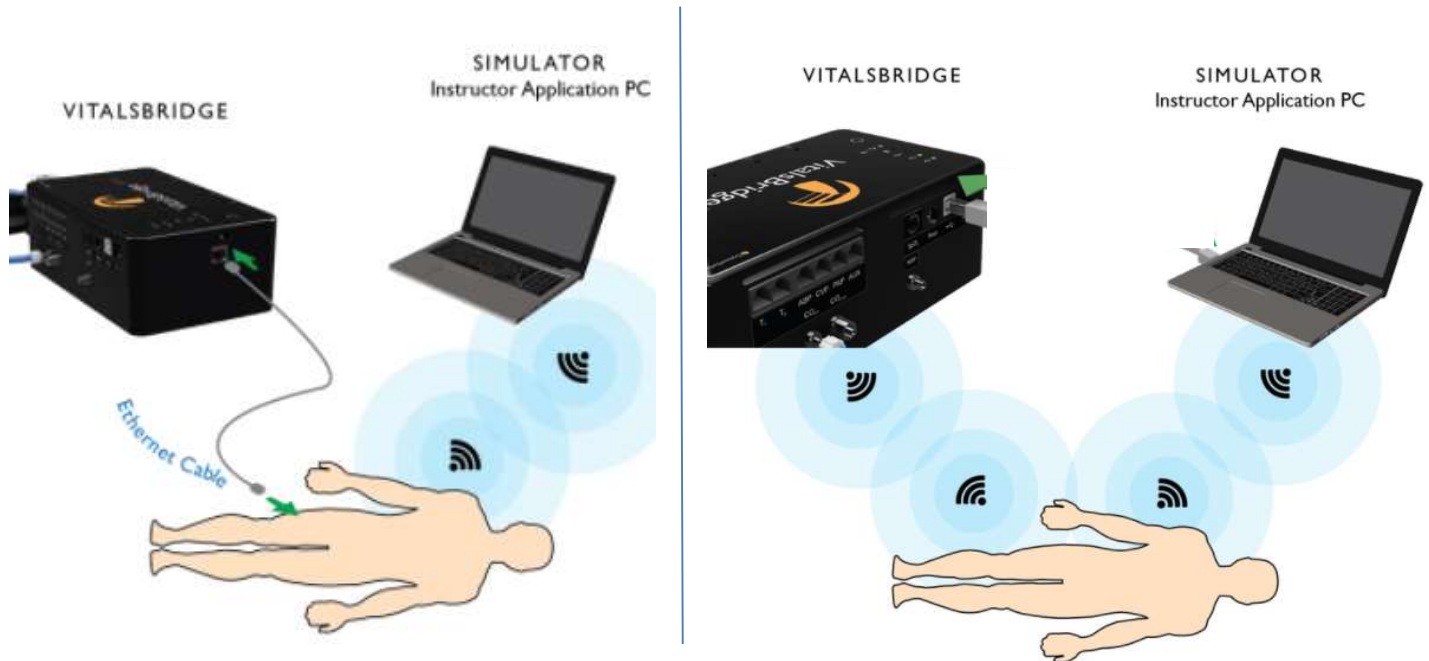When connecting the VitalsBridge to a patient simulator using an Ethernet cable, ensure the cable is functional and is securely connected between the Ethernet ports of the VitalsBridge and the manikin's ethernet port.

It is also possible for the VitalsBridge to be directly connected to a Windows PC that controls a patient simulator with an Ethernet cable. The VitalsBridge is assigned one of the link-local addresses in the range 169.254.1.1 - 169.254.254.254. Some additional network configuration may be necessary.

WiFi

WiFi communication for the VitalsBridge is possible *only* after it has been configured using the VitalsBridge Connector software. WiFi configuration is completed with a Bluetooth or USB connection to the VitalsBridge. WiFi communication *cannot* be used during the initial set-up.

SSID and Password

▶️   Video Link: https://tinyurl.com/VBWiFiinstruction

Note: Before completing the process outlined below, you *must* have already 1) downloaded the VitalsBridge Connector Software, 2) successfully established a connection between your PC and the VitalsBridge **via USB or Bluetooth**, and 3) connected the VitalsBridge to the connector software.

The WiFi SSID and Password may be set for the VitalsBridge in the Configuration tab of the VitalsBridge Connector Software. This will allow for a connection via WiFi.

WiFi may be set up to connect via an access point (i.e. a router within a manikin) or via a typical wireless router.

1. Check the "Update" checkbox adjacent to the WiFi field.
2. Enter the name of the SSID and password of the wireless router or access point (note that both the SSID and password fields are case-sensitive) and UPDATE.

3. You may verify that the VitalsBridge connected to the WiFi and has been assigned an IP address at the bottom of the Configuration tab.

4. To connect to the VitalsBridge via Wifi, restart the VitalsBridge Connector software.

Note: In order to configure the VitalsBridge WiFi, the VitalsBridge must be connected via USB or Bluetooth.

Application Access through Firewalls and Network Ports

Discovery of the VitalsBridge instrumentation uses the UDP network protocol on port 14998, while TCP/IP communication occurs over port 14997. Ensure that the firewalls on both the router and the PC allow access to these ports. For example, when running the VitalsBridge Connector the first time on a Windows PC, please ensure you allow application access through the Windows Firewall on both the public and private profiles.

How to Use the VitalsBridge Connector Software

Before beginning this segment make sure the following have been completed:

1. The VitalsBridge has been connected properly to the patient monitor.
2. The VitalsBridge has been connected properly to the device that will be used to control it.
3. The VitalsBridge Connector Software has been downloaded and installed on the PC that will be used to control the VitalsBridge.

Basic steps to run the VitalsBridge:

1. Power on the VitalsBridge.
2. Run the VitalsBridge Connector Software.
3. Connect the VitalsBridge to the connector software or app.
4. Manually control the desired vital signs via the connector software or app.

