VitalsBridge for SimMan 3G

Directions for Use
VitalsBridge Help

Directions for Use: The Directions for Use includes description, step-by-step instructions and illustrations for using the VitalsBridge. Note: The illustrations may vary slightly from product.

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

Web Downloads: Visit http://www.laerdal.com to download the latest Directions for Use and Software.

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.
Disclaimer and Manufacturer Information

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.


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 Directions for Use.
- The VitalsBridge is intended solely for use during patient simulation. It is not a medical device.
- \( \text{Warning:} \) Never connect the VitalsBridge to a patient.
- \( \text{Warning:} \) Never connect the VitalsBridge to a Vital Signs monitor that is connected to a patient.
- \( \text{Warning:} \) The VitalsBridge is not waterproof. Protect the VitalsBridge in damp conditions and keep away from liquids.
- \( \text{Warning:} \) 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 air or CO\(_2\) with the VitalsBridge. Adequate training and expertise is required to work with compressed gases.
  - \( \text{Warning:} \) Do not use compressed oxygen (fire hazard) or any other flammable substance with or near the VitalsBridge.
  - The VitalsBridge is supplied with a portable CO\(_2\) regulator that uses cartridges of highly pressurized CO\(_2\) gas. Take care when handling these cartridges as they pose a potential risk of injury if used improperly. They should not be heated or punctured when temperatures are above 120\(^\circ\) F or 49\(^\circ\) C. Do not inhale the CO\(_2\) gas.
  - \( \text{Warning:} \) CO\(_2\) cartridges may become extremely cold when discharging. Protect eyes and hands when installing and handling CO\(_2\) cartridges.
  - \( \text{Warning:} \) Mishandled CO\(_2\) cartridges may become a projectile.
  - Note: CO\(_2\) cartridges may not be transported by air.

- Defibrillation Hazards:
  - During defibrillation the defibrillator and VitalsBridge may present a shock hazard. All standard safety precautions must be taken when using a defibrillator with the SimMan 3G and VitalsBridge.
  - The respiration cable connector on the manikin is designed exclusively for respiration monitoring via ECG impedance signals.
  - \( \text{Warning:} \) Defibrillation on the ECG connectors will damage the internal electronics of the VitalsBridge and may cause personal injury.
  - \( \text{Warning:} \) Never connect any cables from the VitalsBridge to the designated defibrillator connectors on the SimMan 3G manikin.
VitalsBridge Overview

The VitalsBridge consists of a device that allows vital signs from the SimMan 3G 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 ECG impedance, plethysmograph waveform, SpO$_2$, capnograph waveform, end-tidal CO$_2$, 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 SpO$_2$ have been pre-installed on the SimMan 3G manikin.
The VitalsBridge converts the SimMan 3G's digitized vital signs waveforms and numbers into signals that are compatible with a vital signs monitor. Compressed gases (air, CO₂) are used for non-invasive blood pressure and capnography to generate the signal. The vital signs created by the VitalsBridge are controlled using the SimMan 3G Instructor Application. An additional piece of software is used to communicate vital signs between the VitalsBridge and the SimMan 3G.

**VitalsBridge Cables and Accessories:** Each VitalsBridge is included with the following cables and accessories:

- VitalsBridge device
- Charge only power supply (for charging the battery when VitalsBridge is off)
- In use power supply (for running the VitalsBridge)
- Mini CO₂ regulator kit
- Tubing and fitting adapter kit for compressed air
- Non-invasive blood pressure cable, from VitalsBridge to manikin
- Non-invasive blood pressure cuff, modified for use with VitalsBridge
- Invasive blood pressure cable, from VitalsBridge to patient monitor cable (x3)
- Temperature cable, from VitalsBridge to patient monitor cable (x2)
- Respiration via ECG cable, from VitalsBridge to manikin
- SpO₂ extension cable, from VitalsBridge to manikin
Requirements

