VitalsBridge ™

Directions for Use

MODEL VB2.0

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Regulatory Information

Use statement: The VitalsBridge is for use in the United States and Canada only.

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:

 support@vitalsbridge.com or 1-801-484-3820.

Disclaimer

Use of the VitalsBridge to train personnel should be undertaken 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 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.

⚠️ *Warning*: The VitalsBridge has a ventilation port on the rear of the unit. Do not block this port or the VitalsBridge may overheat.

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

Compressed Gases and Regulators

Only use VitalsGas cartridges with the VitalsBridge. Adequate training and expertise is required to work with compressed gases. VitalsGas cartridges may be purchased from www.vitalsbridge.com.

The VitalsBridge is supplied with a portable gas regulator that use VitalsGas 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. They should not be used or stored ate temperatures above 120° F or 49° C. Do not inhale the gas.

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

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

⚠️ *Warning*: Mishandled VitalsGas cartridges may become a projectile.

⚠️ *Caution*: VitalsGas 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.

The ECG/respiration cable supplied with the VitalsBridge is designed exclusively for simulation of respiration via ECG impedance signals.

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

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

Requirements Checklists

Cables and Accessories:

Please verify the following has 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, 24V, with wall plug.
2. VitalsGas Regulator with mounting bracket.
3. VitalsGas cartridges.
4. Non-Invasive blood pressure tubing (connects from VitalsBridge to blood pressure cuff).
5. Non-Invasive Blood Pressure Cuff Kit.
6. VitalsBridge compatible Invasive Blood Pressure monitor cable for your patient monitor.
7. Invasive blood pressure transducer cable (3 RJ11 cables, connects from VitalsBridge to monitor's blood pressure cable(s)).
8. VitalsBridge compatible temperature cable for your patient monitor.
9. Temperature transducer cable (2, connects from VitalsBridge to monitor's temperature cable(s)).
10. ECG/Respiration cable (connects from VitalsBridge to manikin and to patient monitor).
11. SpO_2 Cable and probe kit (connects from VitalsBridge to manikin and to patient monitor).
12. USB to serial adapter and cable for optional serial (RS-232) communication with the VitalsBridge

Computer and Software Requirements

1. Windows operating system.
2. Software used to control your patient simulator or to simulate a standardized patient.
3. Ethernet (LAN), wireless network (WLAN), or serial (RS-232) communication capability.
4. VitalsBridge Connector software (see www.vitalsbridge.com/downloads/)

Additional Requirements

1. VitalsBridge instrumentation.
2. A VitalsBridge compatible patient simulator (e.g., Laerdal SimMan® 3G, Laerdal SimMan® Essential, Leardal ALS1, Laerdal Sim Junior1, Laerdal Sim Mom[1]). See www.vitalsbridge.com/downloads/ for complete list of VitalsBridge compatible simulators.
3. Commercially available vital signs monitor.
4. AC power source (i.e. a wall outlet).
5. Source of compressed CO_2 (the supplied VitalsGas portable regulator and cartridges, or another external CO_2 source, regulated to 40 PSI).

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[1] Compatible with the LLEAP configured version. The VitalsBridge is not compatible with Laerdal SimPad®.

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VitalsBridge™ Overview

The VitalsBridge consists of a device that allows vital signs generated by your patient simulator to be presented on a real clinical vital signs monitor. It is intended to increase the fidelity of simulation for users where they may view, interact, and control a vital signs monitor that is used in their clinical practice. The VitalsBridge presents opportunities for high-fidelity simulations that involve critical care, training and education on clinical monitoring, patient information systems testing, just to name a few.

The VitalsBridge presents the following vital signs on a real clinical monitor: heart rate, respiration via Electrocardiogram (ECG) impedance, plethysmography waveform, SpO_2, capnography waveform, end-tidal CO_2, non-invasive and invasive blood pressure (arterial, central venous, pulmonary artery), and temperature. Patient monitoring cables are usually connected to sensors that are attached to the patient. With the VitalsBridge, some of these cables attach to the patient simulator (manikin), and some are connected to the VitalsBridge instrumentation.

The VitalsBridge converts the digitized vital signs waveforms and numbers from the patient simulator into signals that are compatible with a vital signs monitor. Compressed VitalsGas is used for non-invasive blood pressure and capnography to generate the signal. The vital signs created by the VitalsBridge are controlled using the existing instructor application of your patient simulator. The VitalsBridge Connector software is used to communicate vital signs information between the patient simulator and the VitalsBridge.

Powering the VitalsBridge™

External Power

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

⚠️ *Caution*: Use only the included 24V power supply. Using an incorrect power supply may damage the VitalsBridge and void the warranty.

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 3 hours of use. 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 15% of battery life remaining; if you need to continue using the VitalsBridge, connect the external power.

Internal Fan

The VitalsBridge contains an internal fan to keep the battery cool while charging and discharging during use. The fan will be active under the following conditions:

1. Any time the VitalsBridge is connected to the external power supply.
2. When the VitalsBridge is switched on and not connected to the external power supply.

⚠️ *Caution*: Do not block the fan port. There must be at least a 2 cm gap between the fan port and the wall (or other obstruction).

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VitalsBridge and Simulator Communication

Overview

The VitalsBridge communicates with the patient simulator either over a network (Ethernet/Wifi) or by RS-232. The VitalsBridge may be connected to the internal router by an Ethernet cable or by Wifi. In addition to the information below, it is important to follow the procedure for running the VitalsBridge as described on page 25.   The VitalsBridge Wifi module must also be configured to have the same SSID and password as router using the VitalsBridge Network Configuration Tool (see page 36).

Wifi/Ethernet Communication
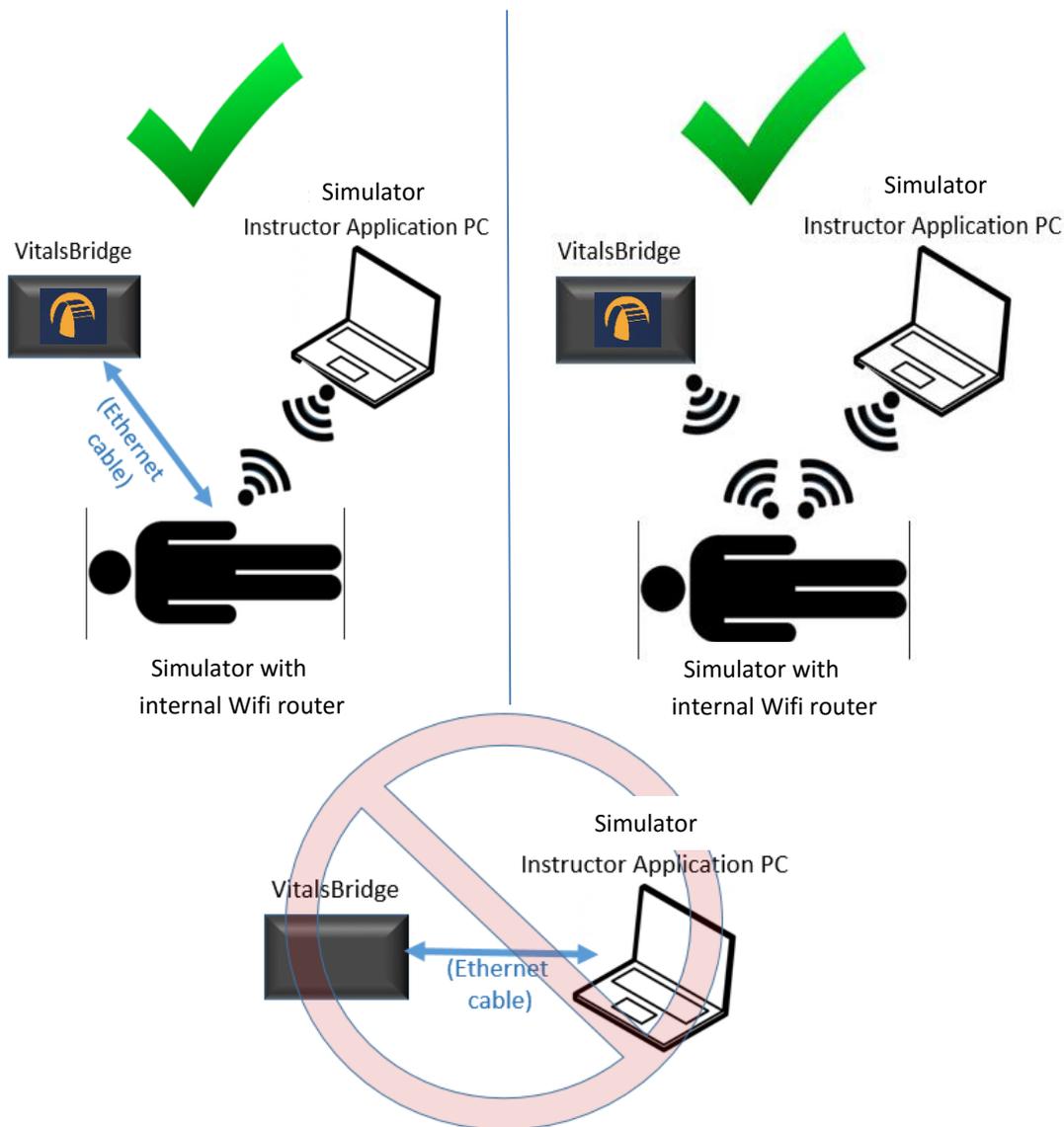
Note: Do not connect the VitalsBridge directly to a computer that controls a patient simulator with an Ethernet cable.