Manual Adjustment of Vital Signs

Once connected to the VitalsBridge, vital signs can be manually controlled. Touch the + / - to increase or decrease the value. One may also hold the + / - value to make rapid changes or type the desired value into the number box. Use the check boxes to completely turn off vital signs, set the temperature probe to room temperature, or to zero invasive blood pressures.
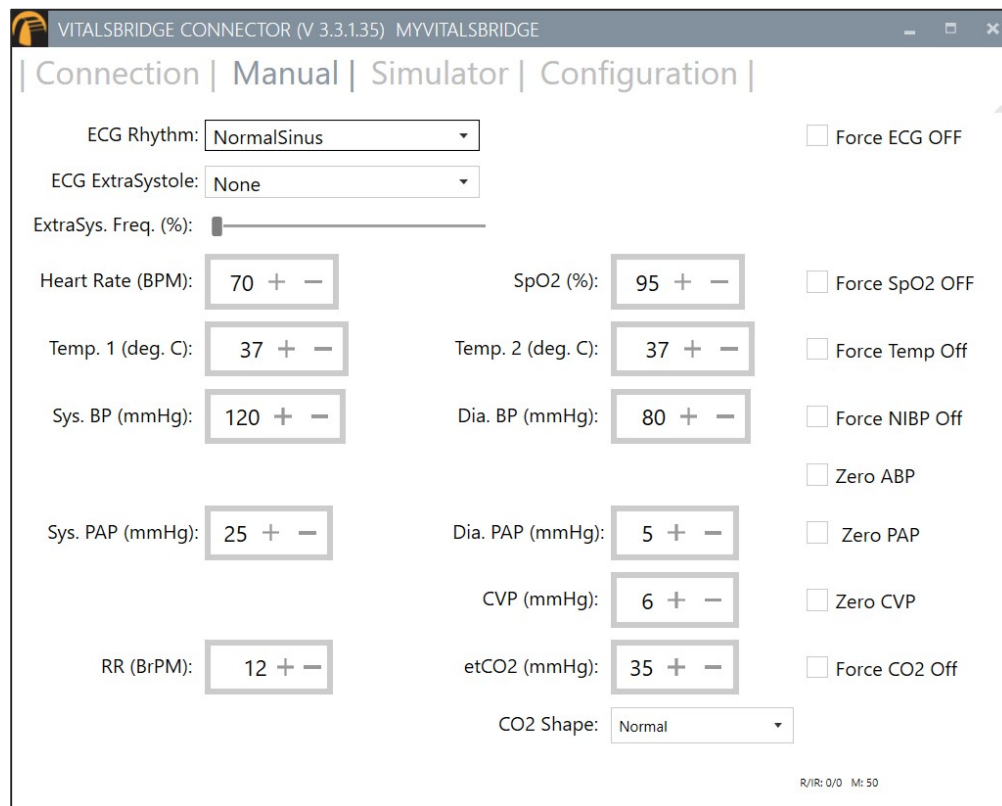
Note: The VB200 and VB100 models support fewer vital signs and unsupported parameters will not be shown.

Note: The 'Force SpO2 OFF' option will not result in the plethysmograph waveform to disappear or 'flat line' on the patient monitor. Instead, the signal may wander in a manner that allows patient monitors to detect that the SpO_2 probe is off.

Calibration and Zeroing

It may be necessary to calibrate the vital signs to your specific monitor. For instructions on how to complete the calibrations from the VitalsBridge Connector Software, see below.

SpO_2 Calibration

The VitalsBridge is pre-calibrated with factory settings for a Nellcor standard probe. SpO_2 calibrations are stored on the VitalsBridge. When the set SpO_2 value significantly deviates from the value shown on the vitals sign monitor, then it is recommended to perform a new calibration. First, ensure the SpO_2 probe is placed properly in the SpO_2 adapter and the VitalsBridge is powered on and connected via the VitalsBridge Connector. Next, under the Configuration Tab, Choose SpO_2 under "Selected Calibration" and press the NEW button.

Note: Disconnect the "mock" SpO_2 probe from the adapter box prior to starting a new calibration.
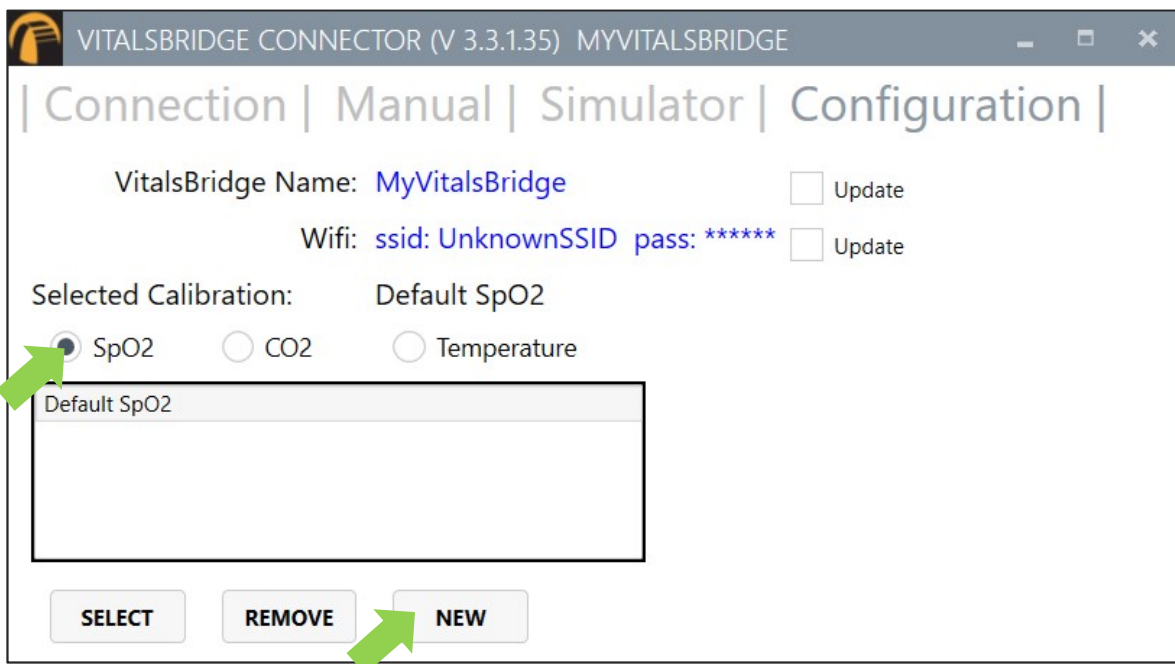
Choose a name for the calibration and SUBMIT.

