

VitalsBridgeTM

Directions for Use

MODEL VB2.0 for US Government Customers

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Regulatory Information

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

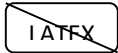
Federal Communications Commission Statement: This device complies with part 15 Subpart B of the FCC rules.



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.



The VitalsBridge instrumentation and its associated cables are latex free.

Support

For technical assistance, contact your local Laerdal Technical Service Center.

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

See the Laerdal Global Warranty, www.laerdal.com.

Manufacturer





The VitalsBridge™ is made in the USA and is manufactured for Laerdal Medical AS by:

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

Warnings and Caution

Follow all cautions and warnings outlined in the SimMan 3G or SimMan Essential Directions for Use.





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.

Compressed Gases and Regulators

Use only sources of compressed CO₂ with the VitalsBridge. Adequate training and expertise is required to work with compressed gases.


The VitalsBridge is supplied with a portable CO₂ regulator that uses cartridges of highly pressurized CO₂ gas. 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 at temperatures above 120° F or 49° C. Do not inhale the CO₂ gas.


-  **Warning:** Do not use compressed oxygen (fire hazard) or any other flammable substance with or near the VitalsBridge.
-  **Warning:** CO₂ cartridges may become extremely cold when discharging. Protect eyes and hands when installing and handling CO₂ handling CO₂ cartridges.
-  **Warning:** Mishandled CO₂ cartridges may become a projectile.
-  **Caution:** CO₂ 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 the SimMan 3G/Essential and VitalsBridge.

The respiration cable connector on the manikin is designed exclusively for respiration monitoring via ECG impedance signals.

 **Warning:** Defibrillation on the ECG connectors 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 the SimMan 3G/Essential manikin.

Requirements Checklists

Checklist of Included Cables and Accessories:

Please verify the following has been included in your shipment; all of the following cables and accessories are REQUIRED to properly operate the VitalsBridge. If you are missing any of these items, or they are damaged, please contact Laerdal for replacements.

1. VitalsBridge power supply, 24V, with wall plug.
2. CO₂ Regulator with mounting bracket.
3. Non-Invasive blood pressure tubing (connects from VitalsBridge to blood pressure cuff).
4. Invasive blood pressure transducer cable (3 RJ11 cables, connects from VitalsBridge to monitor's blood pressure cable(s)).
5. Temperature transducer cable (2, connects from VitalsBridge to monitor's temperature cable(s)).
6. Respiration via ECG cable (connects from VitalsBridge to manikin).
7. SpO₂ Extension Cable (connects from VitalsBridge to manikin).
8. These directions for use.

Checklist of Required Cables and Accessories Not Included (Must be Purchased Separately from Laerdal)

1. Non-Invasive Blood Pressure Cuff Kit.
2. Invasive Blood Pressure Monitor Cables.

Computer and Software Requirements

1. Windows operating system.
2. LLEAP or legacy SimMan 3G Instructor Application software.
3. Ethernet (LAN) or wireless (WLAN) communication capability.
4. VitalsBridge software (may be downloaded from laerdal.com).

Additional Requirements

1. VitalsBridge instrumentation.
2. SimMan 3G or SimMan Essential manikin, updated with SpO₂-compatible hand and ECG-respiration kit.
3. Commercially available vital signs monitor.
4. AC power source (i.e. a wall outlet).
5. Source of compressed CO₂ (either a disposable cartridge for use with included regulator, or another external source).

VitalsBridge™ Overview

The VitalsBridge consists of a device that allows vital signs from the SimMan 3G or SimMan Essential to be presented on a 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 is designed to function with commercially available vital signs monitors. It presents the following vital signs on a clinical monitor: heart rate, respiration via Electrocardiogram (ECG) impedance, plethysmography waveform, SpO₂, capnography waveform, end-tidal CO₂, non-invasive and invasive blood pressure (arterial, central venous, pulmonary artery), and temperature. Vital signs cables are usually connected to sensors attached to the patient. With the VitalsBridge, some of these cables attach to the patient, and some are connected to the VitalsBridge device. Connectors for the respiration via ECG impedance and SpO₂ have been pre-installed on the SimMan 3G/Essential manikin.

The VitalsBridge converts the digitized vital signs waveforms and numbers of the SimMan 3G/Essential into signals that are compatible with a vital signs monitor. Compressed CO₂ gas is used for non-invasive blood pressure and capnography to generate the signal. The vital signs created by the VitalsBridge are controlled using the SimMan3G Instructor Application. Additional software is used to communicate vital signs information between the SimMan 3G/Essential 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

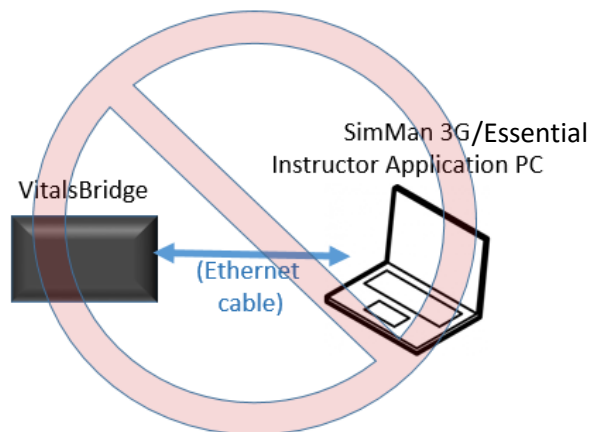
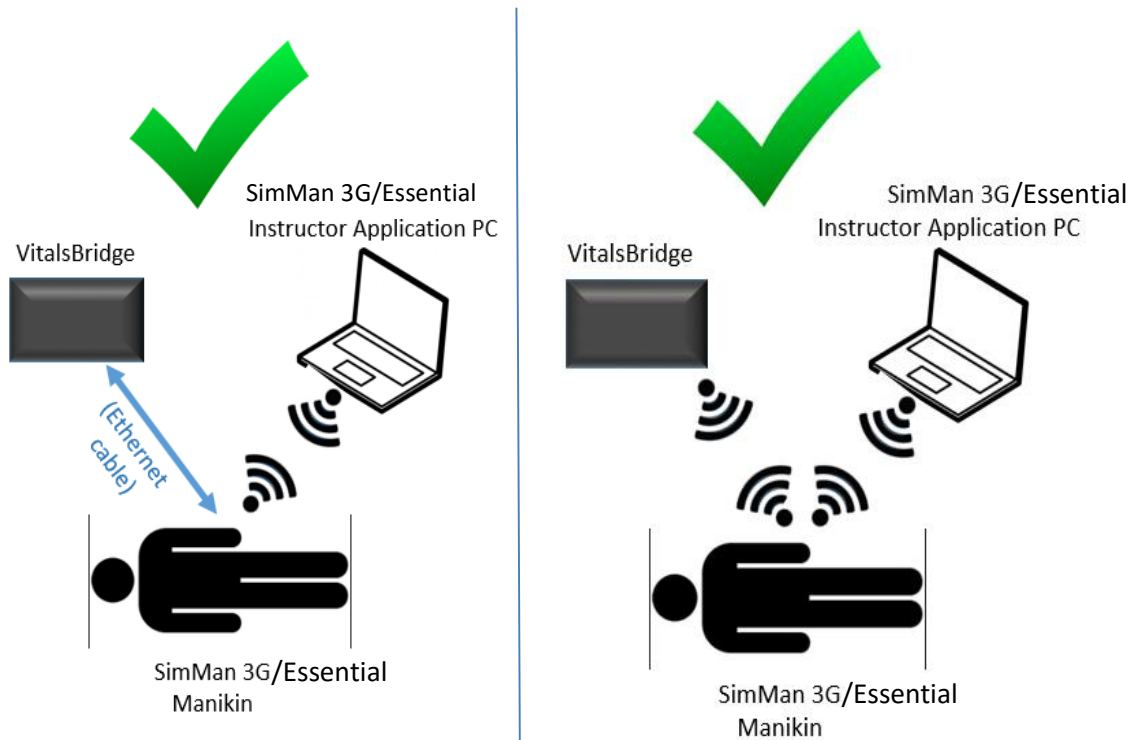
The VitalsBridge contains an internal fan to keep the battery cool while charging and discharging during use. The fan will be active under the following conditions:

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.

Network Connections

Overview

The VitalsBridge communicates with the SimMan 3G/Essential using via the SimMan 3G's internal router. 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 24. The VitalsBridge internal Wifi must also be configured to have the same SSID and password as the SimMan 3G/Essential's internal router using the VitalsBridge Network Configuration Tool (see page 34).