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When connecting the VitalsBridge to the patient simulator using an Ethernet cable, ensure the cable is functional and is securely connected to the Ethernet ports of the VitalsBridge and the manikin.
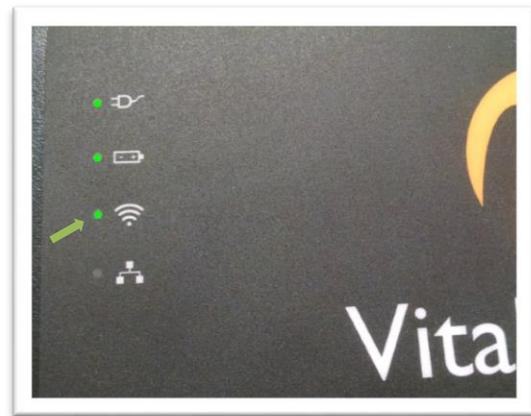

The LED on the top of the VitalsBridge indicates when it has established an Ethernet or Wifi connection with the manikin's internal router.
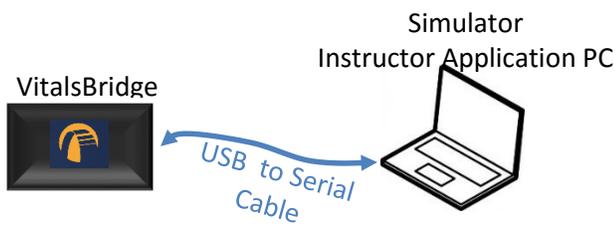
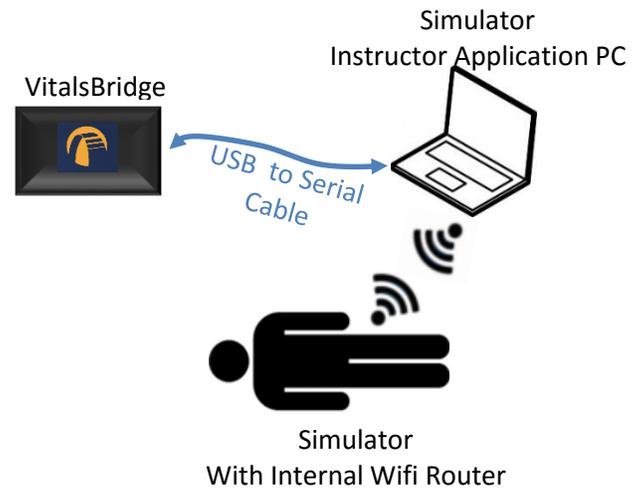(Ethernet Connection)   (Wifi Connection)
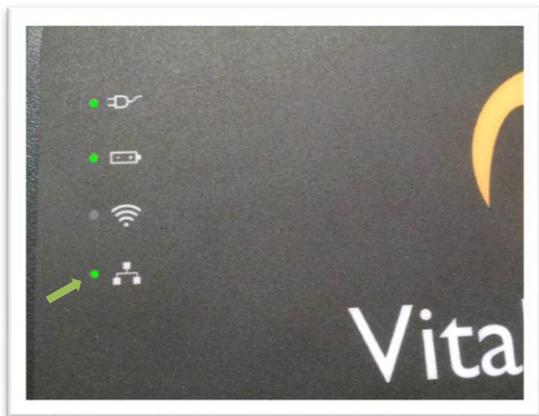
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Serial (RS-232) Communication

Simulator
Instructor Application PC

VitalsBridge

USB to Serial Cable

"Standardized Patient Setup"

Simulator
Instructor Application PC

VitalsBridge

USB to Serial Cable

Simulator
With Internal Wifi Router

"Running the VitalsBridge using a Serial Cable
With a patient simulator"

The VitalsBridge is able to communicate over a serial (RS-232) connection between the PC and the VitalsBridge instrumentation. This setup is ideal for use with a Standardized Patient (live actor) or when communicating with the VitalsBridge over a network is not possible/desired. Connect the USB to Serial adapter to a USB port on the Instructor Application PC, and connect the serial cable between the VitalsBridge and the USB to Serial Adapter. Depending on the version of operating system running on the Instructor Application PC, drivers for the adapter may need to be installed (contact VitalsBridge customer support for assistance, if needed).
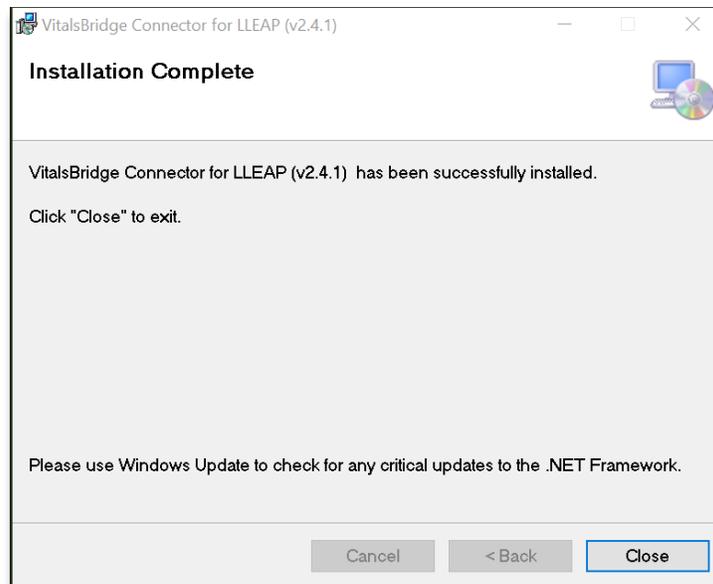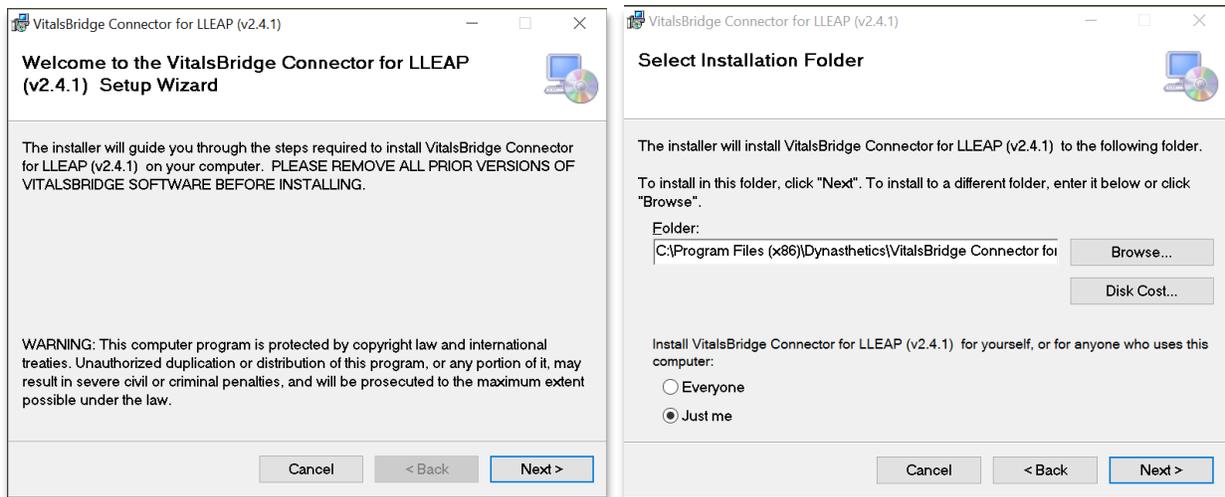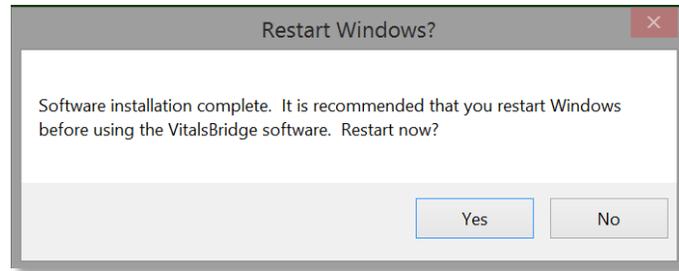
RS-232 Port

USB to Serial Cable

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Installation of the VitalsBridge Connector Software

The VitalsBridge software may be installed on a computer that that communicates with a patient simulator or to an instance of "virtual manikin" software.   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. Navigate to the installation software file and open in. Follow the on-screen installation instructions. Upon successful installation, a VitalsBridge icon will be created on the PC's desktop. Restart the computer if the installation software does not prompt for a reboot.