The user interface will instruct you to wait for a period of time. This is necessary to allow the SpO_2 reading to stabilize on the vital signs monitor before entering the value, as some vital signs monitors filter and average the SpO_2 value, causing delays.

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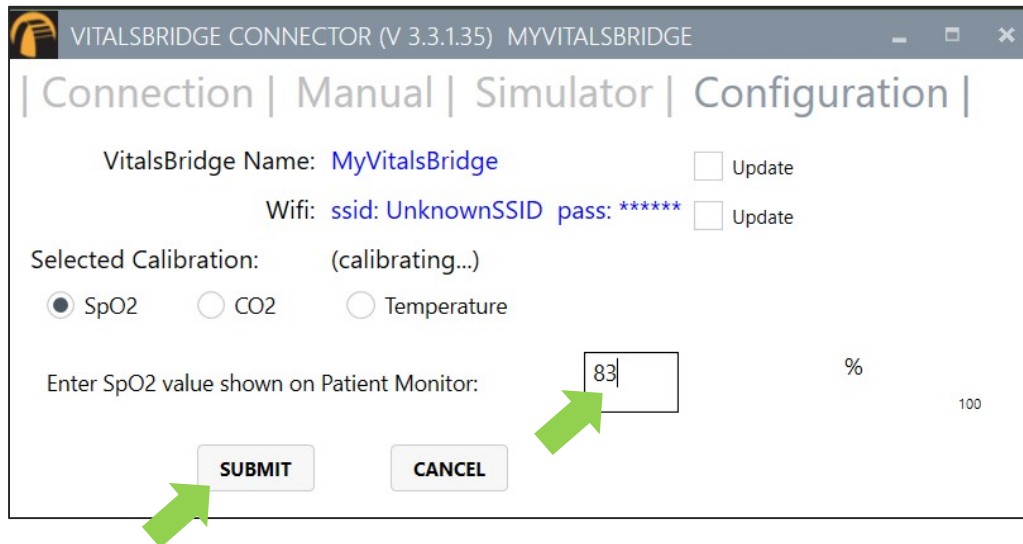
Enter the value shown on the patient monitor and SUBMIT. Verify that this reading is from the real vital signs monitor and not a reading from a patient simulator.

The process of entering in a SpO$_2$ value is repeated until enough points are found for an accurate calibration reading. Once enough calibration points are measured, the calibration data is automatically saved and selected.

Unused calibrations may be removed by highlighting the desired calibration to remove and selecting REMOVE.

Temperature Calibration Selection

The default temperature calibration selection is appropriate for most critical care patient monitors. Select the Default Temperature setting in the Configuration tab of the VitalsBridge Connector.
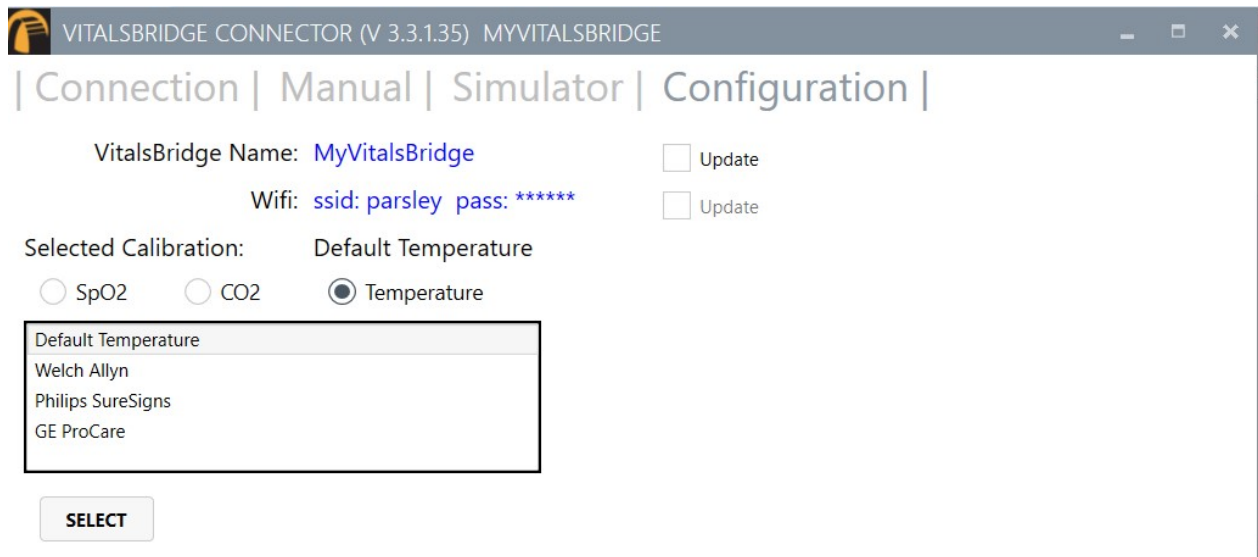
"Spot-Check" Temperature Readings

There are a few non-custom calibrations provided for vital signs monitors that have hand-held "Spot Check" temperature probes.

1. Choose the appropriate patient monitor with a hand-held "Spot-Check" temperature probe from the list of temperature calibrations in the VitalsBridge Connector's Calibration Tab.
2. Place the temperature probe on the spot-check monitor in the probe's cradle.
3. Navigate to the "Manual" tab on the VitalsBridge Connector software.
4. Ensure the "Force Temp Off" checkbox is selected.
5. Take the temperature probe on the spot-check monitor from its cradle, followed by unchecking the "Force Temp Off" checkbox.
6. Wait for the monitor to take a reading.

CO$_2$ Calibration (VB300 only)

Calibration may be needed if the end-tidal CO$_2$ reading on the patient vital signs monitor does not properly match the CO$_2$ waveform on the Instructor Application. CO$_2$ calibration is performed in a similar manner as SpO$_2$ (page 34).

