

# SimMan 3G

User Guide





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# Introduction

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## SimMan 3G Patient Simulator

### For Advanced Clinical Simulation

SimMan 3G is an advanced patient simulation system that facilitates training of Basic and Advanced Life Support. The system allows the instructor to effectively assess the learner's individual and team skills based on a realistic clinical situation.

SimMan 3G allows observation and recognition of most vital signs. This is achieved through direct interaction with the Patient Simulator and observation of the Patient Simulator's status as viewed on the *Patient Monitor*.

### The SimMan 3G Simulation System Features Include:

- An advanced configurable airway, comprised of adjustable lung compliance and resistance - allowing simulation of difficult airway management cases.
- Eyes that respond to light and react according to the clinical state of the Patient Simulator.
- RFID Technology for automatic recognition of drugs and airway devices.
- Auto measurement of volume and concentration for drugs and IV fluids.
- Bleeding and Wound Modules are fed from an internal blood reservoir. An external Blood Fill Unit may be connected for extended bleeding cases.
- Simulated Secretions: sweat, tears, froth, urine and ear fluids are fed from an internal fluid reservoir. An external Fluid Fill Unit may be connected for extended use.
- Convulsions simulate seizures or small hand movements.
- Focus on Quality CPR (QCPR): measurement and feedback according to the 2005 and 2010 Guidelines.
- Vascular Access (intra-osseous) via the tibia.
- Automatic Simulation Control based on preprogrammed and validated Patient Cases.

### The Main Components of the SimMan 3G System:

SimMan 3G is an adult life-size wireless Patient Simulator, with internal battery power, internal air compressor and fluid reservoirs. Interventions by learners are registered by the system in the session log, and used for later debriefing.

The Instructor PC controls the simulation. The headset allows the instructor to simulate interactive voice communication between the patient and the learner.

Software available for use with the simulator includes LLEAP for controlling scenarios, SimDesigner for creating and editing scenarios, SimView server or SessionViewer for debriefing simulation sessions with video capture and a Patient Monitor application.

## WLAN Communication

Communication between the Patient Simulator and the PCs is based on WLAN communication. The Patient Simulator and PCs can also be connected to a LAN cable network, and WLAN disabled.

## General Simulator Handling

The SimMan 3G Patient Simulator should be operated by trained personnel only. Treat the Patient Simulator as you would treat a real patient.

 *Warning: Do not provide artificial respiration to the patient simulator using oxygen enriched air or flammable gases.*

- Do not introduce fluids into or onto the Patient Simulator (except as directed in the User Guide), as this may damage the Patient Simulator and its components.
- Do not introduce humidified air into the system during ventilation.
- Never perform mouth-to-mouth or mouth-to-nose rescue breathing on the Patient Simulator. The simulator's airways are not designed for cleaning or disinfection.
- Do not use the Patient Simulator if the internal tubing and cabling is disconnected.
- Never use the Patient Simulator outdoors in wet conditions, as this may pose a shock hazard or damage the simulator.
- Never use the Patient Simulator in temperatures exceeding 40 °C (104 °F), as this may cause overheating and shutdown.
- Never use the Patient Simulator in temperatures below 4 °C (39 °F), as this may damage the fluid system.
- The Patient Simulator should never be stored in temperatures below -15 °C (5 °F).
- The Patient Simulator will automatically shut down if the battery temperature exceeds 60 °C (140 °F).
- Using a defibrillator in temperatures over 35 °C (95 °F) may cause overheating and shutdown.

 *Warning: Avoid pinch hazards - Do not remove protective bushings from the Patient Simulator's joints or use it without the external skins.*

 *Warning: Avoid all sharp edges on the Patient Simulator to prevent personal injury.*

### **Do not use the SimMan 3G Patient Simulator if:**

- Limbs are not attached to the torso.
- Skins are torn or not properly fastened.
- Internal or external cables, tubes or connectors are damaged.
- There is fluid leakage inside the Patient Simulator torso.
- There are unusual sounds indicating air leakage or mechanical damage.
- There are signs of electrical malfunction, such as an unresponsive Patient Simulator or unusual smell or smoke.