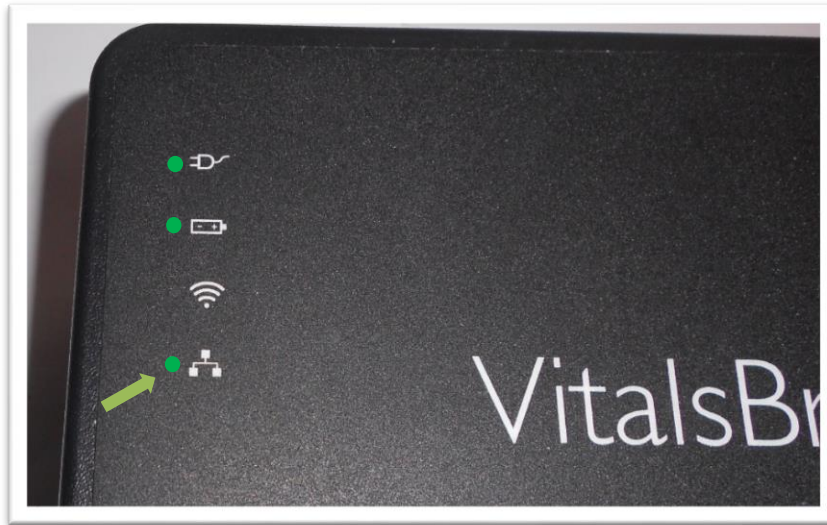


Note: Do not connect the VitalsBridge directly to the SimMan 3G/Essential Instructor Application PC with an Ethernet cable.

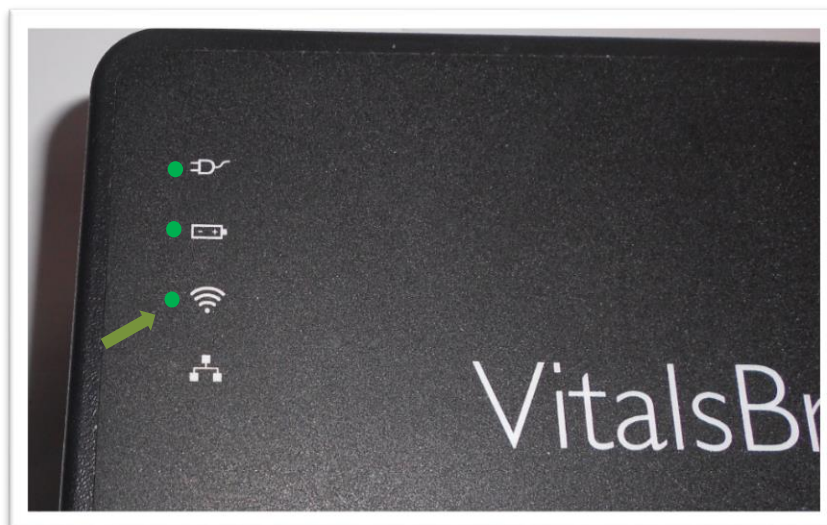
VitalsBridge Directions for Use (for US Government Customers)

When connecting the VitalsBridge to the SimMan 3G/Essential manikin using an Ethernet cable, ensure the cable is functional and is securely connected to the Ethernet ports of the VitalsBridge and the manikin. The top of the VitalsBridge indicates when it has established an Ethernet or Wifi connection with the manikin's internal router.

(Ethernet Connection)



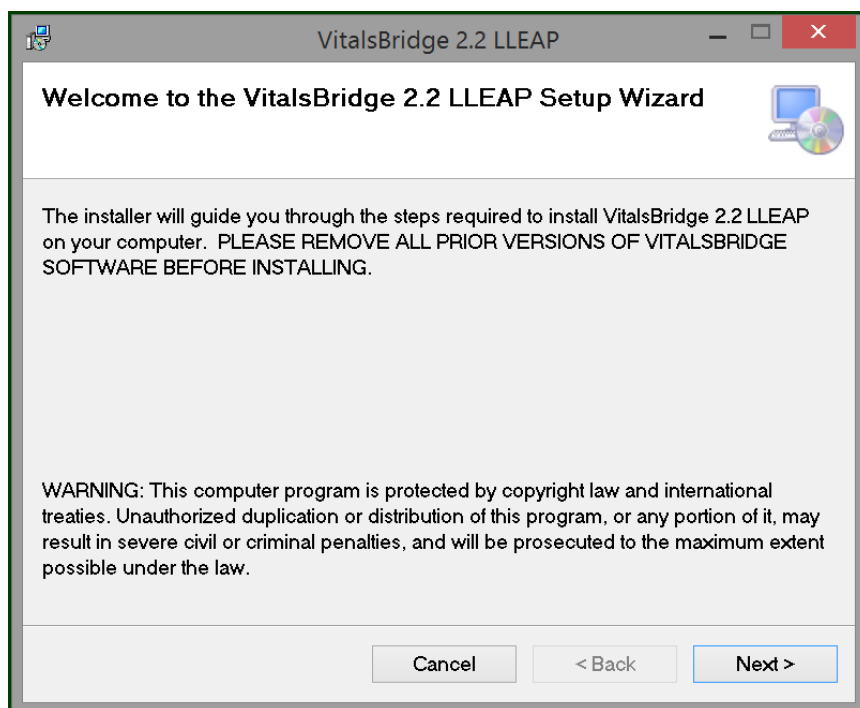
(Wifi Connection)



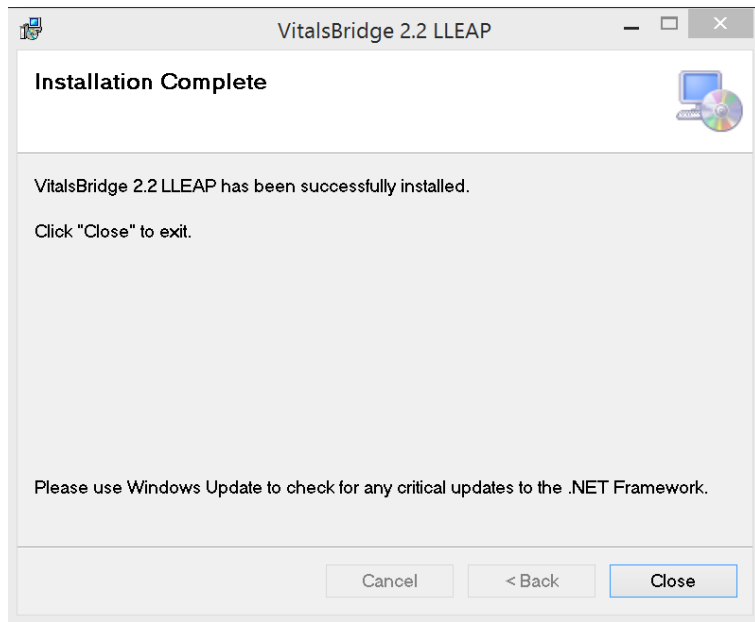
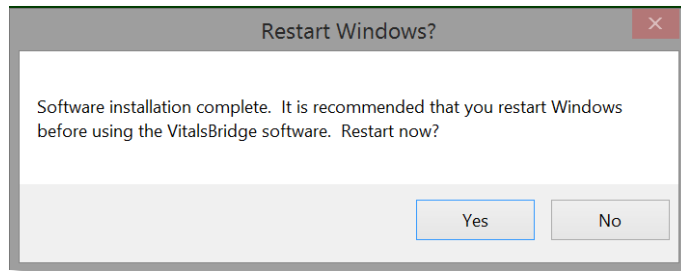
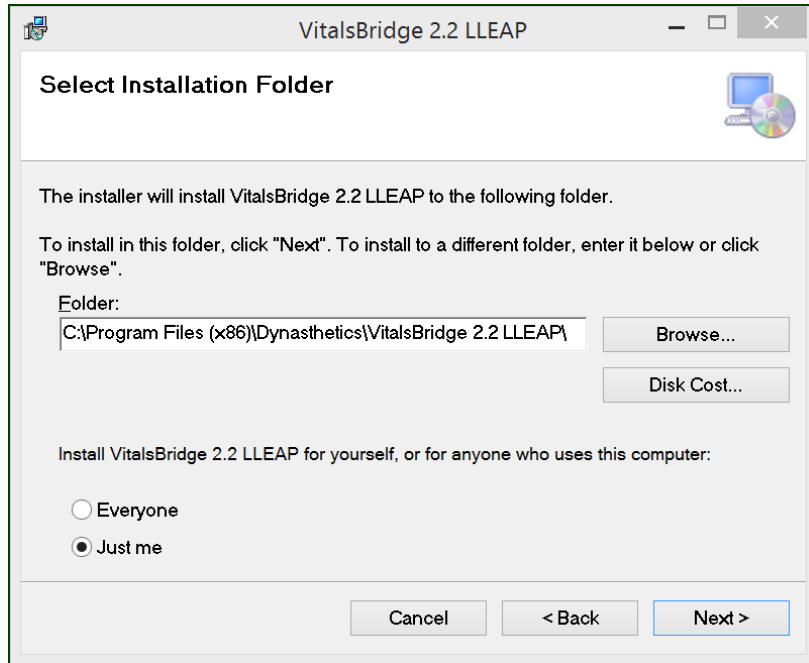
Installation of the VitalsBridge Software

The VitalsBridge software may be installed on a PC that is able to establish a network connection with the SimMan 3G/Essential manikin or to an instance of the virtual manikin. The instructor application PC is recommended for installation of the VitalsBridge software. Download the appropriate VitalsBridge installation software from www.laerdal.com. 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 the version of software running on the SimMan 3G/Essential (e.g., LLEAP versus legacy versions of SimMan 3G software), or the particular version of LLEAP.