1. Ensure CO$_2$ regulator is attached to the VitalsBridge, the patient monitor capnography measurement system is active, the sampling line is attached, and the VitalsBridge is running (pages 18 - 20).
2. In the "Configuration" tab of the VitalsBridge Connector software, select the CO$_2$ radio button and press NEW.
3. Enter the name of the custom calibration.
4. As per the instructions on the user interface, wait a number of seconds and enter the end-tidal CO$_2$ value (mmHg) shown on the patient monitor.
5. Repeat step 3 for all necessary calibration points as prompted.

Invasive Blood Pressure Zeroing (VB300 only)

IBP may be zeroed by setting the blood pressure waveform to "Flat Line" in the software used to control your patient simulator. Refer to your patient monitor's documentation for procedures of zeroing the pressures within the monitor's user interface. Once the pressures are zeroed on the monitor, deselect and apply the "Flat Line" setting in the Instructor Application to allow the waveforms to reappear. If the blood pressure readings differ significantly from the values set in the instructor application, then attempt to re-zero.

1. This step varies depending on which method you are using to manipulate your vital signs.
    a. When using the VitalsBridge in conjunction with a patient simulator: In the simulator's Instructor Application software, locate where the waveform may be "zeroed" or "flatlined" (see patient simulator documentation for further information).
    b. Using the VitalsBridge Connector App: In the Manual tab of the VitalsBridge connector, select the "Zero" checkbox of the invasive blood pressure you wish to zero.
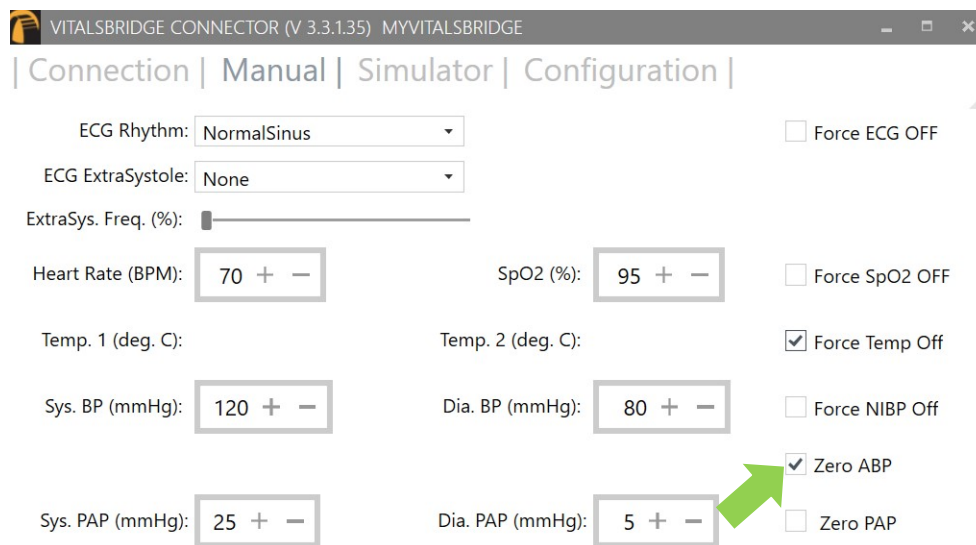
2. Use the patient monitor's user interface and activate the zero function for the corresponding invasive pressure. Consult your patient monitor's user manual on instructions for how to zero an invasive blood pressure. Verify that the zero has succeeded and is showing a value of 0 on the patient monitor.
3. Uncheck the checkbox in the "Manual" tab from Step 1 or disable the zero on the patient simulator's instructor software.

Other Configuration Settings and Features

Setting the VitalsBridge Name

1. Navigate to the "Configuration" tab of the VitalsBridge.
2. Check the "Update" checkbox adjacent to the VitalsBridge Name.

3. Enter the new name of the VitalsBridge and press UPDATE

4. The VitalsBridge will be updated with the new name.

Pulmonary Capillary Wedge Pressure Simulation (VB300 only)

Simulation of wedging a small pulmonary artery by inflating a balloon to measure the pulmonary capillary wedge pressure (PCWP) is accomplished by checking the PCWP checkbox in the Manual tab of the VitalsBridge connector. This will send a PCWP waveform from the VitalsBridge to the vital signs monitor using the PAP connection. Adjust the value of the PCWP value by using the + - on the VitalsBridge. If a patient simulator is generating the PCWP waveform, click the checkbox on the Simulator tab to change the waveform from PAP.Use the VitalsBridge with a Patient Simulator

The VitalsBridge Connector Software offers direct integration with Laerdal Patient Simulators that are running LLEAP. Other patient simulator brands and models may also be compatible with the VitalsBridge. The VitalsBridge can also be run with low-fidelity manikins and standardized patients.

Standardized Patients and Low-Fidelity Patient Simulators

Basic steps to run the VitalsBridge with a standardized patient or low-fidelity manikin:

1. Power on the computer.
2. Power on the VitalsBridge.
3. Run the VitalsBridge Connector Software.
4. Connect the VitalsBridge to the connector software.

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     5.   Control the desired vitals via the VitalsBridge Connector software.

Laerdal High-Fidelity Patient Simulators

Before beginning this segment with a Laerdal manikin that is running LLEAP, make sure the following have been completed:

1. The VitalsBridge instrumentation has been set up properly and is connected to any desired monitors.
2. Confirm that the appropriate version of Laerdal's LLEAP Software is downloaded and installed on the desired PC that you wish to control your Laerdal simulator.
3. Confirm the VitalsBridge Connector software has been installed and is running properly on the same Windows PC that is running LLEAP.

Power on the Patient Simulator

Power on the patient simulator and wait until it is fully initialized. Refer to the simulator's instructions for use on how to power on the patient simulator.

Power on the PC Used to Run the Patient Simulator Software

Power on the computer used to control the patient simulator. Refer to the simulator's directions for use on how to power on the computer that is used to control the patient simulator.

Power on the VitalsBridge

Install and Run the VitalsBridge Connector Software

Run the Software Used to Control the Patient Simulator

Some patient simulator manufacturers supply software to connect their manikin with the VitalsBridge. Please refer to the specific simulator manufacturer's support information.