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., Laerdal LLEAP versus legacy versions of Laerdal SimMan® 3G software), or the particular version of LLEAP.

> **Restart Windows?**   ✕
>
> Software installation complete. It is recommended that you restart Windows before using the VitalsBridge software. Restart now?
>
> [Yes] [No]

Windows Network Settings

Communication between the VitalsBridge instrumentation and the VitalsBridge software occurs over the UDP network protocol on port 14996. The installation software attempts to allow access of this port through the Windows Firewall on both the public and private profiles.   For older versions of Windows (e.g., Windows Vista), custom firewall configurations, and custom network settings, consult your IT support and/or Windows help on how to let communication occur properly on this port.
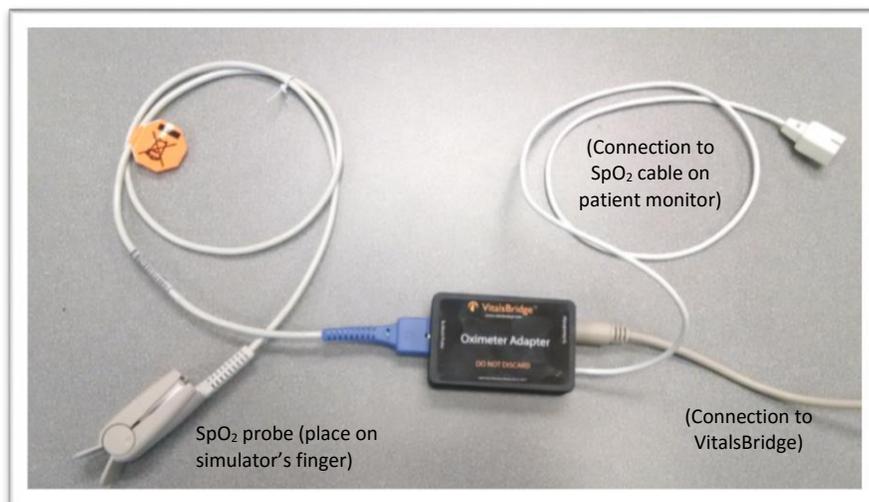
Cables, Tubing, and VitalsGas Setup/Configuration

This section will describe how to connect the cables and tubing between the VitalsBridge, the patient simulator, and the vital signs monitor. The cable 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 cable kits.

Pulse Oximetry (SpO$_2$)

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 kit, which provides expected levels to simulate the SpO$_2$ probe according to the SpO$_2$ value set in the simulator's instructor application. A SpO$_2$ probe is supplied, which may be placed on a manikin's or standardized patient's finger; however, this probe is not required for presenting a SpO$_2$ value on the patient vital signs monitor. The custom SpO$_2$ adapter has labeled cable connections to both the VitalsBridge and the vital signs monitor. It is important to have the correct SpO$_2$ adapter for the brand of SpO$_2$ technology (e.g., Nellcor, Nellcor Oximax, Masimo, Philips).

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(Connection to SpO_2 cable on patient monitor)

SpO_2 probe (place on simulator's finger)

(Connection to VitalsBridge)

Configuration of VitalsGas Source

The VitalsGas, a source of compressed CO_2, is regulated to 35 to 40 PSI is required for capnography and non-invasive blood pressure (NIBP) simulation. The portable VitalsGas regulator uses cartridges of compressed VitalsGas, which can be purchased at www.vitalsbridge.com. Alternatively, compressed CO_2 from another external source may be available at your facility (wall source, a tank, etc). Consult your facility's engineering regarding external CO_2 sources and the appropriate regulators and adapters for correct and safe connection.

Using the Portable VitalsGas Regulator: The portable VitalsGas regulator is mounted to the side opposite the switch and uses VitalsGas disposable cartridges.   The regulator may be detached by lifting 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 must be kept horizontal to upright when the VitalsGas cylinder is attached. The cylinder is pressurized. Sudden release of pressure may cause injury. Turn regulator to **OFF** when not in use.

Installing VitalsGas Cartridge (see images labeled (2) – (6) on the next page, which correspond with the steps below):

1. Temporarily remove the regulator from its bracket on the VitalsBridge instrumentation.
2. Adjust the regulator knob to the "OFF" position by rotating it counterclockwise.
3. 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.
4. Attach the blue tubing to the blue luer lock ($CO_{2\,in}$) on the front of the VitalsBridge and verify a secure connection.
5.   SLOWLY turn the regulator knob clockwise until the pressure on the gauge reads 35-40 PSI. Do not set the regulator to a reading higher than 40 PSI.
6. Replace the regulator back on the bracket that is attached to the VitalsBridge instrumentation.

(2)

(3)

(4)

(5)

(6)

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⚠️ *Caution:* Ensure VitalsGas 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.

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

⚠️ *Warning*: Mishandled VitalsGas cartridges may become a projectile.

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

Capnography (Side-stream End Tidal CO$_2$)

The VitalsBridge is configured for simulating side-stream capnography. Capnography is the measurement of concentration of patients' exhaled CO$_2$. The VitalsBridge utilizes an air pump and the compressed CO$_2$ source to provide a mixture composed of the correct amount of air and CO$_2$ to simulate the fraction of CO$_2$ exhaled over each breath by a patient. To use the capnography function, first ensure that your patient monitor supports capnography measurement. If it does, connect its capnography line to the white fitting on the VitalsBridge.

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To side-stream CO_2
connection on vital signs
monitor.

Non-invasive Blood Pressure (NIBP)

The VitalsBridge is capable of simulating non-invasive blood pressure by mimicking the pulsing of the artery. It uses two tubing connections; the red connection provides the pulse, and the green connection measures the pressure in the cuff. The VitalsBridge automatically detects and controls pulsing during a non-invasive blood pressure reading by the patient monitor. A specially configured blood pressure cuff is used with the VitalsBridge. Some patient monitors require a 1-tube cuff, others a 2-tube. Please consult the patient monitor's configuration and associated documentation to determine which cuff is required.

The tubing connections to the VitalsBridge are color coded:

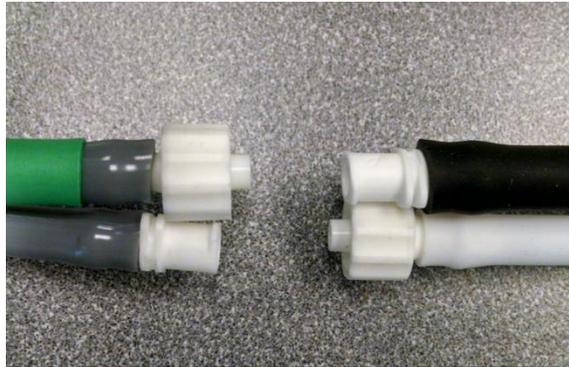A 1-tube blood pressure cuff is configured as follows:

To VitalsBridge
NIBP tubing

To NIBP Tubing connection on the patient
monitor (choose the appropriate connector that
matches the patient monitor cable's connector)

The luer lock connectors between the VitalsBridge NIBP tubing and the tubing on the cuff are "keyed". Firmly connect each of the luer lock fittings to ensure they do not become loose during simulation.

(VitalsBridge NIBP Tubing)

(NIBP Cuff)

A 2-tube cuff is configured as follows:

To VitalsBridge NIBP Tubing

To Patient Monitor's NIBP Tubing (choose the appropriate connectors that match the patient monitor's cable)

The tubing connection from the NIBP cuff to the patient monitor will need configuration, depending on the style of connector used with the patient monitor's NIBP tubing. A variety of connectors have been

included for appropriate fitting(s) to be placed at the end of the cuff tubing that connects with the patient monitor NIBP tubing. Use the included zip ties to secure the fittings that are placed in the black tubing.

⚠️ *Caution:* The NIBP cuffs have been modified to function with the VitalsBridge with the VitalsBridge and are not for clinical use.

Invasive Blood Pressure (IBP)

The VitalsBridge is able to simultaneously simulate 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). The VitalsBridge simulates the transducer output signal for each invasive blood pressure and utilizes an RJ-11 cable to connect from the VitalsBridge to the patient monitor's IBP cable. Note: contact Dynasthetics or 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).

When using IBP, all waveforms are not required to for the VitalsBridge to function. Unused IBP ports on the VitalsBridge may be left unconnected.

Temperature

The VitalsBridge simulates the output of YSI 400 compatible temperature transducers. The temperature cable is a short white cable that consists of a short RJ-11 connector on one end, which connects to the VitalsBridge. The other end of the cable is a transducer-style connector, which connects to the temperature patient monitor cable. Two temperature cables are supplied with the VitalsBridge. T_1 simulates the temperature in the blood on Laerdal simulators, and T_2 simulates Tperi.