## Hygiene

- To maintain Patient Simulator skins, wash hands before use and place the Patient Simulator on a clean surface.
- Wear gloves as required during simulation scenarios.
- After using the fluid- and/or blood system, follow the cleaning instructions (see *Maintenance Section*).
- After using the SimMan 3G Wound Kit, remove glue residue from the Patient Simulator skin with Laerdal Medical Wipes.
- Use only Laerdal Airway Lubricant in the Patient Simulator's airway. Do not spray airway lubricant into the Patient Simulator. Lubricate tools only.

## Prevent Stains on Patient Simulator Skins

Avoid using colored plastic gloves, as they may cause discoloration of the Patient Simulator skin.

Do not use felt-tipped markers, ink pens, acetone, iodine or other staining medications near the Patient Simulator. Take care not to place the Patient Simulator on newsprint or colored paper. All staining may be permanent.

## Transportation and Storage

SimMan 3G is heavy; ensure that the Patient Simulator is properly secured during transportation to prevent personal injury or damage to the product.

## Antivirus and Firewalls

The Patient Simulator and PCs are not supplied with anti-virus programs. *Windows* firewall is activated by default. It is the customer's responsibility to protect the simulation system components from unauthorized access.

The Patient Simulator will revert to factory settings each time the power is switched off.

The customer should install all recommended Windows updates from Microsoft. General security measures should be taken before browsing the internet.

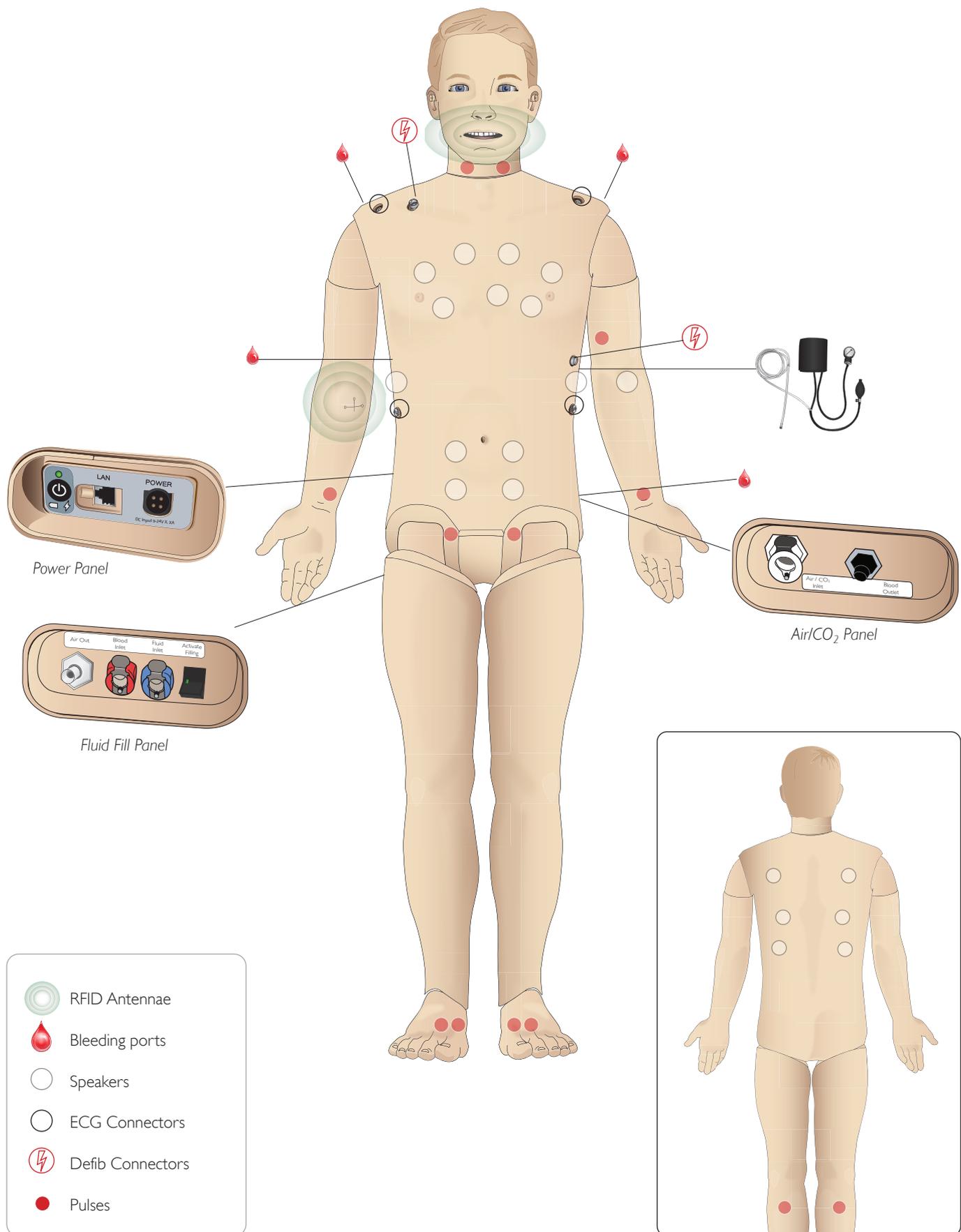
It is recommended that the SimMan 3G PCs are used only as Patient Simulator controllers. Downloading other software programs onto these machines may introduce unexpected errors.