To use the VitalsBridge with Laerdal's manikins, open the 'Laerdal Simulation Home' software, select LLEAP and begin a new session. Refer to the simulator's directions for use on how to appropriately run the software used to control the patient simulator.
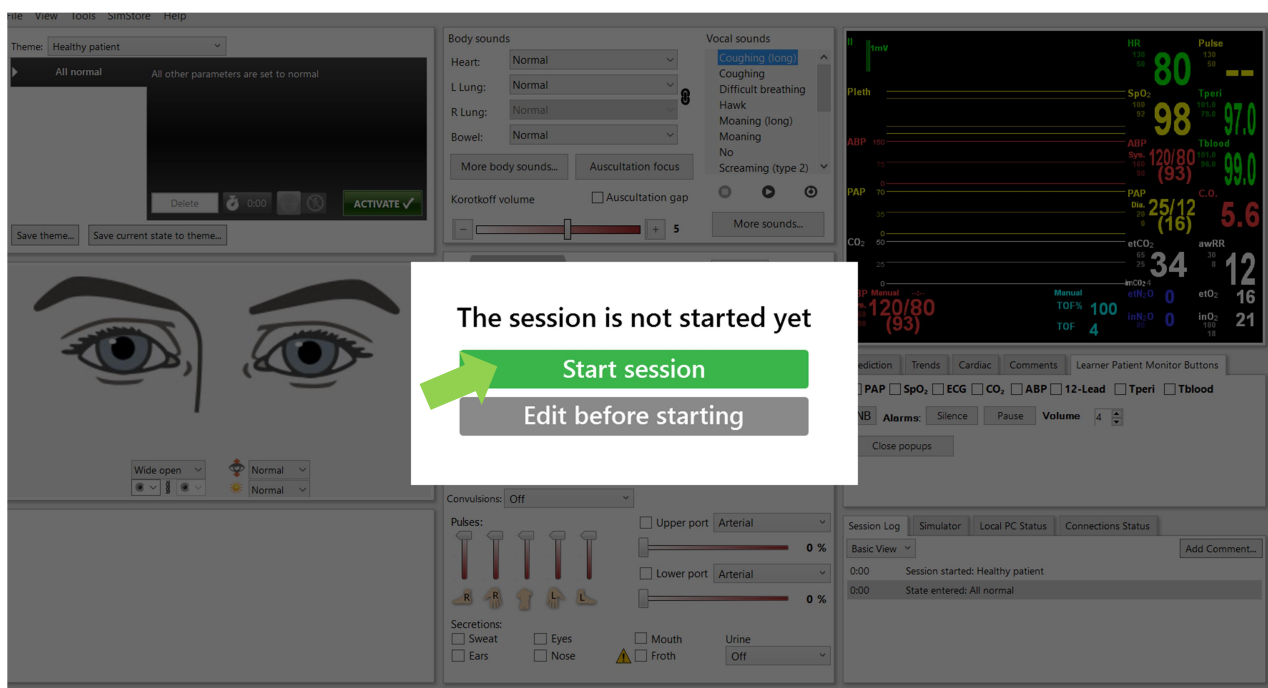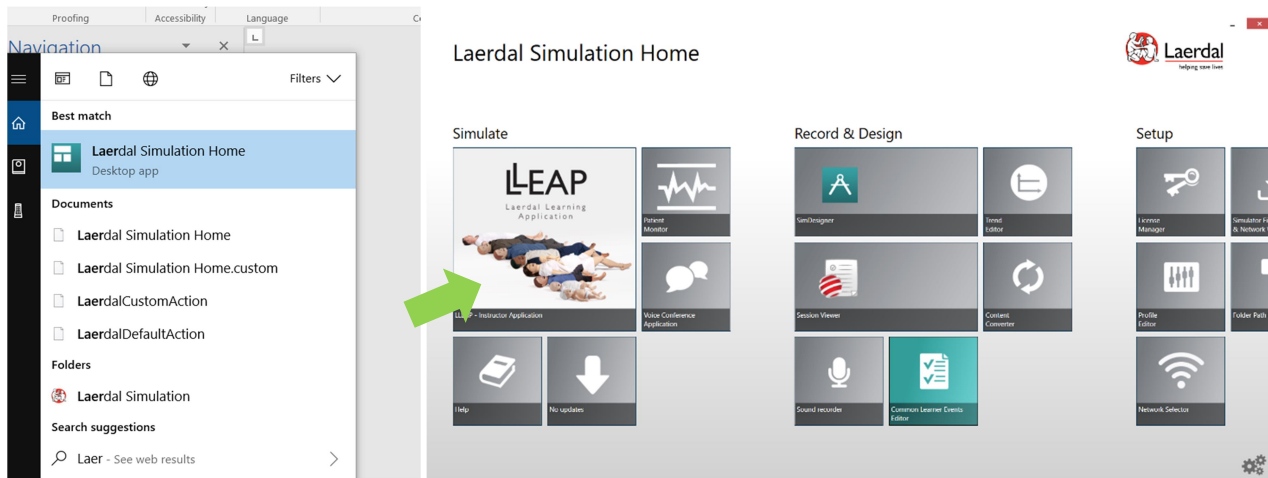
Ensure the computer can connect to a patient simulator over a network. Then, select the "Simulator" tab in the VitalsBridge Connector software.