VitalsBridge Directions for Use (for US Government Customers)



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 Compressed CO₂ Setup/Configuration

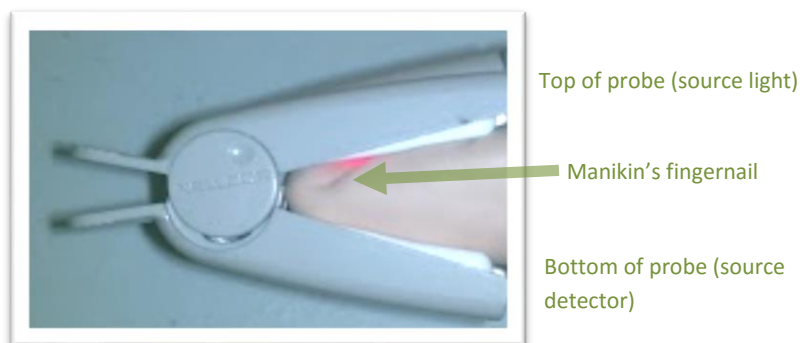
This section will describe how to connect the cables and tubing between the VitalsBridge, the SimMan 3G/Essential, and the patient monitor. Please note that invasive blood pressure and temperature patient monitoring cables, specific to the brand and model of patient monitor being used with the VitalsBridge may be purchased from Laerdal. Note that your monitor will also require a type of non-invasive blood pressure cuff, either a 1-tube or 2-tube design, depending on the brand and model of patient monitor being used. In addition, the patient monitor's SpO₂ sensor probe and cable is used with the VitalsBridge. Please consult the patient monitor documentation for more information regarding temperature cables, invasive/non-invasive blood pressure cables, and SpO₂ sensor probes and cables.

Pulse Oximetry (SpO₂)

Pulse oximetry, or SpO₂, is used to determine the oxygen saturation of a patient's blood. It also will provide a pulse measurement. SpO₂ simulation by the VitalsBridge uses special circuitry inside the manikin's index finger of the right hand, which provides expected light levels of light to the monitor's SpO₂ probe according to the SpO₂ value set in the SimMan 3G's Instructor Application.

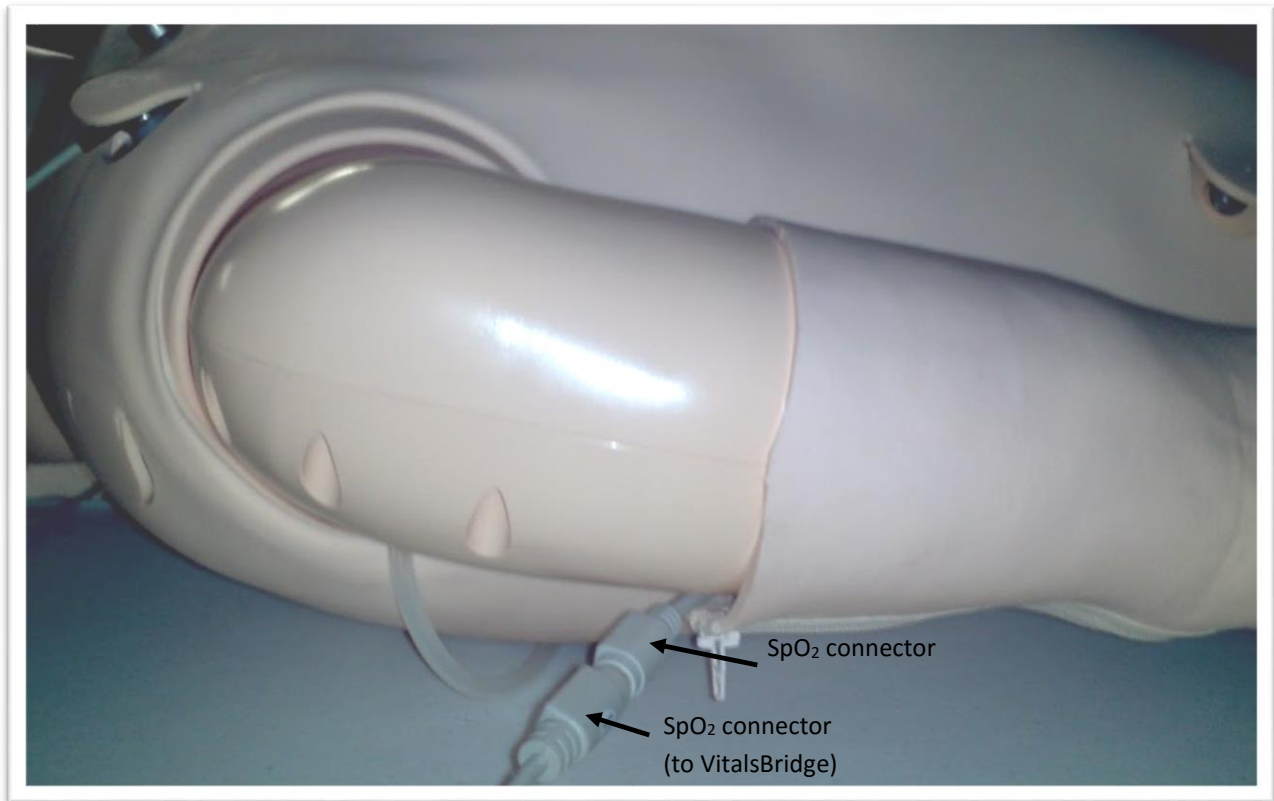
Note: The SpO₂ circuitry in the manikin's hand must be located at the tip of the index finger. If there is empty space between the manikin's fingertip skin and the sensors, the skin will need to be adjusted for a tight fit. Gently, but firmly, push the manikin skin further down so that it is in contact with the probe. Contact Laerdal if additional assistance is needed.

When placing the patient monitor's SpO₂ sensor probe, ensure its orientation is correct. The probe's source light should be placed over the manikin's fingernail. Note: SpO₂ will not function properly in other orientations of probe placement. Below is an example depicting proper placement of a Nellcor non-disposable probe on the manikin's right index finger.



VitalsBridge Directions for Use (for US Government Customers)

To use the SpO₂ function, ensure the SpO₂ cable is connected to the manikin and the VitalsBridge.



Configuration of a Compressed CO₂ Source

For capnography and non-invasive blood pressure (NIBP) simulation, a source of compressed CO₂ regulated to 20-30 PSI is required. A portable CO₂ regulator that uses cartridges of compressed CO₂ is provided with the VitalsBridge. Alternatively, compressed CO₂ from another external source may be available at your facility (wall source, a tank, etc). Consult your facility's engineering regarding external CO₂ sources and the appropriate regulators and adapters for correct and safe connection.

Using the Portable CO₂ Regulator: The portable CO₂ regulator is mounted to the side opposite the switch and uses a 16g threaded disposable cartridge of compressed CO₂. The regulator may be detached by lifting the regulator up out of the slot that is on the side of the VitalsBridge. The regulator 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.

Note: Carefully verify the regulator that you are using. Some regulators supplied with the VitalsBridge have a maximum pressure of 30 PSI on the gauge, while other regulators have a higher maximum pressure reading on the gauge (e.g., 140 PSI). Either are acceptable, where the regulated pressure will be set to 20-30 PSI as per the instructions below.

⚠ Caution: The regulator must be kept upright when the CO₂ cylinder is attached. Do not tilt the regulator more than 30 degrees from vertical when in use. The CO₂ cylinder is pressurized. Sudden release of pressure may cause injury. Turn regulator to **OFF** when not in use.



VitalsBridge Directions for Use (for US Government Customers)

Installing a CO₂ Cartridge (see images labeled (2) – (7) that 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 amount of CO₂ to leak out during cartridge installation.
4. Attach the blue tubing to the blue luer lock (CO₂_{in}) on the front of the VitalsBridge and verify a secure connection.
5. Replace the regulator back on the bracket that is attached to the VitalsBridge instrumentation.
6. If the regulator supplied with the VitalsBridge has a maximum pressure of 30 PSI on the gauge, then SLOWLY turn regulator knob clockwise to the “HI” position, usually set at or just above 20 PSI. Note: it is acceptable if the gauge reading is in the red area.