Respiration Impedance via Electrocardiogram (ECG)

The VitalsBridge is supplied with a custom 3-lead ECG harness that also simulates respiration by impedance measurement.
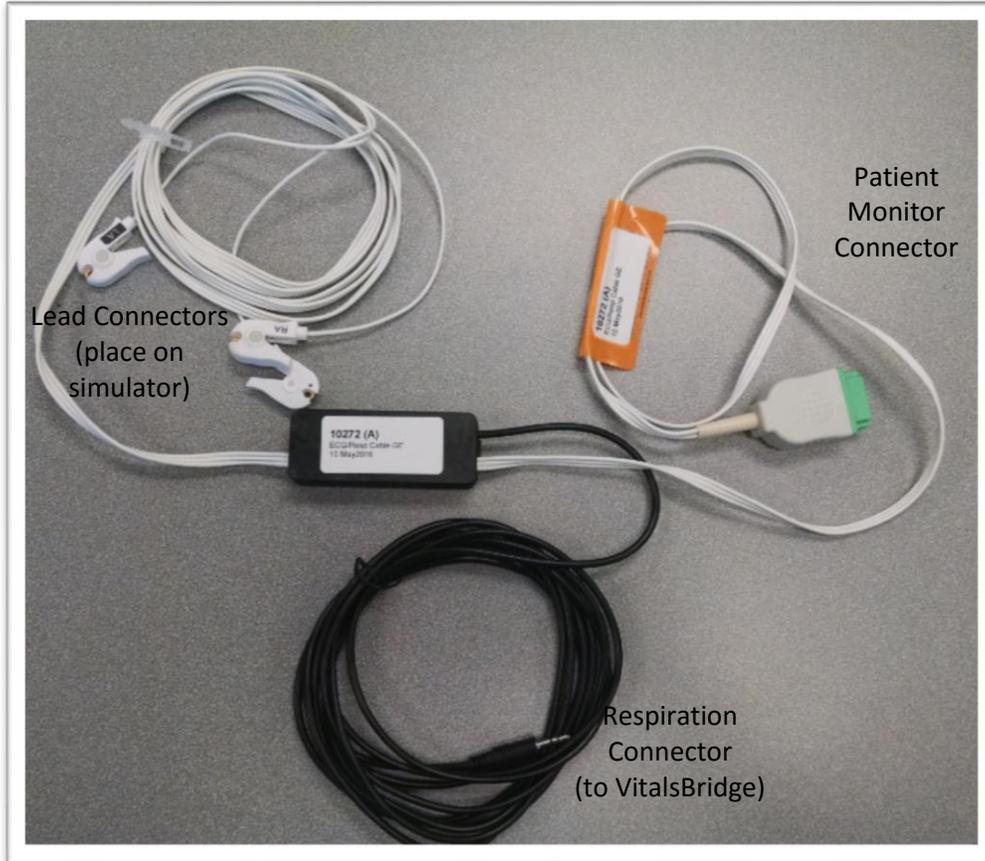
The VitalsBridge connector on the ECG cable plugs into the port labeled Resp.

Once connected, the patient monitor will display the respiration rate and ECG information.

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Running the VitalsBridge™

There is a specific sequence for initializing and running the VitalsBridge. Assuming that both the VitalsBridge and patient simulator are turned off, the summary of the steps are as follows:

1. Power on the patient simulator
2. Power on the patient simulator's computer
3. Run the software that is used to control the patient simulator
4. Power on the VitalsBridge instrumentation.
5. Run the VitalsBridge Connector software

Step 1: Power on the patient simulator and wait until it is fully initialized. Refer to the simulator's directions for use on how to power on the manikin.

Step 2: 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.

Step 3: Run the software used to control the patient simulator. Refer to the simulator's directions for use on how to appropriately run the software used to control the patient simulator.

Step 4: Power on the VitalsBridge instrumentation. Use the toggle switch, located on the side panel, to power VitalsBridge on or off. Once powered on, the VitalsBridge takes approximately 6-15 seconds to initialize and, if communicating over a network, attempt to connect to the manikin's internal router.

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

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The VitalsBridge instrumentation has 4 LEDS: Power, battery/charge, WLAN and LAN.
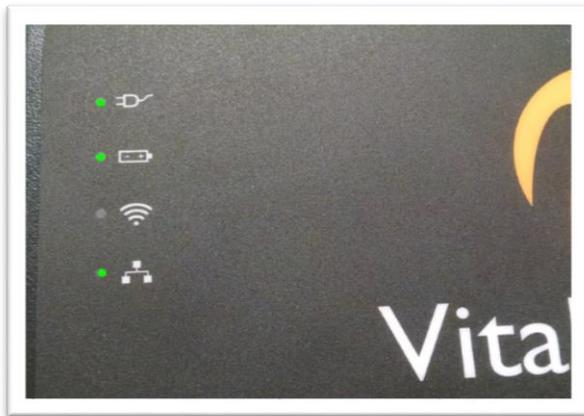
- Power indicator:
    - o   no light: switched off, or switched on and no power to the VitalsBridge
    - o   solid: switched on and power available to the VitalsBridge

- 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%

- WLAN or LAN:
    - o   no light: not connected to router
    - o   solid: VitalsBridge connected to the manikin's internal router
    - o   flashing ~ 1x/second: VitalsBridge connected to router and is trying to associate a connection
    - o   flashing on/off frequently: VitalsBridge receiving/sending from/to a patient simulator

Step 5: Run the VitalsBridge Connector software: Double click on the VitalsBridge icon, labeled VitalsBridge, located on the computer's desktop.
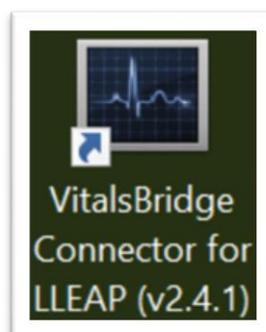

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Alternatively, the software may be located by searching for "VitalsBridge" using the Windows search function (i.e., by pressing the ⊞ button in Windows 7 and typing in the search dialog or by pressing ⊞+S in Windows 8/10).

The first window that is shown allows association between a running patient simulator and a VitalsBridge device. Click on the desired patient simulator and VitalsBridge device and press the Connect button.
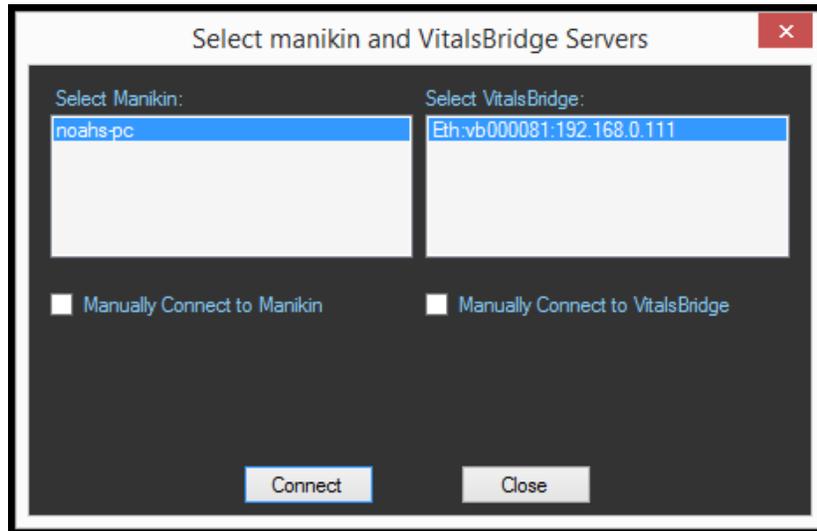
If connected over a network, it is also possible to manually enter the manikin and VitalsBridge connection information: the manikin name or ip address and the VitalsBridge serial ID and ip address.
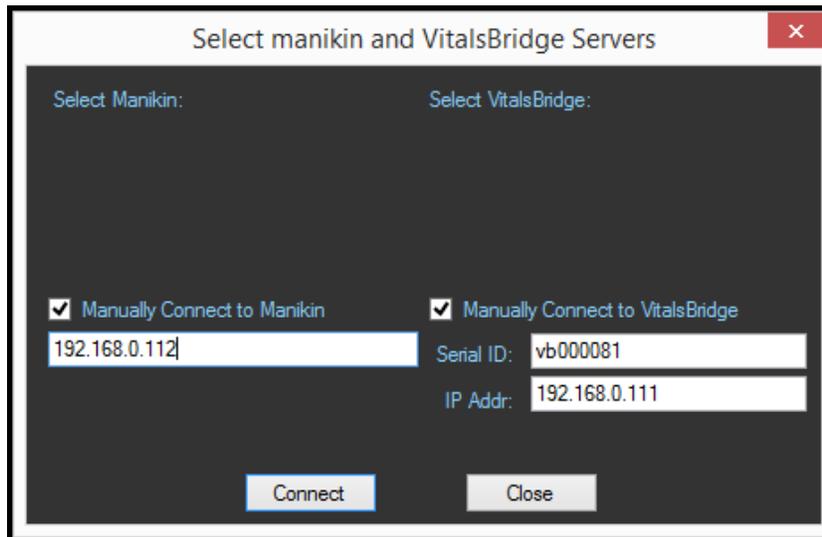
Upon successful association with the two devices, the main VitalsBridge user interface is shown. A summary of the vital signs that are being sent from the patient simulator to the VitalsBridge is shown.