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Select the appropriate patient simulator that is reported in the dialog box and select CONNECT (if Laerdal's LLEAP software is running, it should automatically appear in the menu).
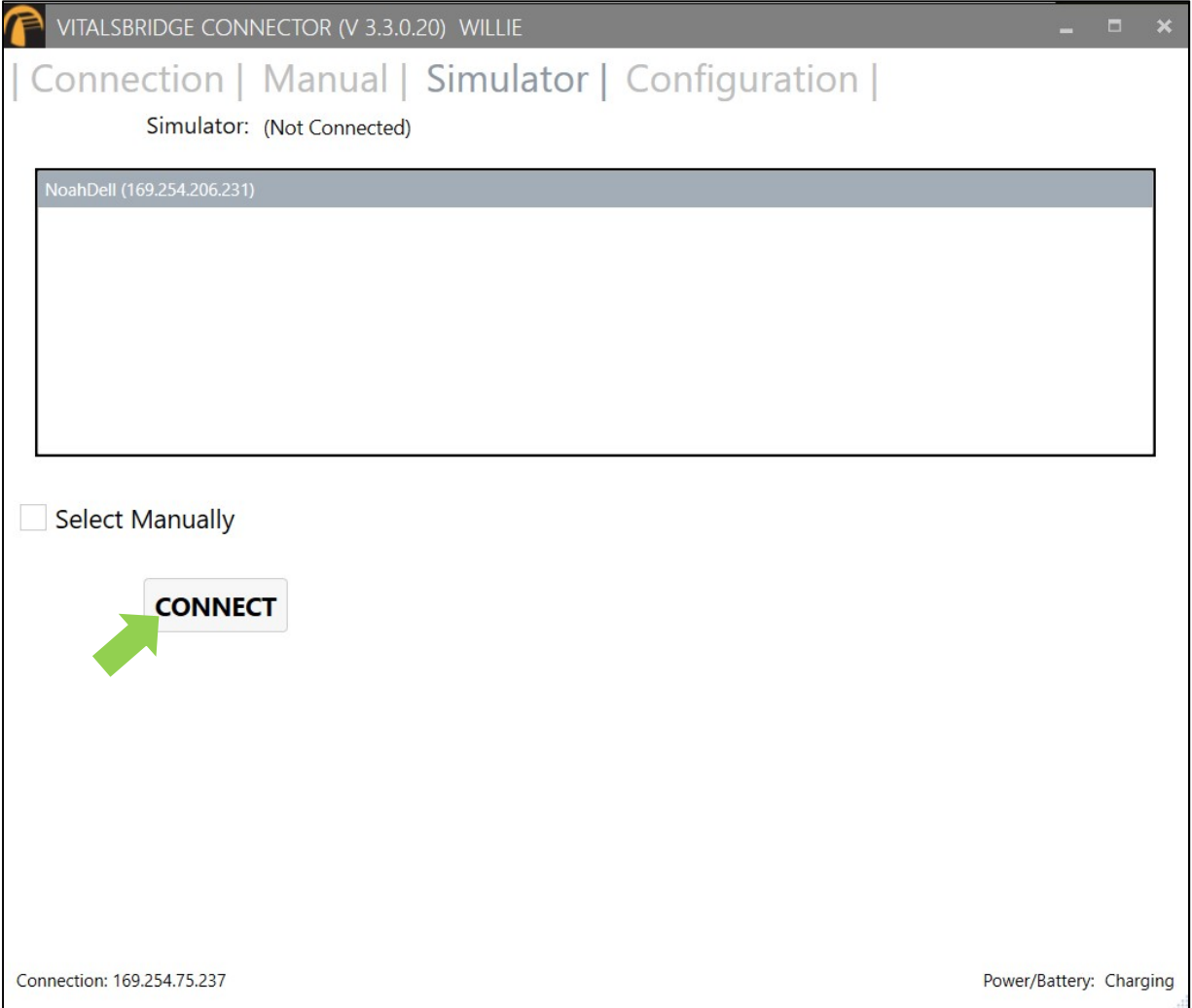
Control Vital Signs for the VitalsBridge and the Patient Simulator