For regulators that have a maximum pressure on the gauge that is greater 30 PSI (e.g., 140 PSI), then SLOWLY turn the regulator knob clockwise until the pressure on the gauge reads 30 PSI. Do not set the regulator to a reading higher than 30 PSI.

7. The regulator is now set at the maximum regulated pressure.

(2)

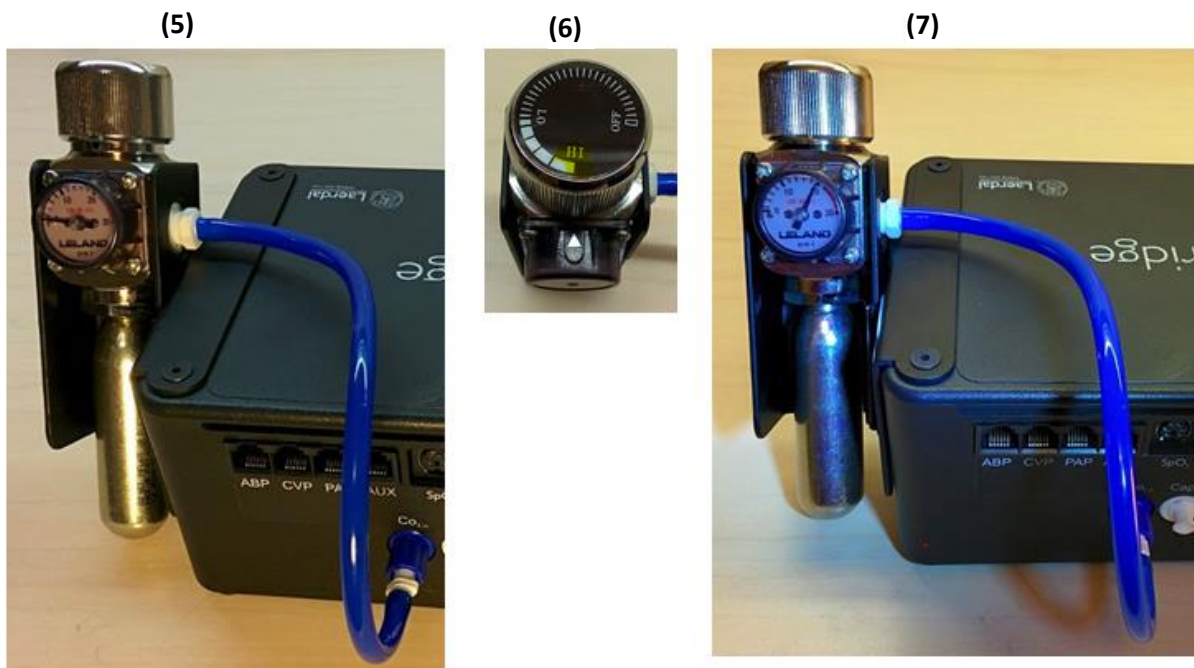


(3)



(4)





⚠ Caution: Ensure CO₂ 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 CO₂ gas to expel in a controlled manner. The CO₂ 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 CO₂ to the off position and disconnect the CO₂ line from the VitalsBridge.

⚠ Warning: CO₂ cartridges may become extremely cold when discharging. Protect eyes and hands when installing and handling CO₂ handling CO₂ cartridges.

⚠ Warning: Mishandled CO₂ cartridges may become a projectile.

⚠ Caution: CO₂ cartridges may not be transported by air.

Capnography (Side-stream End Tidal CO₂)

The VitalsBridge is configured for simulating side-stream capnography. Capnography is the measurement of patients' exhalation of CO₂. The VitalsBridge utilizes an air pump and the compressed CO₂ source to provide a mixture composed of the correct amount of air and CO₂ to simulate the fraction of CO₂ 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.



To side-stream CO₂
connection on vital signs
monitor.

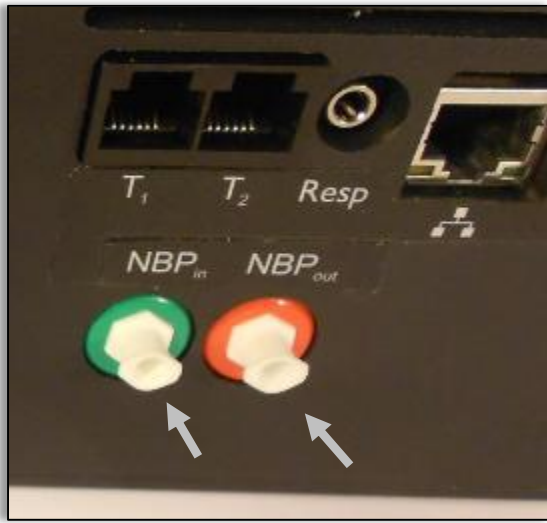
Non-invasive Blood Pressure (NIBP)

The VitalsBridge is capable of simulating non-invasive blood pressure by simulating 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.



VitalsBridge Directions for Use (for US Government Customers)

The tubing connections to the VitalsBridge are color coded:



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



To NIBP Tubing
connection on the
patient monitor

VitalsBridge Directions for Use (for US Government Customers)

A 2-tube cuff is configured as follows.



To Patient
Monitor's NIBP
Tubing

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.

⚠ 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 Laerdal 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).

VitalsBridge Directions for Use (for US Government Customers)



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

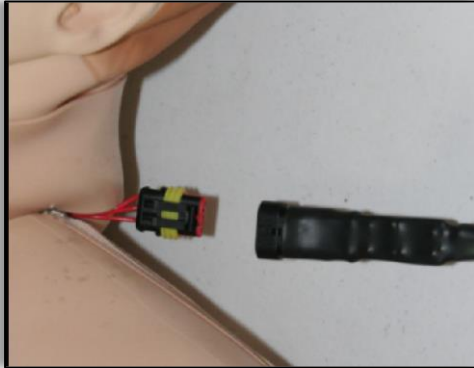
Temperature

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. T₁ simulates the temperature in the blood, and T₂ simulates T_{peri}.



Respiration Impedance via Electrocardiogram (ECG)

This connection is utilized with a cable plugged into a connector located on the manikin's neck.



The other end of the cable plugs into the VitalsBridge.



Once connected, the patient monitor will display the respiration rate and ECG information. Note: a three lead ECG is recommended with the patient monitor and the SimMan 3G/Essential for respiration impedance simulation.

Running the VitalsBridge™

Because the VitalsBridge requires a network connection with the SimMan 3G/Essential's internal router, there is a specific sequence for initializing and running the VitalsBridge. Assuming that both the VitalsBridge and SimMan 3G/Essential are turned off, the summary of the steps are as follows:

1. Power on the manikin and wait until manikin is breathing
2. Power on the SimMan 3G/Essential instructor PC
3. Run the Instructor Application software (either through the legacy SimMan 3G software or LLEAP)
4. Power on the VitalsBridge instrumentation, wait for network connection.
5. Run the VitalsBridge software

Step 1: Power on the SimMan 3G/Essential manikin and wait until manikin is breathing. Refer to the SimMan 3G/Essential's directions for use on how to power on the manikin.

Step 2: Power on the SimMan 3G/Essential instructor PC. Refer to the SimMan 3G/Essential's directions for use on how to appropriately power on the Instructor PC.

Step 3: Run the Instructor Application software. Refer to the SimMan 3G/Essential's directions for use on how to appropriately run the SimMan 3G Instructor Application software.

Step 4: Power on the VitalsBridge instrumentation, wait for network connection. 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 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.