VitalsBridge^{TM} Software Features

The VitalsBridge software allows the user to monitor connectivity between the VitalsBridge and the patient simulator, calibration of SpO_2, CO_2, temperature signals, and configuration of a few additional settings.

Additionally, if some waveforms are unneeded for the simulation (e.g., PAP/PCWP, CVP, CO_2), uncheck the box next to the vital sign's label. CO_2 is off by default, check to enable capnography. The Calibrate tab provides functionality for calibrating SpO_2 and CO_2 and selecting default or previously stored calibrations.
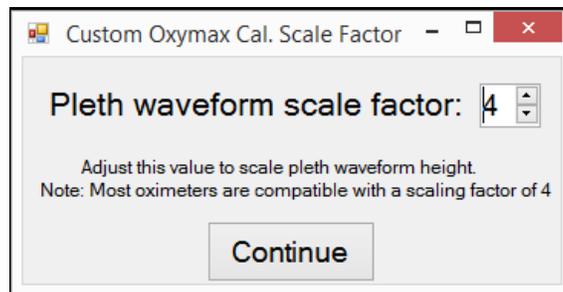
SpO₂ Calibration

The VitalsBridge is pre-calibrated with factory settings for a Nellcor standard probe. If the SpO_2 value set on the Instructor Application significantly deviates from the value on the vitals sign monitor, then it is possible to use your own calibration. To perform a new calibration, first ensure the probe is properly set and aligned on the manikin's right index finger (page 14), then select "update" next to the SpO2 label located in the "Calibrate" tab. Then select "(New Calibration)".
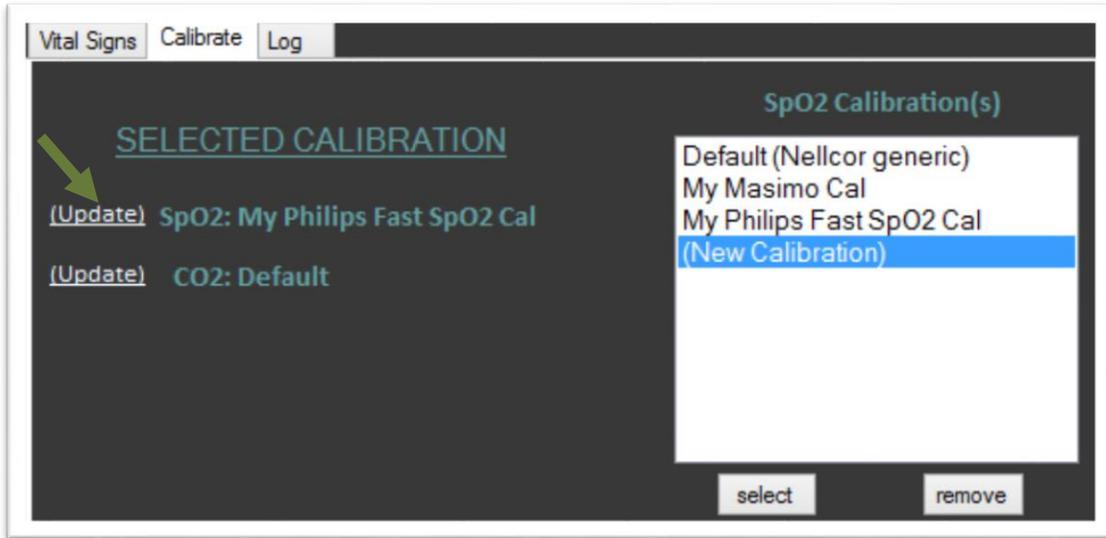
Enter the name of the custom calibration.
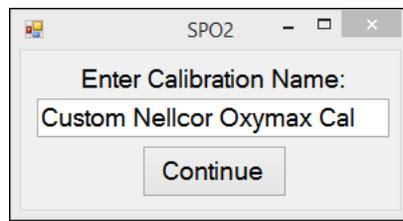
The first portion of the calibration procedure involves scaling the height of the plethysmograph (pleth) waveform.   Usually, a scale factor of 4 works great, but may be increased or decreased in size if necessary. If you wish to use a different scaling factor, adjust the scaling factor until a pleth waveform of adequate size is viewed on the vital signs monitor, and there is also a SpO2 reading shown on the monitor.


For each calibration point, observe the target SpO_2 value in the calibration window in the software. *Slowly* move the indicator to the left to decrease the SpO_2 value observed on the vital signs monitor or to the right to increase the SpO_2 value on the vital signs monitor. It is recommended to use the left and right arrow keys on the keyboard to make adjustments. Observe the vital signs monitor for changes in

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the SpO$_2$ reading. Adjust the indicator until the target SpO$_2$ in the dialog window in the VitalsBridge software matches or nearly matches the SpO$_2$ reading on the patient vital signs monitor. Then, click the submit button to proceed to the next calibration point. Note: ignore the SpO$_2$ reading that is shown in the Instructor Application during SpO$_2$ calibration.
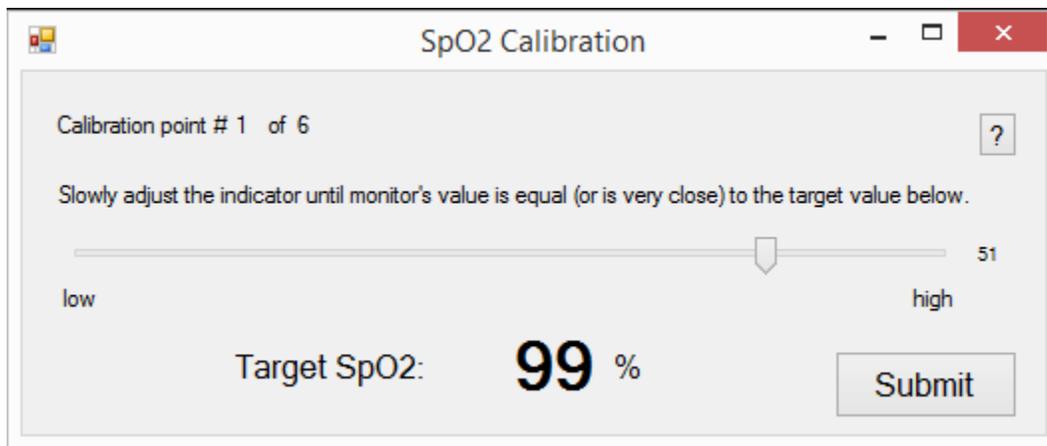

Some vital signs monitors will filter and average the SpO$_2$ value, and there may be a several seconds delay before the reading changes to indicator movements. Repeat for all calibration points. Once completed, the calibration data will automatically be stored and retrieved on the VitalsBridge.
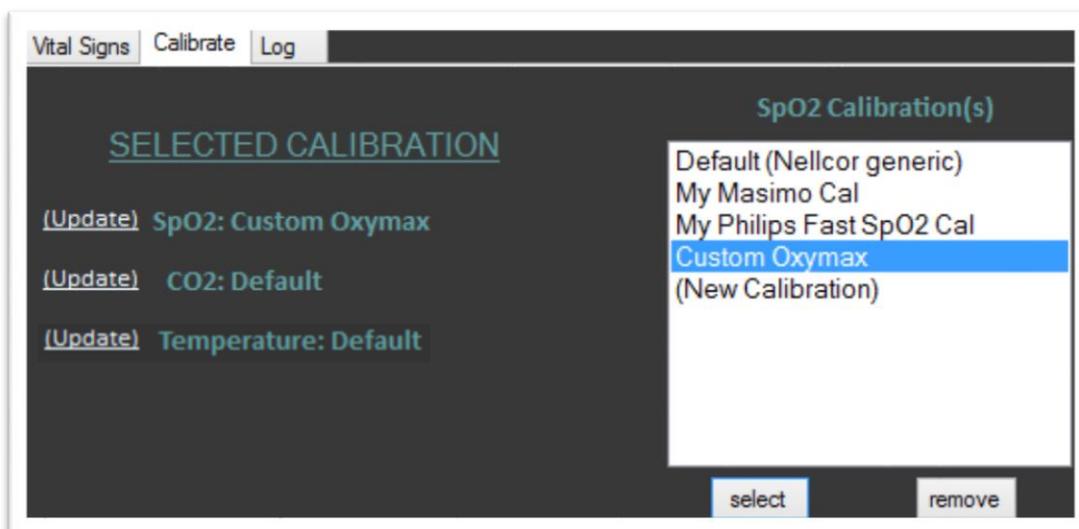
Unused custom calibrations may be removed by highlighting the desired calibration to remove and clicking the remove button.