## File Security and Backup of Data

The customer is responsible for file security and backup routines for all simulation session data. All use and storage of simulation session data should be in accordance with local rules, regulations or laws and is the sole responsibility of the customer.

# Features

## SimMan 3G Overview



## General

### Main Anatomical Features

Dimensions (Patient Simulator only):

1800mm (l) x 550mm (w) chest (5.90 ft x 1.80 ft)

Weight (Patient Simulator only): 38.5kg (85 lbs)

Weight (with clothes): 40 Kg (88 lbs)

Default male body with interchangeable genitalia pads

### Configurable Anatomical Features

#### Genitalia

The Patient Simulator comes with a neutral genitalia pad as default. The pad can be changed for a male or female module, both included with the SimMan 3G System. See *Changing the Genitalia Modules* section.

#### Teeth

Patient Simulator comes with a set of soft teeth as default. These can be exchanged for a hard set of teeth, included with the SimMan 3G System. See *Changing upper dentures* section.

#### Trauma Modules/Limbs

Left leg - amputation and bleeding module (optional accessory).

Right arm - amputation and bleeding module (optional accessory)

The SimMan 3G arm adaptor kit is used to connect the trauma arm modules.

Contact your local Laerdal representative to enquire about other trauma modules compatible with SimMan 3G.

### Mobility of Joints

Neck:	Movement can be on a 3-axis movement of head. Range of movement can be restricted. See <i>Airway Features</i> section.
Shoulders:	3-axis rotation
Lumbar:	1-axis
Elbows:	Fixed, no mobility
Wrists:	3-axis rotation
Thumbs:	Free mobility
Hip joints:	3-axis rotation
Knees:	1-axis rotation
Ankles:	1-axis rotation

 *Note: Do not remove protective bushings at shoulder or lower back. These are present to protect users from pinch points.*

## Laerdal Simulation Software

To run a simulation, LLEAP (Laerdal Learning Application) must be started from Laerdal Simulation Home on the Instructor PC.