VitalsBridge Directions for Use (for US Government Customers)



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%

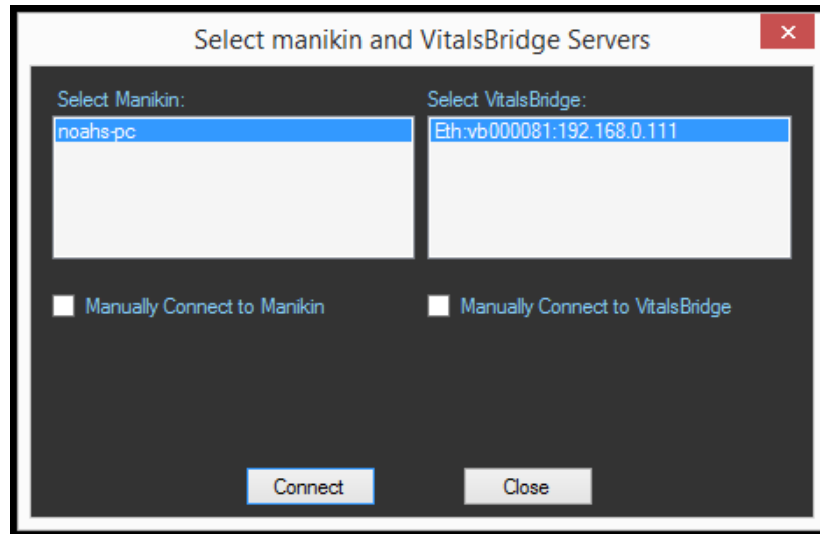
- WLAN or LAN:
 - o no light: not connected to router
 - o solid: VitalsBridge connected to the manikin's internal router
 - o flashing ~ 1x/second: VitalsBridge connected to router and is trying to associate a connection
 - o flashing on/off frequently: VitalsBridge receiving/sending from/to a SimMan 3G/Essential

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

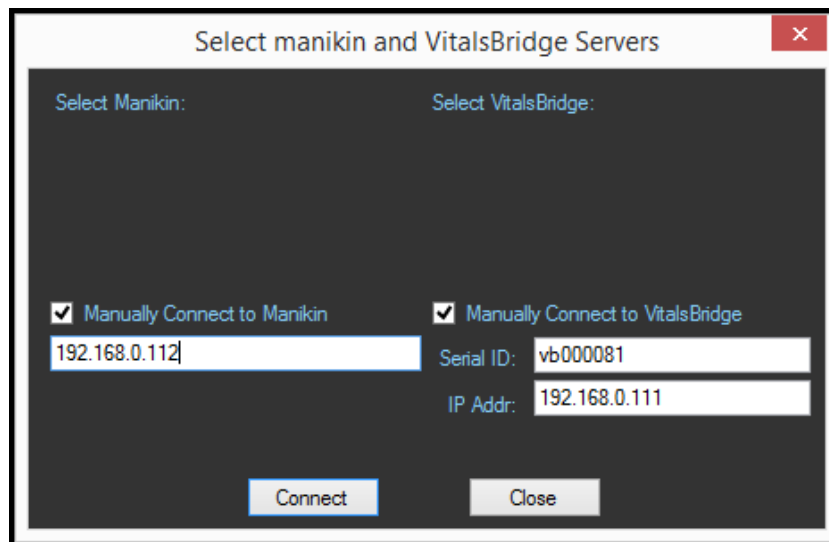


VitalsBridge Directions for Use (for US Government Customers)

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). The first window that is shown allows association between a running SimMan 3G/Essential manikin and a VitalsBridge device. Click on the desired manikin and VitalsBridge device and press the Connect button.

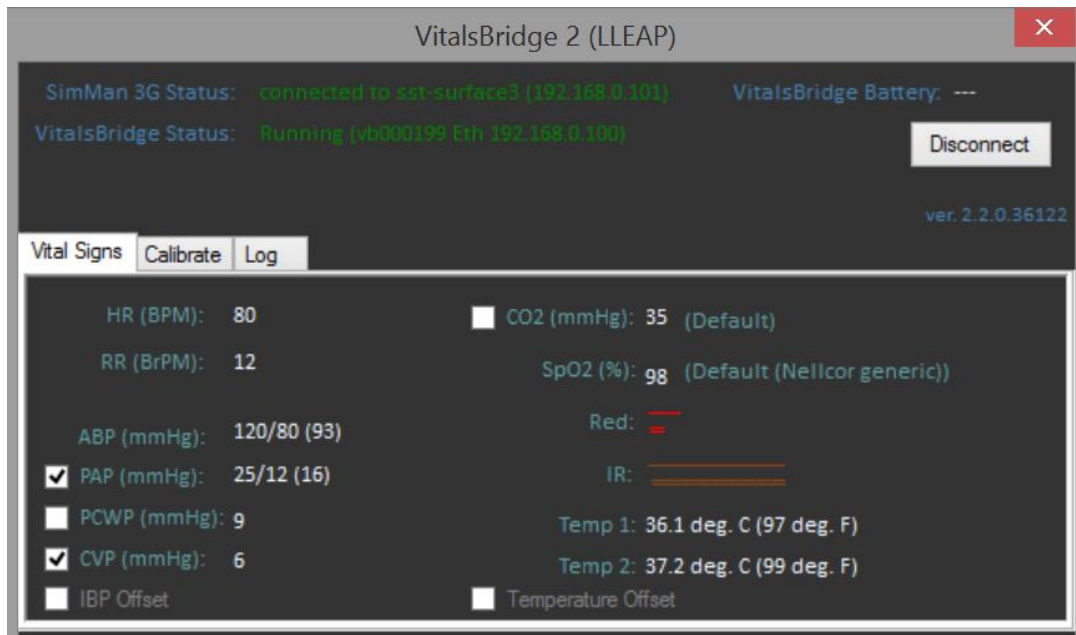


It is also possible to manually enter the manikin and VitalsBridge connection information: the manikin name or ip address and the VitalsBridge serial ID and ip address.



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 SimMan 3G/Essential to the VitalsBridge is shown.

VitalsBridge™ Software Features

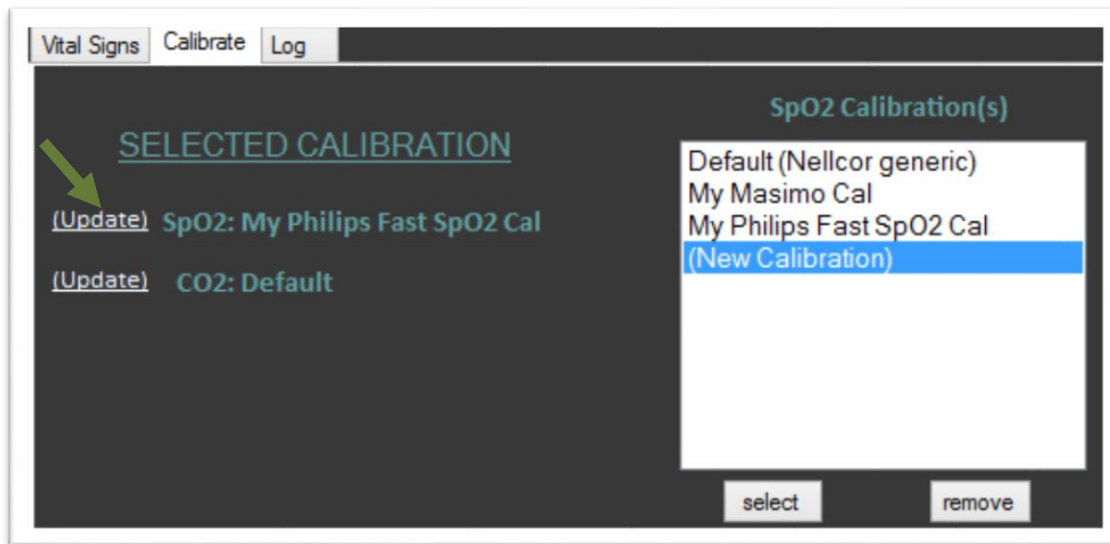


The VitalsBridge software allows the user to monitor connectivity between the VitalsBridge and the SimMan 3G/Essential, calibration of SpO₂ and CO₂ signals, and configuration of other settings.

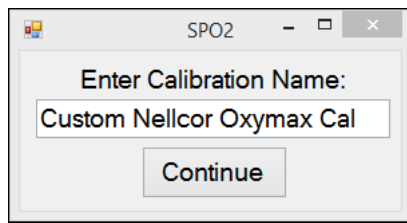
Additionally, if some waveforms are unneeded for the simulation (e.g., PAP/PCWP, CVP, CO₂), uncheck the box next to the vital sign's label. CO₂ is off by default, check to enable capnography. The Calibrate tab provides functionality for calibrating SpO₂ and CO₂ and selecting default or previously stored calibrations.

SpO₂ Calibration

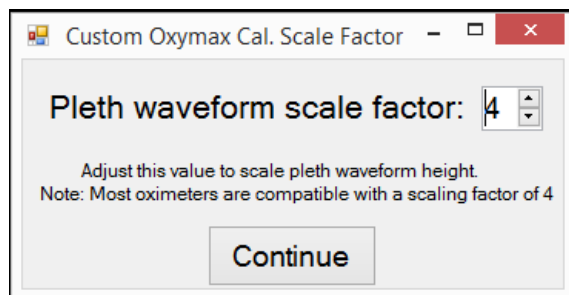
The VitalsBridge is pre-calibrated with factory settings for a Nellcor standard probe. If the SpO₂ value set on the Instructor Application significantly deviates from the value on the vitals sign monitor, then it is possible to use your own calibration. To perform a new calibration, first ensure the 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.