Enabling CO₂ Simulation

Capnography requires use of a pump internal to the VitalsBridge. The pump is active during capnography simulation. Because the pump consumes additional power and adds a moderate level of noise, CO_2 may be disabled. In the VitalsBridge software uncheck the CO_2 option. Note, CO_2 is unchecked by default.
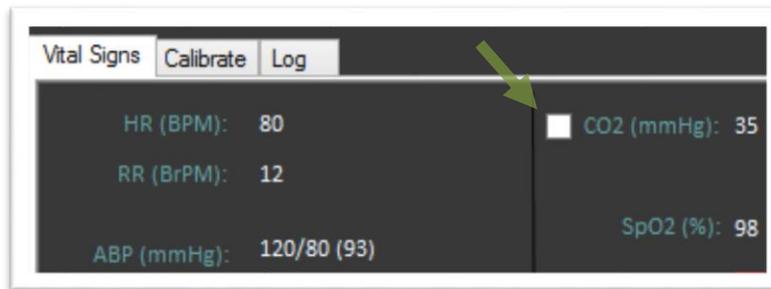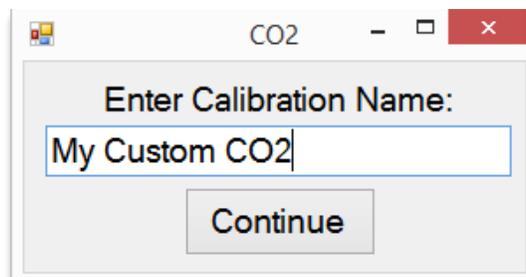

CO₂ Calibration

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. From the "Calibrate" tab on the VitalsBridge software, select "(Update)" next to the CO2 label.   Select a "(New Calibration)".
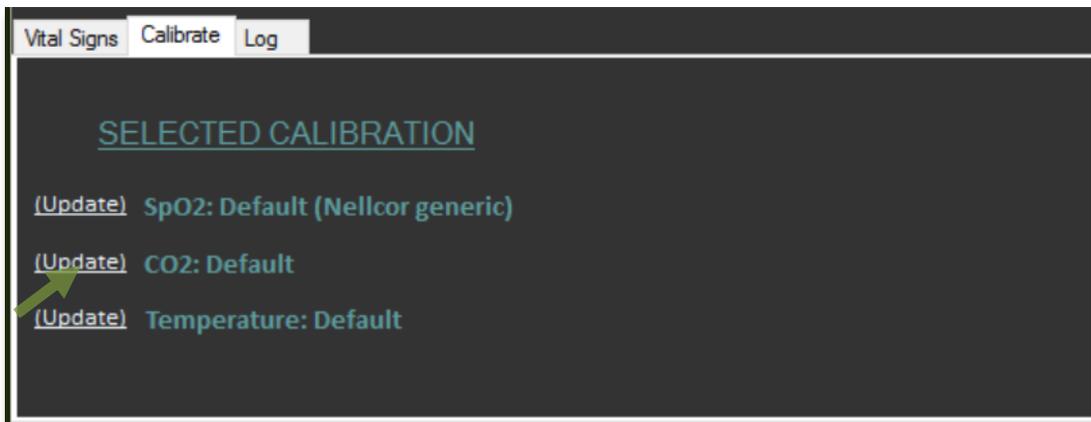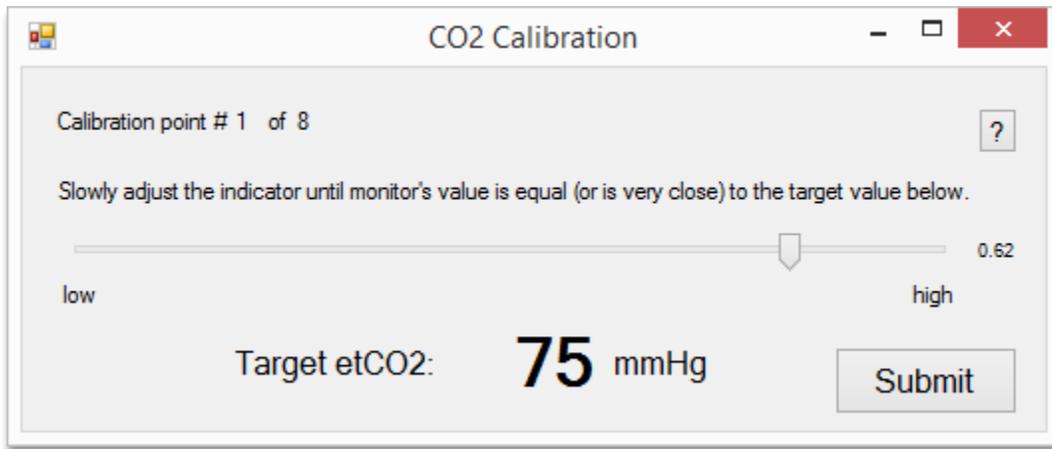

Enter the name of the custom calibration.

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For each calibration point, observe the target etCO$_2$ value in the CO2 Calibration window. Slowly move the indicator to adjust the flow up or down until the end-tidal CO$_2$ reading on the patient vital signs monitor equals the target end-tidal CO$_2$ reading.

Note that some vital signs monitors filter and average the end tidal CO$_2$ value, and there may be a several second delay for the reading to change. Additionally, small CO$_2$ set values may be difficult to read on the monitor. A useful feature, available in some patient vital signs monitors, is to "freeze" the waveform and investigate it more closely (refer to the vital signs monitor documentation for additional information).

Repeat for all calibration points. Once completed, the calibration data will automatically be stored/retrieved on the VitalsBridge.
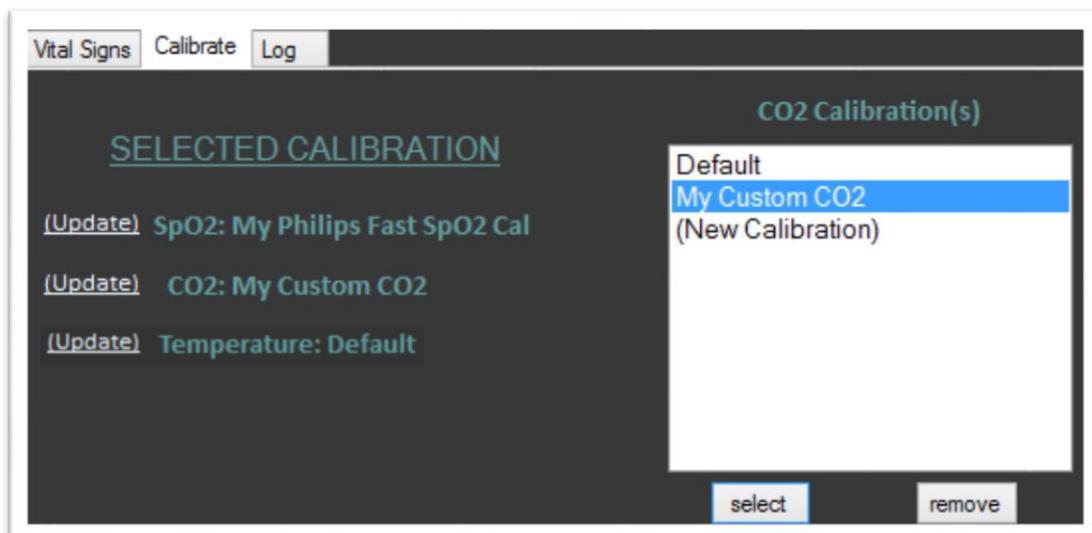
Temperature Calibration

Calibration of temperature is usually needed for "spot check" patient vital signs monitors that are commonly used during a routine patient exam. The Default temperature calibration usually works well with clinical vital signs monitors that are used in critical care environments. However it is possible to calibrate whenever the reading on the patient vital signs monitor poorly matches the temperature on the Instructor Application. From the "Calibrate" tab on the VitalsBridge software, select "(Update)" next to the Temperature label. Select a "(New Calibration)".
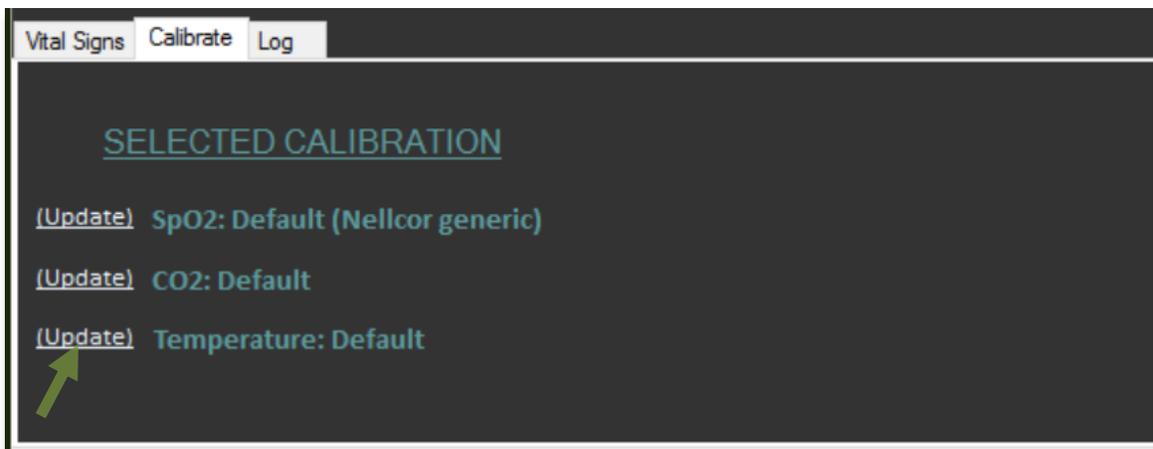
Enter the name of the custom calibration.