Use the patient simulator's application to control whether ECG leads are placed, capnography is enabled, and whether the SpO$_2$ probe in place by checking the "Learner Patient Monitor Buttons" on the Laerdal control panel for the vital signs you would like to control.
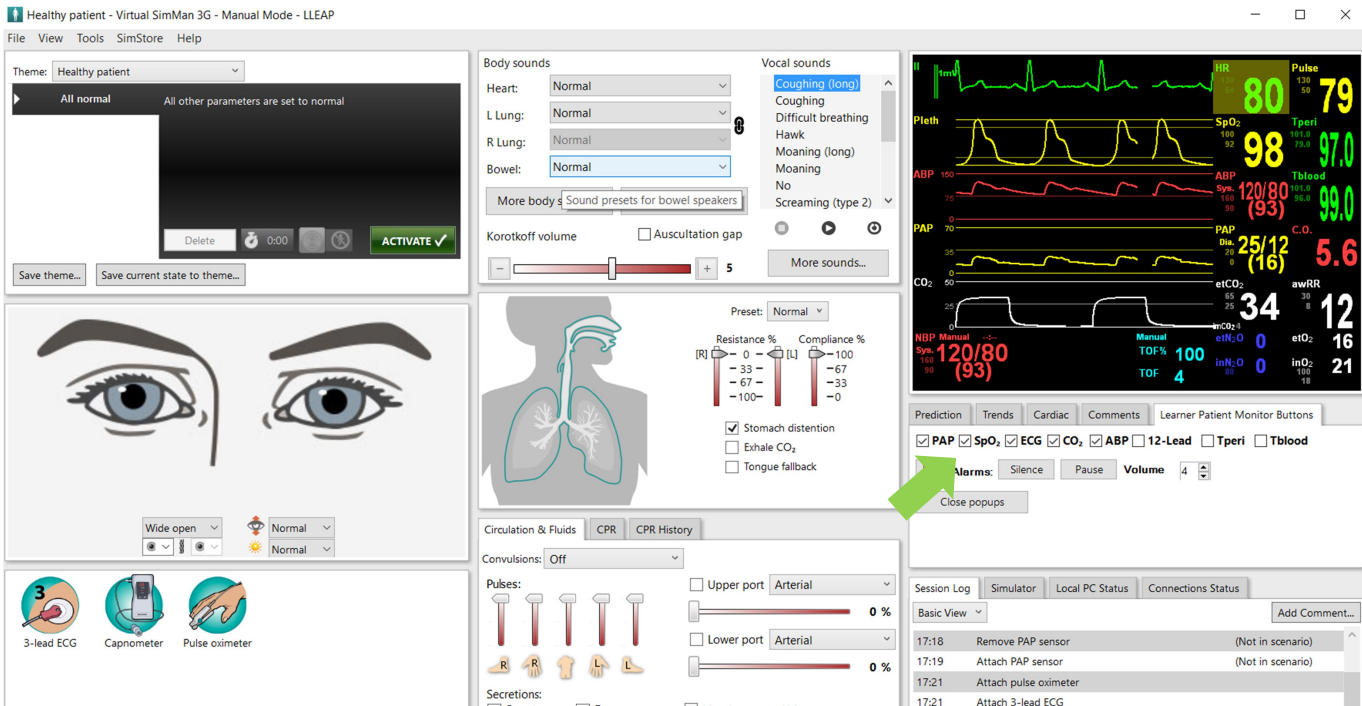
Vital signs set in LLEAP will be communicated to the VitalsBridge Connector software. If the VitalsBridge is connected and configured with a real patient monitor, the vital signs will be updated.
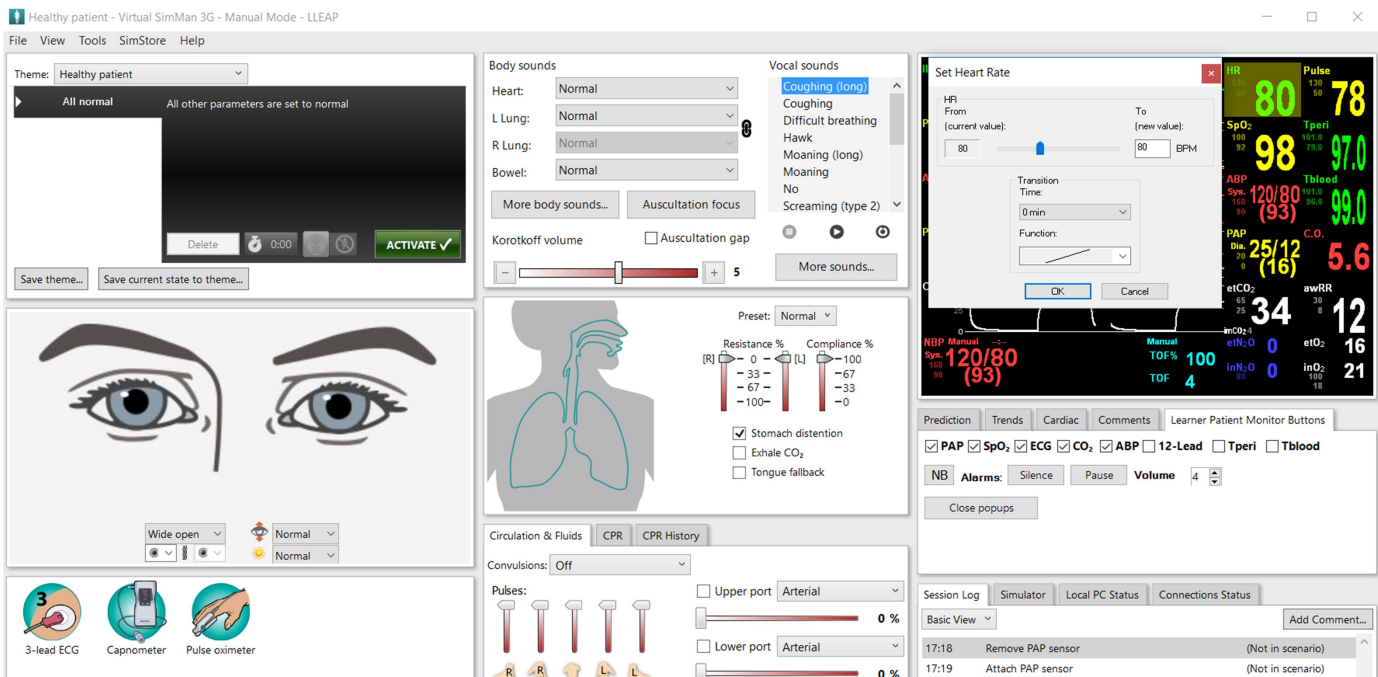
Refer to the patient simulator's directions for use for more detailed instructions on how to control the vital signs.

rev. A.5

Hints for Increasing Simulation Realism

Props

Various "props" can be used to enhance simulation experience when using the VitalsBridge. None of these props are necessary for the VitalsBridge to run.

Only one prop is included with your VitalsBridge. This is the mock SpO_2 probe that is described on page 12. This is also the only prop that is connected to the VitalsBridge. When connected to the SpO_2 adapter, the probe must be on a finger of some sort for an SpO_2 reading to be displayed on the patient monitor (simulating how a real SpO_2 probe would need to be on a patient finger for a reading to be displayed).

Additional props that may be used but that do not come with the VitalsBridge may include instruments used to measure NBP, temperature, ECG, and other vital signs displayed on the patient monitor. While these props may be used, they should NOT be plugged into the VitalsBridge or the patient monitor.

VitalsBridge Placement

To make the experience more realistic for the learner, consider placing VitalsBridge out of sight, while simultaneously making it appear that the patient monitor cables are placed from the patient monitor to the manikin (or standardized patient), despite the actual patient monitor cables are connected to the VitalsBridge. Suggested placement locations include behind the monitor, underneath a manikin, etc.

Frequently Asked Questions

General Use and Connectivity

Q: Who do I contact for customer support?

A: Please contact Dynasthetics LLC in the USA, phone: +1-435-200-3402 or +1-801-484-3820, email: support@vitalsbridge.com. Also see www.vitalsbridge.com.

Q: Is my monitor compatible with the VitalsBridge?

A: There are many different brands and thousands of different configurations of vital signs monitors. The VitalsBridge is compatible with most brands and models. The VitalsBridge is now compatible with side-stream and mainstream capnography technology , though mainstream capnography capabilities require special configuration prior to shipment. The VitalsBridge requires some specific cables and configuration for a vital signs monitor's non-invasive blood pressure cuff, SpO_2, invasive blood pressure, and temperature. Refer to www.vitalsbridge.com for information on how to purchase VitalsBridge-compatible patient monitor cables.

Q: Is the VitalsBridge compatible with Laerdal patient simulators that can run the LLEAP software?

A: Yes, the VitalsBridge is LLEAP compatible. However, when installing the VitalsBridge software, ensure that the correct version is chosen (i.e., choose the LLEAP compatible installer if running with LLEAP).