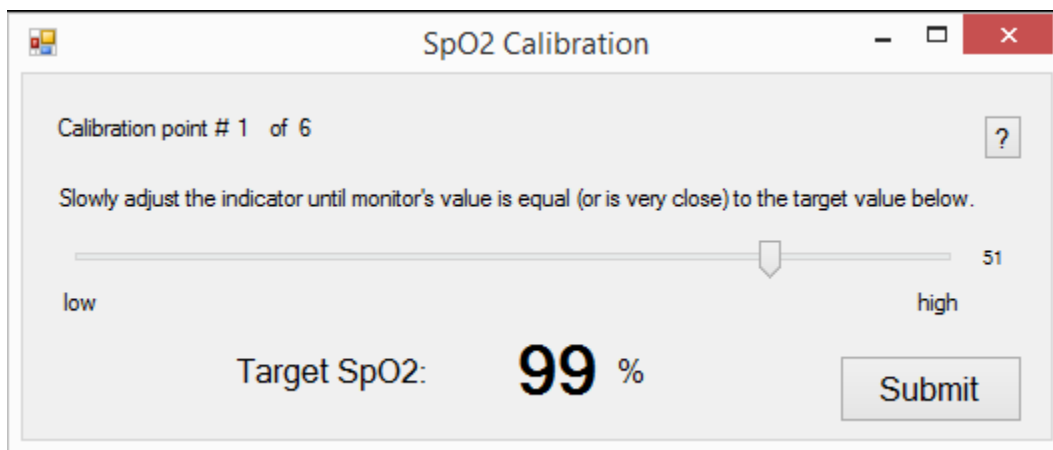


The first portion of the calibration procedure involves scaling the height of the plethysmograph (pleth) waveform. Usually, a scale factor of 4 is best, but may be increased or decreased in size if necessary. If you wish to use a different scaling factor, adjust the scaling factor until a pleth waveform of adequate size is viewed on the vital signs monitor, and there is also a SpO₂ reading shown on the monitor.

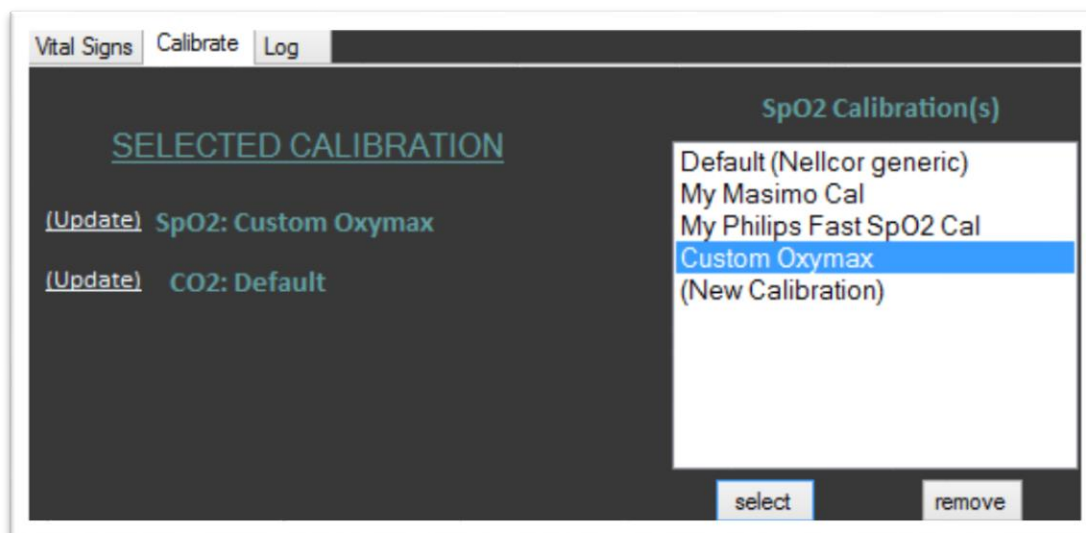


For each calibration point, observe the target SpO₂ value in the calibration window in the software. *Slowly* move the indicator to the left to decrease the SpO₂ value observed on the vital signs monitor or to the right to increase the SpO₂ value on the vital signs monitor. It is recommended to use the left and right arrow keys on the keyboard to make adjustments. Observe the vital signs monitor for changes in the SpO₂ reading. Adjust the indicator until the target SpO₂ in the dialog window in the VitalsBridge

software matches or nearly matches the SpO₂ reading on the patient vital signs monitor. Then, click the submit button to proceed to the next calibration point. Note: ignore the SpO₂ reading that is shown in the Instructor Application during SpO₂ calibration.



Some vital signs monitors will filter and average the SpO₂ value, and there may be a several second 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.

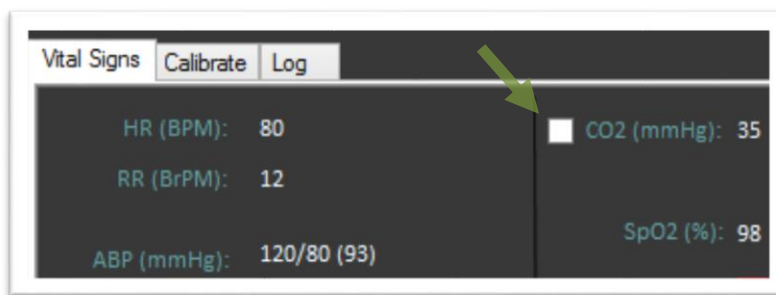


Unused custom calibrations may be removed by highlighting the desired calibration to remove and clicking the remove button.

Enabling CO₂ Simulation

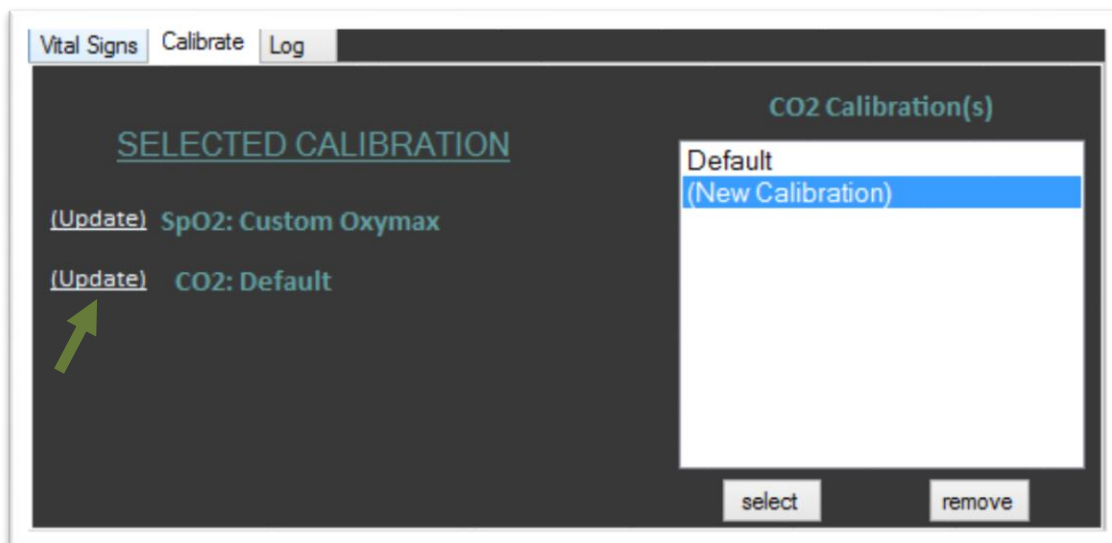
Capnography requires use of a pump internal to the VitalsBridge. The pump is active during capnography simulation. Because the pump consumes additional power and adds a moderate level of noise, CO₂ may be disabled. In the VitalsBridge software uncheck the CO₂ option. Note, CO₂ is unchecked by default.

VitalsBridge Directions for Use (for US Government Customers)

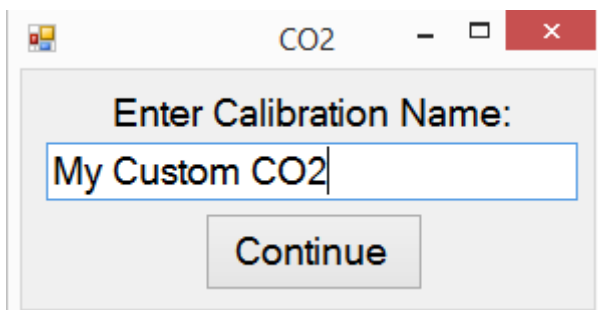


CO₂ Calibration

Calibration may be needed if the end-tidal CO₂ reading on the patient vital signs monitor does not properly match the CO₂ waveform on the Instructor Application. From the "Calibrate" tab on the VitalsBridge software, select "(Update)" next to the CO₂ label. Select a "(New Calibration)".