### Laerdal Simulation Home

Laerdal Simulation Home is an application from where LLEAP and other Laerdal programs related to patient simulation can be found and started. Also the help files can be opened from here. Laerdal Simulation Home is located in the Laerdal Medical folder under the Windows start menu (Windows 7).

Software used in a simulation session comprises the following main applications:

- LLEAP (Laerdal Learning Application)
- Voice Conference Application
- Patient Monitor
- SimView Server or Session Viewer

SimDesigner and other applications are also used for designing or preparing a simulation.

### LLEAP

LLEAP is the instructor's application from where the simulation session is run, controlled and monitored. LLEAP can be operated in Automatic or Manual mode. Automatic mode is used for pre-programmed scenarios while Manual mode allows the instructor full manual control of the simulation session. Running simulations in Manual Mode requires some medical expertise to create clinically sound simulations.

### Voice Conference Application

The VCA software allows the instructor to communicate through the simulator during the session. VCA can also be used to communicate with other instructors on a network, and create separate channels where only members can communicate.

### Patient Monitor

The Patient Monitor application emulates a typical hospital patient monitor. It is the learner's console and can be set up and controlled by the instructor, as well as by the learner through on-screen touch menus.

### Session Viewer and SimView Server

Session Viewer and SimView Server are applications that record video and patient monitor screen captures during simulation, in addition to providing an interface to debrief your session. After a session is ended, log files generated in LLEAP are transferred and merged with the video files in Session Viewer or SimView Server for the debrief.

Session Viewer typically runs locally on the same computer as used for LLEAP, SimView Server runs on a dedicated server in the local network. During the first start-up of LLEAP, you are prompted to select a debriefing system available on your computer or on a local network. This can be changed later.

# Features

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## Other Applications

There are also other programs that are used in conjunction with the simulation sessions, for example License Manager for handling program licenses and Simulator Firmware & Network Wizard for updating the firmware of the simulators or troubleshooting network problems.

### SimDesigner

The SimDesigner application allows you to configure your own preprogrammed scenarios. It can also be used to analyze and print out a graphical representation of a scenario.

SimDesigner must be installed to allow conversion of legacy instructor application files to LLEAP compatible file formats.

For a full overview of all applications and their help files, start LLEAP Home.

### Web Downloads

Visit [www.laerdal.com/downloads](http://www.laerdal.com/downloads) to download the latest User Guide and Software.

## Airway Features

The airway is anatomically modeled as far as the bronchia.

### The airways can be manipulated by a learner:

- Head tilt/Chin lift
- Jaw thrust w/articulated jaw
- Cricoid pressure and manipulation
- Suctioning (oral & nasopharyngeal)

If the tongue fallback feature is enabled, head tilt is required to open the airways for mask ventilations.

### The Patient Simulator may be ventilated by normal and emergency methods:

- Bag-mask ventilation
- Orotracheal intubation
- Nasotracheal intubation
- Transtracheal intubation

Prior to using airway adjuncts, apply a small amount of *Laerdal Airway Lubricant* to the equipment. Do not spray lubricant directly into the airway.

### The following equipment or methods are suitable to secure the Patient Simulator's airway:

- Laryngeal mask airways: The airways are designed for use with size #4, but size #5 may also seal correctly.
- Endotracheal tube intubation, Size ID 7.5 - 8.5 is suitable, but using the smaller size reduces wear of the Patient Simulator's airways.

Use of a malleable stylet is recommended - make sure it does not extend beyond the ET tube.

### Recommended styles:

- i-Gel
- Fiberoptic intubation
- Combitube (size small adult is suitable)
- Retrograde intubation
- Needle cricothyrotomy
- Surgical cricothyrotomy

### The following Patient Simulator features indicate incorrect tube placement:

- Right main stem intubation – unilateral chest rise
- Stomach distention
- Lack of chest sounds, CO<sub>2</sub> exhalation (see *Breathing Features* section)

## Configurable Airway Features

Patient Simulator features may be configured to present various airway Scenarios:

- The airway may be closed automatically or manually. There are four levels of resistance and compliance within the airway.
- Tongue edema - multiple levels
- Pharyngeal swelling
- Laryngospasm
- Decreased cervical range of motion
- Trismus
- Teeth - soft upper dentures may be replaced with a hard set of teeth for enhanced realism while practicing intubations.