Q: Is the VitalsBridge compatible with Laerdal patient simulators that run on SimPad?

A: The VitalsBridge is **not** SimPad compatible. However, many Laerdal patient simulators that run on SimPad also run on LLEAP, which is compatible with the VitalsBridge. Contact Laerdal for additional details.

Q: How long will the VitalsBridge run on a fully charged battery?

A: Typical running times are 1.5 to 4+ hours, depending on how often non-invasive blood pressure measurements are made and whether capnography simulation is turned on in the VitalsBridge software.

Q: What is the recommended sequence for starting the VitalsBridge?

A: If you have been running the manikin for more than 30 minutes prior to starting the VitalsBridge, it is recommended that you exit the Instructor Application software, and power off the manikin. Power on the patient simulator and wait for it to initialize fully, start the software that is used to control the patient simulator, power on the VitalsBridge, and start the VitalsBridge Connector application.

SpO2

Q: My monitor is not giving a SpO_2 reading with the cable adapter kit that I received with my VitalsBridge. What is wrong?

A: Check to be sure you don't have the mock probe plugged in but not on a finger. If that is not the case, you may have an incorrect SpO_2 cable kit. Please contact Dynasthetics support.

Q: There is a lot of noise on my SpO_2 waveform reading. What is wrong?

A: If you manikin has a RFID reader (e.g., for drug and airway management device recognition), try disabling the RFID through the application that is used to control the patient simulator.

Non-invasive Blood Pressure

Q: I am not getting a reading from my non-invasive blood pressure monitor. What should I check?

A: First check that the cable from the monitor is secure and not leaking at both the monitor's connector and at the VitalsBridge connector. Ensure that NBP tubing and connections are not leaking. Ensure that none of the cuff tubes are kinked. Ensure that the VitalsBridge is running.

CO2

Q: How long will each CO_2 cartridge last?

A: When the VitalsBridge is running, a 16g CO_2 cartridge will last 8 hours or longer, depending on the simulation. When the regulator is not in use, turn the regulator to off, disconnect the tubing connection from the luer fitting on the VitalsBridge and securely fit the cap on the end of the regulator tubing, without over tightening.

Q: My CO_2 regulator has a partially full cartridge that I wish to empty and dispose, what do I do?

A: Turn the regulator to off. Disconnect the regulator from the VitalsBridge by unscrewing the luer fitting. Hold the tubing approximate 3-5 cm away from the end of the tubing. *Slowly* turn the knob on the regulator to let the gas escape at a low flow rate from the outlet of the regulator until no more gas release is heard or felt. Take care when removing the empty cartridge. It may be very cold.

Q: My monitor is not showing a CO_2 waveform, what should I check?

A: Check that the CO_2 cartridge is not empty. Ensure the monitor is connected correctly to the VitalsBridge (side-stream connection cables are used with side-stream monitors and mainstream adapters are used with mainstream monitors). If you are using a mainstream monitor, verify that your VitalsBridge is configured for mainstream sampling (the serial number listed on the bottom of the device is VB35xxxx). Ensure that CO_2 is enabled in the software. If using the Manual Tab of the VitalsBridge Connector, ensure that "Force CO_2 Off" is unchecked. If using a LLEAP patient simulator, ensure that the CO_2 checkbox is checked in the "My Learner Buttons" section. Consider re-calibrating the CO_2.

Q: Is the VitalsBridge compatible with patient monitors that use mainstream capnography?

A: Some VitalsBridge 300 units are compatible with mainstream capnography (units with serial # 35xxxx are mainstream capable, while units with serial # vb30xxxx are side-stream only). Side-stream only units may be upgraded to mainstream capable units, contact support@vitalsbridge.com for details.

Q: Can my mainstream CO_2 capable VitalsBridge 300 also simulate side-stream CO_2?

A: Yes, a small adapter that is provided with the VitalsBridge must be placed between the sampling line connection and the VitalsBridge $CO_{2\,out}$ port.

Invasive Blood Pressure

Q: I see a blood pressure waveform on the vital signs monitor, but there is no number being shown. What is the problem?

A: The monitor's blood pressure must be zeroed. In the software that is used to control the patient simulator, ensure the invasive blood pressure waveform is set to "flat line" (i.e., the set pressure is a continuous value of zero over time). On the patient monitor, apply the "zero blood pressure" function, making certain you select the correct transducer. Disable "flat line" for the blood pressure waveform in the software that is used to control the patient simulator

Q: The invasive blood pressure readings on my monitor are inaccurate (more than 5-10 mmHg from the set value). What is wrong?

A: Ensure that the monitor has been properly zeroed by enabling the "flat line" feature on the invasive blood pressure waveform of interest in the software that controls the patient simulator. Then use the zero blood pressure feature on the vital signs monitor (consult the vital signs monitor documentation).

Q: My monitor came with a cable that connects from the monitor to an invasive blood pressure transducer. However, it does not fit the invasive blood pressure cables or connections on the VitalsBridge. How do I find the right connector?

A: You may purchase the proper invasive blood pressure cable kit for your Vital Signs monitor that is compatible with the VitalsBridge. Consult www.vitalsbridge.com (or e-mail support@vitalsbridge.com) for additional information.

Q: How do I simulate a pulmonary-capillary wedge pressure with the VitalsBridge?

A: Ensure the software that controls the patient simulator can send PCWP (e.g., pre-LLEAP Laerdal SimMan 3G's are incompatible with sending PCWP to the VitalsBridge). Then, follow the instructions on page 39.

Respiration by ECG Impedance

Q: I am using a 5-lead ECG on my simulator, but my simulator does not have connections for 5 leads. Will respiration work?

A: You may use the 5 ECG posts on the VitalsBridge (200 and 300 models only) to simulate an ECG with respiration impedance.

Temperature

Q: My monitor came with a cable that connects from the monitor to a temperature probe; however, it does not fit the short, white, temperature cables that connect to the VitalsBridge. How do I find the right connector?

A: You may purchase the proper temperature cable kit for your vital signs monitor. Consult www.vitalsbridge.com for additional information.