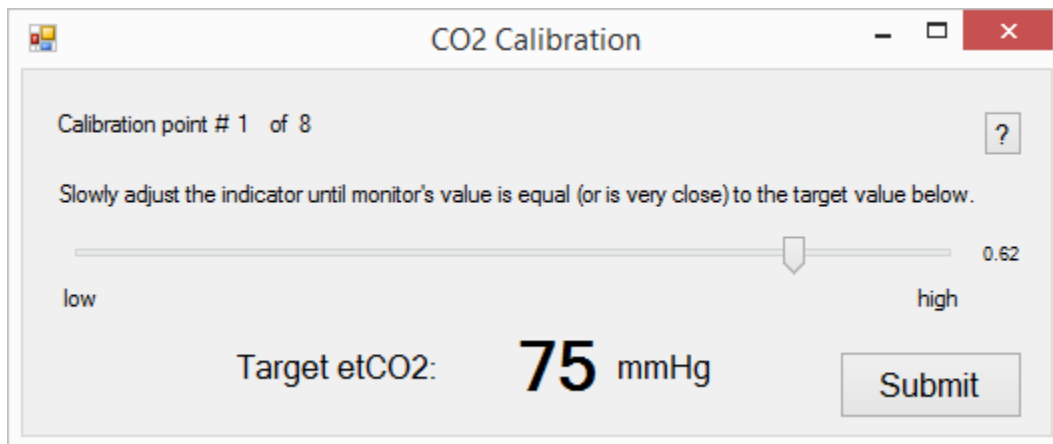


Enter the name of the custom calibration.



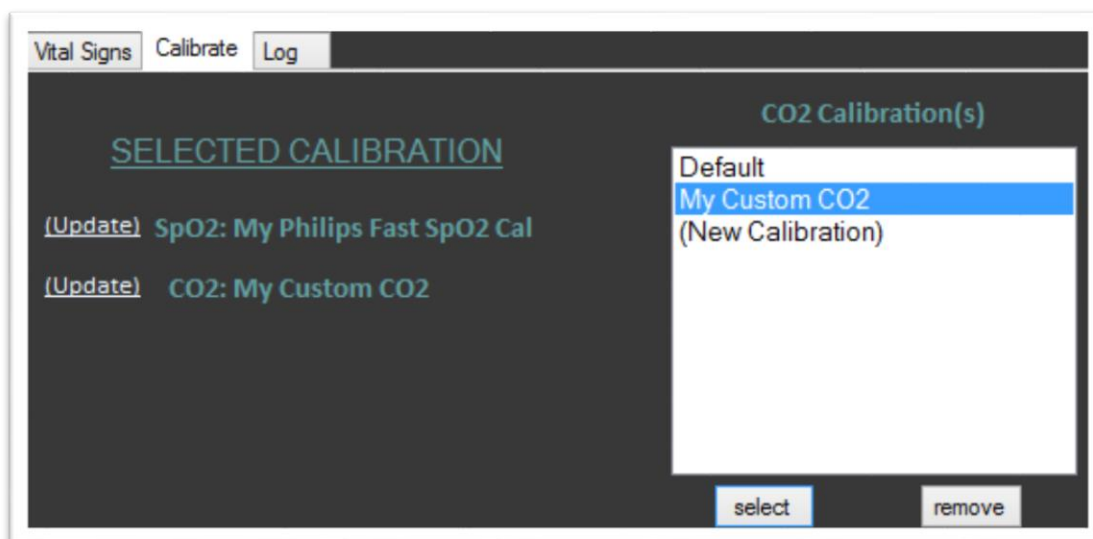
For each calibration point, observe the target etCO₂ value in the CO₂ Calibration window. Slowly move the indicator to adjust the flow up or down until the end-tidal CO₂ reading on the patient vital signs monitor equals the target end-tidal CO₂ reading.

VitalsBridge Directions for Use (for US Government Customers)



Note that some vital signs monitors filter and average the end tidal CO₂ value, and there may be a several second delay for the reading to change. Additionally, small CO₂ 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).

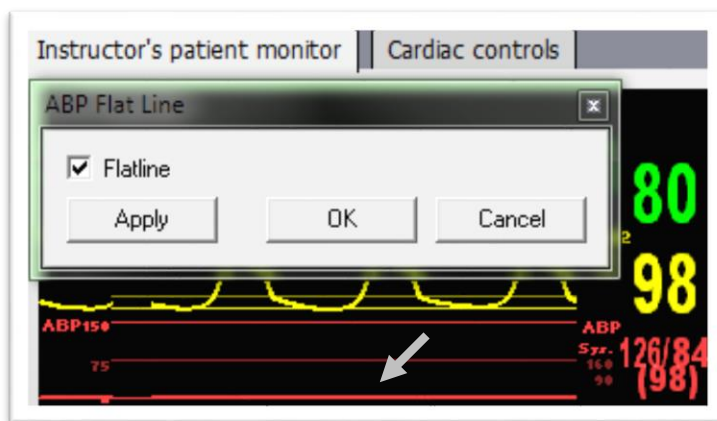
Repeat for all calibration points. Once completed, the calibration data will automatically be stored/retrieved on the VitalsBridge.



Zeroing the Invasive Blood Pressure(s)

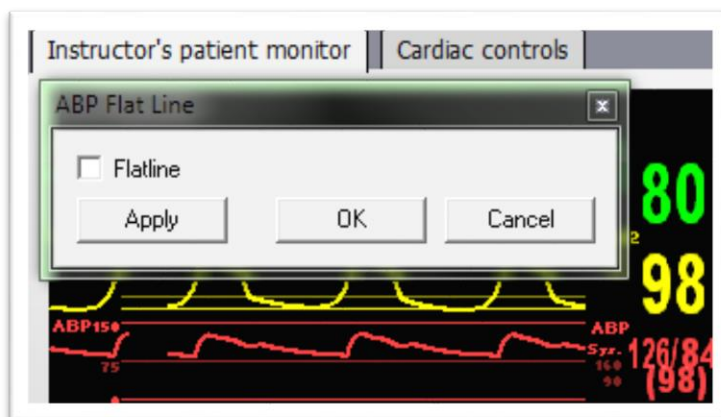
IBPs may be zeroed by setting the blood pressure waveform to “Flat Line” in the Instructor Application for SimMan 3G/Essential. Refer to your patient monitor's documentation for procedures of zeroing the pressures within the monitor's user interface. Once the pressures are zeroed on the monitor, deselect 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.



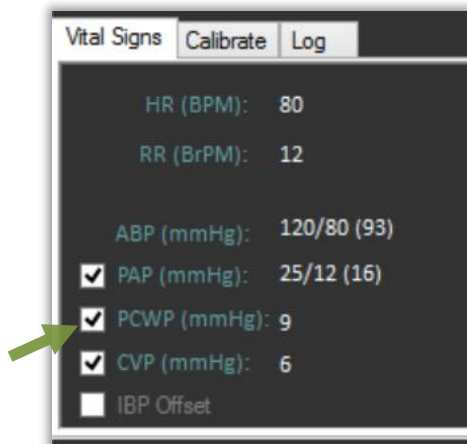
Step 2: Zero the pressure on the patient monitor. Verify that the zero value has succeeded on the patient monitor.

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



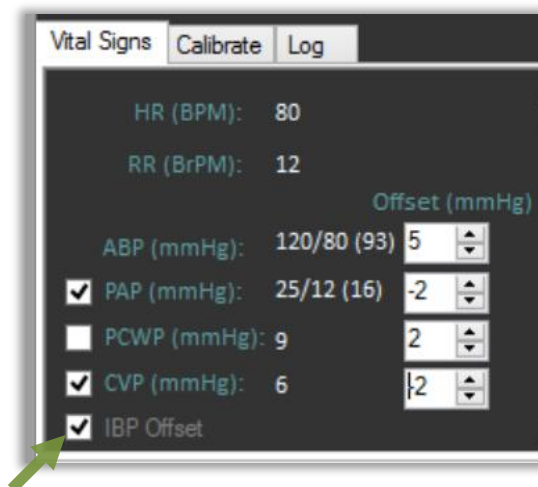
Pulmonary Capillary Wedge Pressure Simulation

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

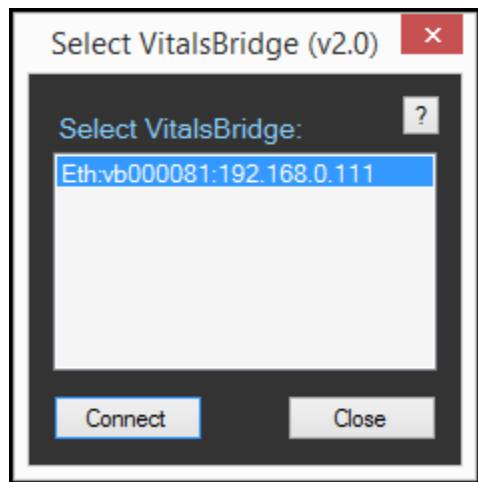
An offset to each of the invasive blood pressures may be included, to attain additional accuracy with invasive blood pressure readings on the vital signs monitor. Adjust the up/down arrows to increase/decrease the offset of the BP waveform by 1 mmHg. When the IPB offset is unchecked in the Device menu,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