### During simulation, the following conditions can be set:

- Can't intubate/can ventilate
- Can't intubate/can't ventilate

### The following information is automatically registered in the SimMan 3G simulation session:

- Detection of proper head position.
- Intubation device used (if fitted with RFID tag)
- Jaw Thrust
- Pneumothorax decompression
- Ventilations
- Stomach distension

 Note: In LLEAP the airway and breathing status for the current simulator is shown in a window. Settings for lung resistance, compliance, and other parameters can be made. See LLEAP Help for further information.

## Breathing Features

The SimMan 3G can simulate spontaneous breathing:

 **Warning:** Do not ventilate the Patient Simulator with oxygen enriched air or flammable gass.

 **Caution:** Do not ventilate Patient Simulator lungs using humidified air.

- Bilateral and unilateral chest rise and fall
- There are 4 compliance settings, from normal to extremely stiff
- There are 4 settings for airway resistance, from normal to extremely tight
- Normal and abnormal breath sounds
- 5 anterior auscultation sites and 6 posterior auscultation sites
- Unilateral, bilateral and lobar breath sounds
- Oxygen saturation and phlethysmogram
- Cyanosis - indicated by blue lights on the lips
- CO<sub>2</sub> exhalation for use with third-party etCO<sub>2</sub> detectors (Requires connection to an external CO<sub>2</sub> reservoir)

### Patient Monitor Features - Breathing

- SpO<sub>2</sub>
- Airway respiration rate (awRRR)
- End-tidal CO<sub>2</sub> (etCO<sub>2</sub>)
- End-tidal O<sub>2</sub> (etO<sub>2</sub>)
- inO<sub>2</sub>
- pH

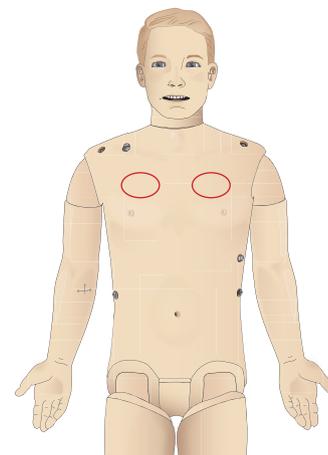
### Lung Specifications

- Max tidal volume: 1.2 liters
- Max tidal volume registered in the LLEAP is 900ml. All volumes larger than 900ml will register as 900ml
- Max airway pressure: 80 cm H<sub>2</sub>O
- Simulated stomach inflation starts from approximately 40cmH<sub>2</sub>O airway pressure.

 **Note:** Lungs are not intended for use with PEEP-valves.

## Pneumothorax

Tension pneumothorax with needle decompression can be performed at bilateral mid clavicle line, 2nd intercostal space. The pneumothorax bladders may be pierced +/-10 times, the pressure inside the bladder will drop after repeated puncturing.

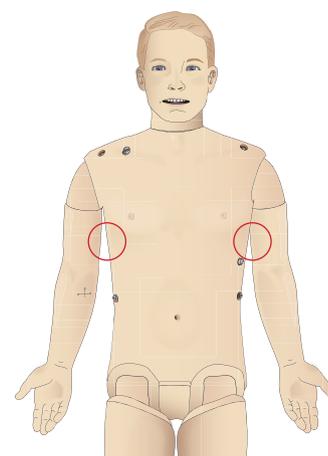


A 22 (or smaller) gauge needle is recommended for decompression of the chest. Using a smaller gauge needle increases the longevity of the chest skin and bladders.