To use the VitalsBridge the following components are needed:
- VitalsBridge device
- VitalsBridge accessory cables: invasive blood pressure (3), temperature (2), respiration
- Non-invasive blood pressure cuff, modified for use with the VitalsBridge
- Li-ion battery charging power supply, for battery charging only
- VitalsBridge power supply (15V), for use while running the VitalsBridge
- VitalsBridge software installed on a computer running Windows and a network connection
- Sources of compressed air and CO₂ at 50 to 100 PSI. Note that a portable CO2 regulator that accepts 12 or 16 gram cartridges of compressed CO₂ is provided with the VitalsBridge; however, cartridges are not included.
- A 120V A/C power source
- Ethernet (LAN) or Wireless (WLAN) Communication - Communication between the VitalsBridge and the SimMan 3G is based on WLAN communication (IEEE 802.11.b/g). The VitalsBridge can also be connected with the manikin using an Ethernet cable (LAN, IPv4, not included).
- SimMan 3G and instructor PC running the application software version 2.3 or later
- A commercially available patient vital signs monitor, with relevant cables that connect between the patient and the monitor. The monitor is not included with the VitalsBridge.
Internal Battery Charging

*Note:* A separate power supply is provided for charging the battery when the VitalsBridge is not in use. Use the power supply marked "Battery Charging Only" when charging the VitalsBridge (when not in use). Use the power supply marked "VitalsBridge Use" when running the VitalsBridge.

*Charging the Internal Battery:* Use the power supply marked "Battery Charging Only", and connect it to the power port on the rear panel of the VitalsBridge. This charger will fully charge a depleted battery in 6-12 hours.

*Battery Use:* The battery is non-replaceable. Contact technical support if battery appears to no longer charge. Battery life will be at least 2 hours of VitalsBridge use, when fully charged. The battery indicator on the top panel will flash when < 15% of battery life is available.

*Running the VitalsBridge with wall power:* The battery's charge will be maintained if the charger marked "VitalsBridge Power Supply" is used while running the VitalsBridge.
Installation of the VitalsBridge Software

The software may be installed on a PC that is able to establish a network connection to the SimMan 3G manikin or to an instance of the virtual manikin. Insert the CD into the PC's DVD/CD ROM drive. If installation is not started automatically, navigate to the DVD/CD ROM drive and double click on the file "VitalsBridge For SimMan 3G Setup.exe". Follow the on-screen installation instructions. Upon successful installation, a VitalsBridge icon will be created on the PC's desktop.
Confirm Installation

The installer is ready to install VitalsBridge for SimMan 3G on your computer.
Click "Next" to start the installation.

Installation Complete

VitalsBridge for SimMan 3G has been successfully installed.
Click "Close" to exit.

Please use Windows Update to check for any critical updates to the .NET Framework.
Configuration of the VitalsBridge WLAN and LAN communication

The VitalsBridge communicates with the SimMan 3G manikin over WLAN (Wifi) or LAN (Ethernet).

The VitalsBridge will need to be configured to connect to the WLAN using the SimMan 3G internal router's network SSID and password. Additionally, the VitalsBridge is configured to obtain an IP address automatically when connected to the Internal SimMan 3G router via an Ethernet switch and cable. To alter the VitalsBridge network configuration, a network configuration utility will need to be run using an Ethernet connection over a local area network.

**VitalsBridge Network Configuration using the SimMan 3G internal router:** Using a network cable, connect the cable from the Ethernet port located on the SimMan 3G Manikin to the Ethernet port located on the VitalsBridge. The computer that has the VitalsBridge software installed may connect wirelessly to the SimMan 3G Power on the SimMan 3G, the computer, and wait until the Manikin’s chest rises and falls. Then, power on the VitalsBridge hardware.

**VitalsBridge Network Configuration using an external local area network:** Consult your network administrator for assistance for 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 enabled.

**VitalsBridge Network Configuration over WLAN:** This is not recommended.

Run the VitalsBridge network configuration utility "VitalsBridge Network Configuration", found under the start menu in the folder Laerdal/VitalsBridge/. In the program window, choose the VitalsBridge to configure by clicking on its label and Connect.
If a VitalsBridge device is not shown in the window, double check all Ethernet cable connections, wait several seconds or power off/on the VitalsBridge and restart the network configuration utility.