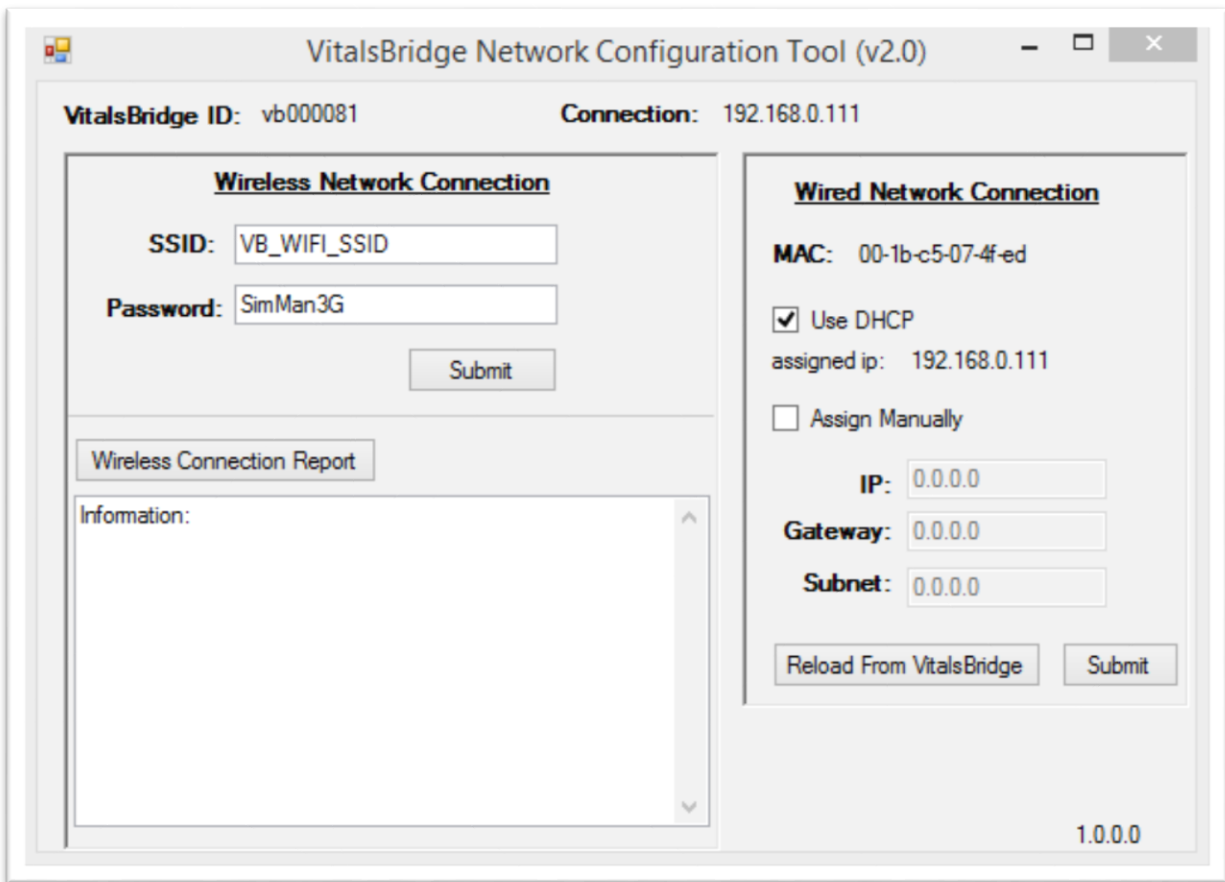
Network Configuration Tool

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 the SimMan 3G/Essential:

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 SimMan 3G/Essential is connected and running.
2. Exit all simulation programs (e.g., Instructor Application, LLEAP, etc).
3. Ensure both the manikin and the VitalsBridge are completely OFF.
4. Turn on the SimMan 3G/Essential; allow to initialize completely (breathing and blinking).
5. Power on the instructor PC, and ensure that it is connected to the manikin's router via Wifi (consult the SimMan 3G/Essential 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 is lit up on top of the box.
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.

VitalsBridge Frequently Asked Questions

General Use and Connectivity

Q: Who do I contact for customer support?

A: In the US, phone: 877-LAERDAL (523-7325), email: us-techsupport@laerdal.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, SpO₂, invasive blood pressure, and temperature. Consult your Laerdal representative to purchase VitalsBridge compatible patient monitor cables.

Q: Is the VitalsBridge compatible with SimMan 3G/Essential manikins running 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: 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 manikin, wait for the manikin to start breathing (chest rise and fall), start the Instructor Application software, power on the VitalsBridge, wait for a network connection between the VitalsBridge and the SimMan 3G/Essential manikin, 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.

SpO₂

Q: Is the VitalsBridge compatible with disposable SpO₂ probes?

A: It is possible to use disposable Nellcor SpO₂ sensors (i.e., sticker-style sensors), but it is not recommended. It is recommended that the Nellcor or Nellcor-Oximax non-disposable finger-clip style probes are used. The manikin's hand geometry does not provide an optimal fit for the disposable style of SpO₂ sensors; however, they can usually be made to work with careful placement.

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

A: It is possible to use these style SpO₂ sensors, but it is not recommended. Performance is best when using a Nellcor compatible probe.

Q: I am not getting a SpO₂ waveform reading. What is wrong?

A: First, check that there is no loose skin at the tip of the index finger on the manikin's right hand. By pinching the fingertip, you should be able to feel something solid underneath. If not, use your hands to slowly but firmly work the skin on the finger towards the hand until all excess space at the fingertip is gone. You may have to push down the skin of the other fingers as well to ensure the entire hand skin is properly placed on the manikin's hand. Second, check proper placement of a non-disposable finger-clip style probe: there should be no gap between the tip of the finger and the top housing of the probe. Remove and replace the probe if needed. Check proper function of the SpO₂ probe and monitor by placing it on a live person's finger.

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 CO₂ source is properly connected to the VitalsBridge. Ensure that the VitalsBridge is running.

CO₂

Q: How long will each CO₂ cartridge last?

A: When the VitalsBridge is running, a 16g CO₂ cartridge will last 4 hours or longer, depending on the simulation. When the CO₂ regulator is not in use, turn the regulator to off, disconnect the tubing connection from the CO₂ luer fitting on the VitalsBridge and securely fit the cap on the end of the regulator tubing, without over tightening.

Q: My CO₂ 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 CO₂ 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 CO₂ 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 CO₂ waveform, what should I check?

A: Check that the CO₂ cartridge is not empty (briefly disconnect CO₂ regulator from the VitalsBridge and listen for gas escaping from the outlet of the regulator). Ensure the monitor uses side stream capnography. Ensure that the CO₂ sampling line is connected properly to the VitalsBridge and the monitor. Check that CO₂ waveforms are enabled on the VitalsBridge software. Attempt to re-calibrate the CO₂.

Q: My monitor shows a CO₂ waveform and value that is extremely high (> 150 mmHg). What is wrong?

A: Ensure that the CO₂ checkbox on the VitalsBridge software app is selected. Ensure that the supply pressure of CO₂ to the VitalsBridge is 50 PSI (~4.4 bar).

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. Enable flatline for the blood pressure waveform on the Instructor Application. Making sure you select the correct transducer, apply the "zero blood pressure" function on the monitor. Disable flatline for the blood pressure waveform on the Instructor Application.

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 "Flatline" feature on the invasive blood pressure waveform of interest in the Instructor Application. 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 transducer cable from Laerdal. Consult Laerdal's website or your local Laerdal sales representative.

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

A: This feature is available for manikins running LLEAP.

Respiration by ECG Impedance

Q: We do not need to simulate respiration rate via ECG impedance. Do I still need to plug in the cable from the manikin's neck to the VitalsBridge?

A: No, it is fine to not use this cable and to hide the connector near the manikin's neck in the chest cavity area.

Q: I am using a 5-lead ECG on my SimMan 3G/Essential manikin, how come I do not see a respiration signal on the monitor?

A: Many monitors require all 5 leads to be connected on a patient for respiratory rate monitoring. Many of Laerdal's manikins only have placement for up to 4 leads. Replace the vital signs monitor's 5-lead ECG harness and cable with a 3-lead harness.

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 for your Vital Signs Monitor from Laerdal. Consult Laerdal's website or your local Laerdal sales representative.