For each calibration point, observe the target temperature value in the Temperature Calibration window. Slowly move the indicator left to adjust to a higher temperature or right to adjust to a lower temperature until the temperature reading on the patient vital signs monitor equals the calibration target reading.
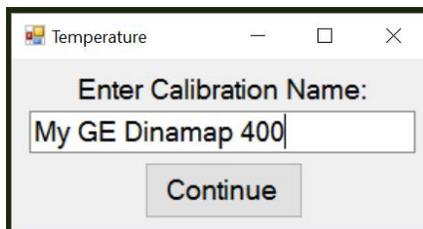

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Repeat for all calibration points. Once completed, the calibration data will automatically be stored/retrieved on the VitalsBridge.
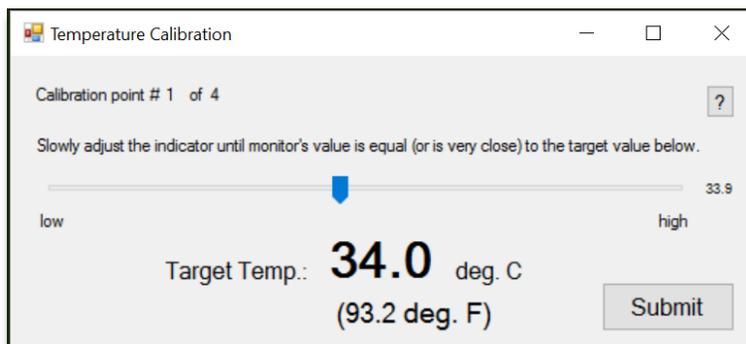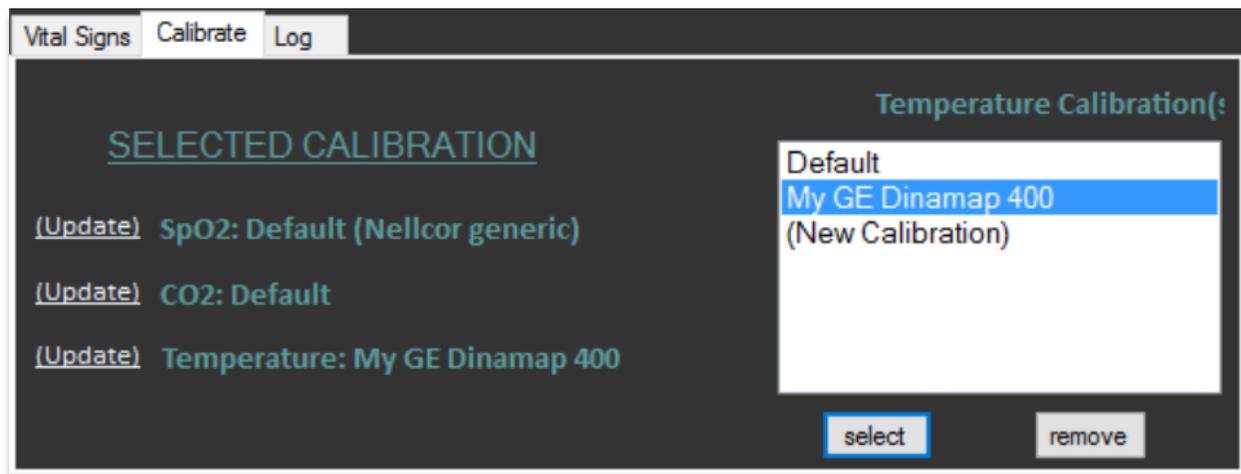

Zeroing the Invasive Blood Pressure(s)

IBPs 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.

Step 1: To bring up the ABP Flat Line option in the Instructor Application, click on the IBP waveform (not the number). Then check "Flatline" and click on the "Apply" button.
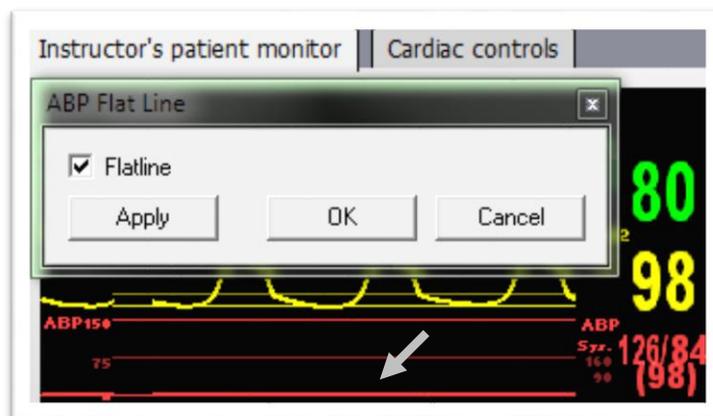
Step 2: Zero the pressure on the patient monitor. Verify that the zero value has succeeded on the patient monitor.

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Step 3: Uncheck the "Flatline" option and click "Apply". Click "OK" to close the "Flat Line" dialog window.
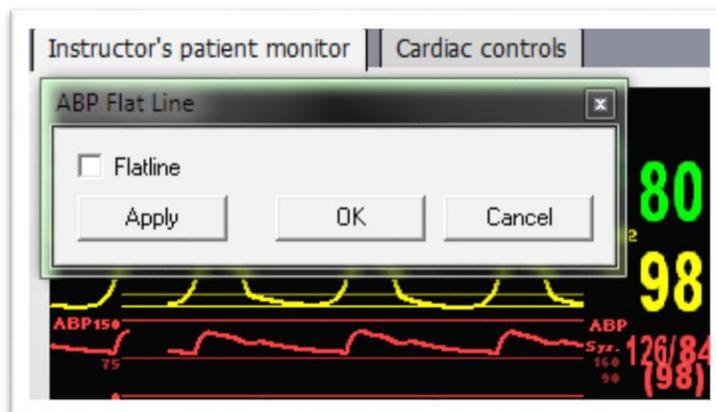

Pulmonary Capillary Wedge Pressure Simulation

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. This will send a PCWP waveform from the VitalsBridge to the vital signs monitor using the PAP connection. Note: the Instructor Application does not show the pulmonary capillary wedge pressure waveform; however, one may access and change the PCWP value by clicking on the PAP numeric value in the Instructor Application.
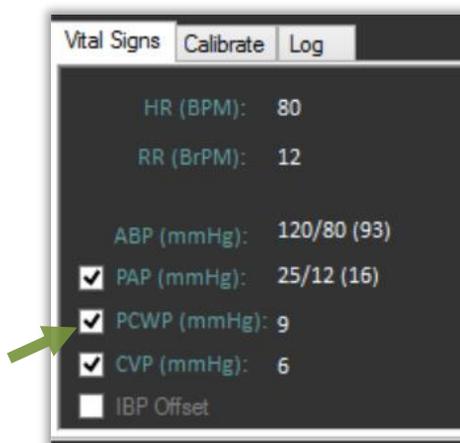
Invasive Blood Pressure Offsets

An offset to each of the invasive blood pressures may be included, to attain additional accuracy with invasive blood pressure readings on the vital signs monitor. Adjust the up/down arrows to increase/decrease the offset of the BP waveform by 1 mmHg. When the IPB offset is unchecked in the Device menu, no offset will be delivered to the signal.