Once connected, the existing network settings will be read from the VitalsBridge device and shown in the edit fields on the screen.

For WLAN, change the SSID and password fields to match the configuration of the SimMan 3G router. For LAN, it is highly recommended that you use DHCP, however you may select between DHCP and manual IP settings. **Warning:** improper changes to the Wired Network Connection settings may result the inability to connect and configure to the VitalsBridge.

*Resetting to default network configuration:* To reset the VitalsBridge to default network settings, use the power toggle switch located on the side of the VitalsBridge device to power on the VitalsBridge for 2 seconds, power off for 2 seconds. Repeat for a total of 4 power on/off cycles.
Configuration of Cable Connections Between the VitalsBridge, the SimMan 3G manikin, and the Patient Vital Signs Monitor

$SpO_2$: The $SpO_2$ sensor is located in the manikin's right index finger, and a connector is located near the top of the arm skin, near the zipper. Connect the $SpO_2$ extension cable between the VitalsBridge and this connector on the arm.

Connect the $SpO_2$ extension cable into the appropriate connector on the VitalsBridge.
Place a non-disposable finger-clip style \(\text{SpO}_2\) probe from the Vital Signs monitor squarely over the index finger of the manikin’s right hand. Correct placement and position of the \(\text{SpO}_2\) probe is important: Ensure it is not “twisted” on the finger, and leave a gap of 1-2 mm between the tip of the finger and the top housing of the probe.

*Respiration Impedance via ECG:* The manikin has a connector for simulation respiration via ECG impedance, which is located near its neck (right or left side). Connect the female connector of the Respiratory ECG to the complementary connector on the SimMan 3G manikin.
Firmly connect the male connector side to the VitalsBridge.

**Temperature:** 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, and $T_2$ simulates $T_{peri}$.

**Invasive Pressure:** The invasive pressure cable is a 1 ft RJ-11 cable. One end of the cable connects to the VitalsBridge, and the other end connects to the invasive pressure patient monitor cable. Four invasive cables are included with the VitalsBridge. ABP is arterial blood pressure, PAP is pulmonary artery pressure, CVP is central venous pressure, and AUX is an unused auxiliary pressure connector.
Configuration of Compressed Gases and Pneumatic Connections

**Compressed Gases:** For CO\(_2\) and non-invasive blood pressure (NIBP) simulation, sources of compressed air and CO\(_2\) are required. These sources must be regulated to pressures between 50 and 75 PSI. A small CO\(_2\) regulator that uses cartridges of compressed CO\(_2\) is provided with the VitalsBridge. Alternatively, CO\(_2\) from another external source may be available at your facility (wall, tank, etc). A 1/8" female to female NPT coupler and tubing are provided to connect to the external source of compressed air. Consult your facility's engineering regarding sources of compressed air (wall, tank, compressor, etc) and for the appropriate regulators and adapters for connecting.

**Using the Portable CO\(_2\) Regulator:** The portable CO\(_2\) regulator uses 12g or 16g cartridges of compressed CO\(_2\). It has a luer-lock fitting connection to the VitalsBridge, which may be capped when a CO\(_2\) cartridge is in place but is disconnected from the VitalsBridge.

![Diagram of CO\(_2\) regulator and cartridges](image)

**Installing CO\(_2\) Cartridge:** Turn the stopcock the regulator so that it is closed. If the regulator is connected to the VitalsBridge, disconnect the luer connection from the VitalsBridge. Discharge any remaining CO\(_2\) from the cartridge by turning the stopcock to open.

Choose the proper cup size (unthreaded 12g or 16g) for your CO\(_2\) cartridge. Ensure the cup is free of any debris or material inside and that the cup and the threads on both the cup and regulator are not damaged. Place the larger round end of the cartridge first into the cup, with the nipple on the top.

Ensure the cartridge is seated properly in the cup. Align the threads of the regulator with the threads on the cup. While firmly holding the regulator in one hand and the cup in the other, quickly rotate the regulator clockwise into the cup until it is hand tight and not leaking. Do not over tighten.
The duration of use for a cartridge varies from 30 to 60 minutes, depending on cartridge size and simulation.

⚠️ Caution: Ensure CO2 has been fully released prior to removing the cup and disposing of the cartridge. This may be done by removing the cap from the end of the regulator and waiting until no rush of air is heard at the outlet of CO2. Wear gloves and eye protection when removing a CO2 cartridge from the cup.

Compressed CO2 connection to VitalsBridge: Hold both ends of the luer connector on the blue tubing and the blue connector on the VitalsBridge. Rotate the tubing connector onto the connector labeled CO2 in on the VitalsBridge, but do not over tighten. When ready to simulate using CO2, open the stopcock on the CO2 mini regulator. Re-close when not simulating.
**Compressed air connection:** Hold both ends of the luer connector on the yellow tubing and the yellow connector on the VitalsBridge. Rotate the tubing connector onto the connector labeled AIR in on the VitalsBridge, but do not over tighten. When ready to simulate, turn on the compressed air at its source.

⚠️ **Caution:** When not in use, turn off the compressed air source and disconnect the CO₂ regulator and place the cap on its outlet.
Non-invasive blood pressure connection: There are two luer connections for non-invasive blood pressure, a green connector for measuring the pressure in the cuff (NBP_in) and a red connector for sending a pulse during measurement (NBP_out). Hold both ends of the luer connector to make a firm connection.
The non-invasive blood pressure portion of the patient monitor uses 1 or 2 tubes to inflate the cuff. For 1-tube, the fitting on the green tube (NIBP$_{in}$) leads from the VitalsBridge and connects to the appropriate fitting on one of the two black tubes on the NIBP cuff. The remaining black tube connects to the patient monitor tube. A third white tube on the NIBP cuff connects to the fitting on the clear tube that leads to the NIBP$_{out}$ connection on the VitalsBridge.

A 2-tube cuff configuration is similar to a 1-tube configuration, but both black tubes on the cuff connect to the patient monitor tubes. However, there will be a “T” fitting on one of the tubes, which allows connection of the green marked tube.
**Capnography:** CO₂ sample line is provided to connect from the VitalsBridge to the CO₂ analyzer on the patient monitor. Connect one end the sample line to the luer fitting marked "Capno" and the other end to the monitor.

To side-stream CO₂ connection on vital signs monitor.
Running the VitalsBridge

*Power on the SimMan3G Manikin and Start the Instructor Application.* Prior to running the VitalsBridge, ensure the manikin and the Instructor Application are running.

*Power and Initialization of the VitalsBridge:* Use the toggle switch, located on the side panel, to power VitalsBridge on or off. Once powered on, the VitalsBridge takes approximately 6 seconds to initialize and connect to a network.

![Power switch](image)

*VitalsBridge Status Indicators:* If connected to the WLAN, the WLAN indicator will light up. If connected to the LAN, the LAN indicator will light up.

![Status indicators](image)

**WLAN or LAN:**
- no light: not connected to router
- flashing 1x/second: VitalsBridge connected to router
- solid: VitalsBridge associated with a SimMan 3G
- flashing on/off frequently: VitalsBridge receiving data from a SimMan 3G

**Battery/charge indicator:**
- no light: VitalsBridge is not on
- flashing every 1 second: unit is running on low battery charge < 15%
- solid: VitalsBridge is on, battery charge > 15%
Power indicator:
- no light: switch is off or VitalsBridge does not have adequate battery charge or external power connected
- solid: switch is on and VitalsBridge has adequate battery charge or external power

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

Alternatively, the software is located under the start menu in the folder Laerdal\VitalsBridge. The first window that is shown allows association between a running SimMan 3G manikin and a VitalsBridge device. Click on the desired manikin and server and press the Connect button.
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 to the VitalsBridge is shown.

Additionally, if some waveforms are unneeded for the simulation (e.g., PAP, CVP, CO2), uncheck the box next to the vital sign’s label. The Device menu provides additional functionality for stopping and restarting VitalsBridge communication, selecting a SpO2 probe, calibrating SpO2, and calibrating CO2.
Zeroing the Invasive Blood Pressures: Invasive blood pressures may be zeroed by setting the blood pressure waveform to “Flat Line” in the Instructor Application. 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.
**Invasive Blood Pressure offset:** 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. Enabling IBP offsets are achieved via the Device menu. 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 is given.