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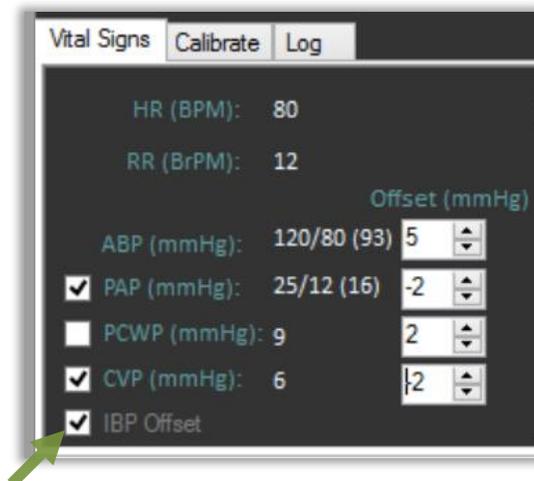
Network Configuration Tool

After installing the VitalsBridge software, a shortcut to the VitalsBridge Network Configuration Tool should be located on the PC's desktop. Alternatively, the software may be located by searching for "Network Configuration Tool for VitalsBridge" using the Windows search function (i.e., by pressing the ⊞ button in Windows 7 and typing in the search dialog or by pressing ⊞+S in Windows 8).   Perform the following steps to set up your VitalsBridge to connect wirelessly to a patient simulator:

Configuration over a Serial (RS-232) connection:

1. Ensure the computer where you installed the VitalsBridge Connector software is powered on and running.
2. Connect the USB side of the Serial adapter cable to a USB port on the computer and connect the other end of the Serial adapter cable to the VitalsBridge.
3. Power on the VitalsBridge.
4. Wait approximately 20 seconds.
5. Proceed to step 9. in "Configuration over an Ethernet connection below"

Configuration over an Ethernet connection:

1. Identify the SSID (i.e., Wifi name) of the manikin's internal router. This may be obtained by inspecting the Network and Sharing Center when the patient simulator is connected and running.
2. Exit all simulation software programs.
3. Ensure both the manikin and the VitalsBridge are completely OFF.
4. Power on the patient simulator; allow to initialize completely.

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5. Power on the computer used to run the patient simulator software, and ensure that it is connected to the manikin's router via Wifi (consult the patient simulator's directions for use on information specific to this task).
6. Connect the VitalsBridge to the manikin via Ethernet cable.
7. Power on the VitalsBridge.
8. Wait approximately 5-30 seconds. Verify network connection indicator on top of the unit.
9. Open the VitalsBridge Network Configuration Tool. Double click on the Network Configuration Tool shortcut icon on the PC's desktop, and a selection window will appear.
10. Wait until the white box is appears with the VitalsBridge that is connected to the manikin. Note: this usually takes a few seconds but may take as long as 30 seconds.
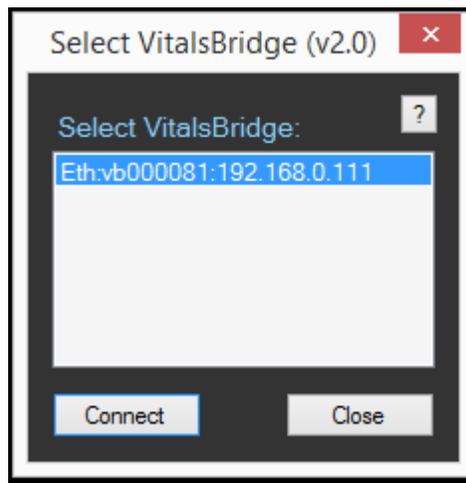
11. Select the VitalsBridge ID and click the "Connect" button.
12. After clicking on connect, the Network Configuration Tool window will appear.
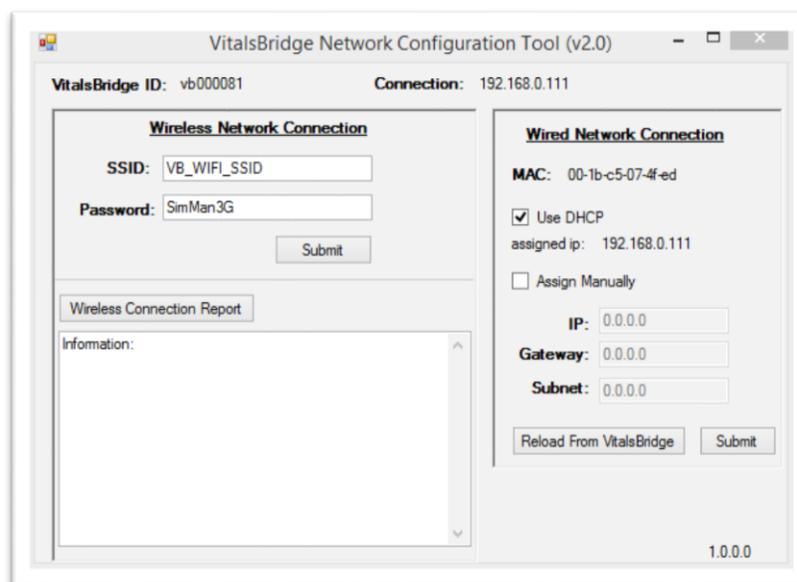
13. Input the SSID (i.e., the name of the network) and password that is set for the manikin's internal router. Click the "Submit" button.
14. The Network Configuration Tool will configure the VitalsBridge to connect to the manikin's router wirelessly. Configuration takes approximately 1 minute. Do not power off the VitalsBridge during this process.
15. The process is complete when the Network Configuration Tool dialog box reads "Power Cycle VitalsBridge before attempting to connect via Wi-Fi".
16. Turn off VitalsBridge.
17. Close Network Configuration Tool.

Your VitalsBridge is now set up to connect wirelessly.

VitalsBridge Network Configuration Using an External LAN

Consult your network administrator for assistance configuring the VitalsBridge on an external LAN. Using an Ethernet cable, connect the VitalsBridge to a LAN where the PC is located. Note: the local area network must have UDP multicasting installed.

LAN Manual Connection

For a manual LAN, uncheck the "Use DHCP" box in the Network Configuration Tool window, and check the "Assign Manually" box. You may then input the IP, Gateway, and Subnet manually. Note: a manually assigned LAN ip address is not recommended.

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VitalsBridge Frequently Asked Questions

General Use and Connectivity

Q: Who do I contact for customer support?

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

Q: Is my monitor is 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 compatible with side-stream capnography technology (not mainstream). 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 2.5 to 4+ hours, depending on use 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 software.

Q: The VitalsBridge software shows that the VitalsBridge initially connects, but after 10-20 seconds, it stops. What is wrong?

A: The manikin server may have problems and is unable to send waveforms properly to the VitalsBridge. This is particularly true when using the VitalsBridge with legacy versions of the Instructor Application (i.e., SimMan® 3G manikins not running LLEAP). To fix: exit the VitalsBridge software and the Instructor Application, power off the manikin, power off the VitalsBridge, power on the manikin, wait for the manikin to start breathing (chest rise and fall), power on the VitalsBridge, start the Instructor Application software, start the VitalsBridge software. This issue usually happens after the manikin has been running for more than 1 hour and you are re-attempting to connect the VitalsBridge.

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SpO₂

Q: My monitor is not giving a SpO$_2$ reading with the cable adapter kit that I received with my VitalsBridge.

A: You may have an incorrect SpO$_2$ cable kit. Please contact Dynasthetics support.

Q: Is the VitalsBridge compatible with the Philips flexible finger-cot probe (M1191A) or Philips finger-clip style probe (M1196A)?

A: The SpO$_2$ cable adapter kit provided with the VitalsBridge comes with its own finger-clip style probe which is used in lieu of the probes supplied with the patient monitor.

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 cuff. Ensure that none of the cuff fittings at the tubing are leaking. Ensure that none of the cuff tubes are kinked. Ensure that the compressed CO$_2$ source is properly connected to the VitalsBridge. Ensure that the VitalsBridge is running.

CO₂

Q: How long will each VitalsGas cartridge last?

A: When the VitalsBridge is running, a VitalsGas cartridge will last 4 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 VitalsGas 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.

Q: My monitor is not showing a CO$_2$ waveform, what should I check?

A: Check that the VitalsGas cartridge is not empty (briefly disconnect regulator tubing at the luer connection from the VitalsBridge and listen for gas escaping from the outlet of the regulator). Ensure the monitor uses side stream capnography. Ensure that the CO$_2$ sampling line is connected properly to the VitalsBridge and the monitor. Check that CO$_2$ waveforms are enabled on the VitalsBridge software. Attempt to re-calibrate the CO$_2$.

Q: My monitor shows a CO$_2$ waveform and value that is extremely high (> 150 mmHg). What is wrong?

A: Ensure that the CO$_2$ checkbox on the VitalsBridge software app is selected. Ensure that the supply pressure to the VitalsBridge is 35-40 PSI.

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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 2235.

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: The custom 3- lead ECG cable provided by Dynasthetics is recommended, which includes special functionality for respiration simulation.

Q: I wish to use a 5-lead ECG on my simulator, but the ECG cable included with the VitalsBridge only has connection for 3 leads

A: The ECG cable and respiration adapter provided with the VitalsBridge is built specifically for a 3-lead ECG. Most monitors will automatically detect that a 3-lead cable is attached and will automatically adjust to allow the respiration signal to work properly.

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.

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