![SimMan3G Vitals Bridge Device menu screenshot](image)

**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 Device menu on the VitalsBridge software, select CO₂, and then select Calibrate.

![SimMan3G Vitals Bridge CO₂ Calibration screenshot](image)
For each calibration point, observe the target end-tidal CO₂ value in the software window. Use the buttons 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.

![CO₂ Calibration window](image)

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. To use this calibration instead of the default calibration, choose CO₂, Calibration Type and User Defined from the Device menu.

![SimMen3G Vitals Bridge](image)
**SpO₂ calibration:** The VitalsBridge is pre-calibrated with factory settings for Nellcor, Masimo and GE SpO₂ probes. Select one of these settings from the Device, SpO2, Sensor Type menu, depending on the brand of SpO₂ probe used in your vital signs monitor.

If the SpO₂ value set on the Instructor Application significantly deviates from the value on the vital signs monitor, then it is possible to use your own calibration. To calibrate the SpO₂ probe, select Calibrate from the Device menu. For each calibration point, observe the target SpO₂ value in the calibration window in the software. Use the UP button to increase the “Set ratio” (lowers the SpO₂ value on the vital signs monitor) or the DOWN button to decrease the “Set ratio” (raises the SpO₂ value on the vital signs monitor). Observe the vital signs monitor for changes in the SpO₂ reading. Adjust the “Set ratio” until the target SpO₂ in the dialog window in the VitalsBridge software matches or nearly matched the SpO₂ reading on the patient vital signs monitor.

Note that some vital signs monitors filter and average the SpO₂ value; there may be a several second delay for the reading to change. Repeat for all calibration points. Once completed, the calibration data will automatically be stored/retrieved on the VitalsBridge. A user-defined calibration setting may be selected from the Device menu under SpO2, Sensor Type, Custom (user calibrated).
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 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\textsubscript{2}, invasive blood pressure, and temperature.

Q: How long will the VitalsBridge run on a fully charged battery?
A: Typical running times are 2.5-4.5 hours, depending on use.

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), power on the VitalsBridge, start the Instructor Application software, 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. 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.

SpO\textsubscript{2}

Q: Is the VitalsBridge compatible with disposable SpO2 probes?
A: No. The VitalsBridge is compatible with most non-disposable finger-clip style probes.

Q: Is the VitalsBridge compatible with the Philips flexible finger-cot probe (M1191A)\
A: No. Consider using a Nellcor compatible probe or Philips finger-clip style probe (M1196A).

Q: I am not getting an 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. Second, check proper placement of a non-disposable finger-clip style probe: there should be about a 1 to 2 mm gap between the tip of the finger and the top housing of the probe. If the fingertip...
is flush against the probe housing, move the probe away from the fingertip by a slight nudge, repeating until the signal is obtained.

**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 air 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 12g CO₂ cartridge will last 30-60 minutes or longer, depending on the simulation. When the CO₂ regulator is not in use, disconnect from the VitalsBridge and securely fit the cap, without over tightening, to the outlet of the regulator.

Q: My CO₂ regulator has a partially full cartridge that I wish to empty and dispose of, what do I do?
A: Disconnect the CO₂ regulator from the VitalsBridge by unscrewing the luer fitting. Let CO₂ gas escape from the outlet of the regulator until no more gas release is heard or felt. This may take as long as 10-15 minutes for a nearly full cartridge. Once the cartridge is empty, unscrew the cup and recycle or properly dispose the empty CO₂ cartridge.

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 compressed air source, with outlet pressure 50-75 PSI (4.4 to 6.2 bar), is properly connected to the VitalsBridge.

**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 not yet accessible from Laerdal server software used by the VitalsBridge. In a future software update, pulmonary capillary wedge pressure is anticipated to be available.

**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 manikin, how come I do not see a respiration signal on the monitor?
A: Many monitors require all 5 leads on a 5-lead ECG for it to compute a respiratory rate value. Replace the 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.