However, a too small gauge prevents automatic detection of the decompression event in the simulation model.

## Chest Tube Insertion

Chest tube insertion can be simulated, and exploration and cut can be made at left or right mid-axillary line in the 4th and 5th intercostal space.



# Features

## Circulation

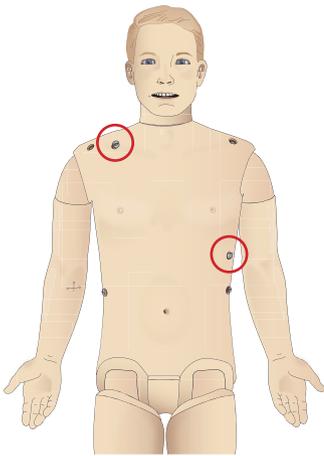
### Cardiac Features

- Extensive ECG library, pulses from 0-220
- Heart sounds - for every anterior location
- ECG rhythm monitoring (4-connector; 3-lead ECG)
- 12-lead ECG display
- Pacing
- Defibrillation and cardio version using live defibrillators

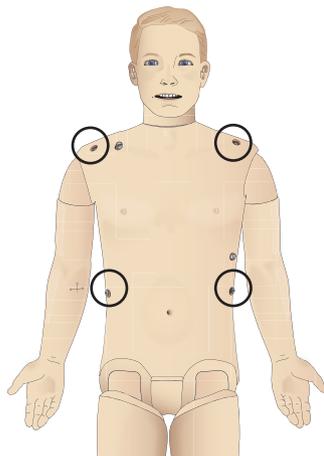
### Defibrillation

- With live defibrillators; energy level and waveform model is registered by the Patient Simulator
- The energy levels and number of shocks required for automatic conversion are set in each simulation Patient Case

### Defibrillation Studs



### 3-Lead ECG Studs



### Circulation Features

- BP measured manually by auscultation of Korotkoff sounds
- Carotid, brachial, radial, femoral, popliteal, dorsalis pedis, and posterior tibialis pulses synchronized with ECG
- Pulse strength variable with BP
- Pulses are synchronized with ECG when the instructor sets the pulse strength manually
- Pulse palpation is detected and logged

### CPR

- Compliant with 2005 and 2010 Guidelines
- Compressions generate palpable pulses, blood pressure wave form, and ECG artifacts
- Realistic compression depth and resistance
- Detection of depth, release and frequency of compressions
- Real-time view of Quality of CPR on the Instructor's PC

 **Warning:** Do not use automated chest compression machines on the Patient Simulator.

### Patient Monitor Features - Circulation

- ECG (12-lead) and heart rate (HR)
- Pulse
- NBP
- ABP
- PAP
- C.O.

### Patient Monitor Features - Temperatures

- TPeri
- Tblood

 *Note:* In LLEAP a variety of settings in the Circulation and fluids window can be made. See LLEAP Help for further information.

## Bleeding

To allow the Patient Simulator to bleed realistically, it has internal reservoirs for simulated blood. See *Setup* section.

The four bleeding ports and blood flow can be adjusted independently from LLEAP:

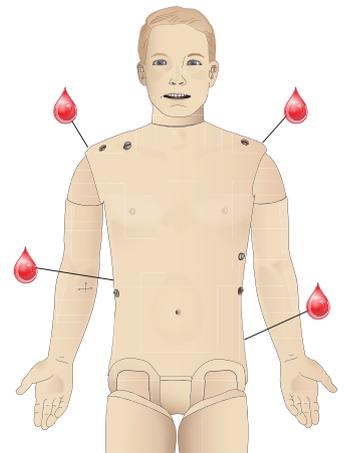
- Upper/lower bleeding ports
- Venous/Arterial
- Works with various wound modules and moulage kits

### Bleeding Treatment

- Bandage
- Pressure point
- Tourniquet
- Surgical Clamps

### Vascular Access

- IV access (right arm)
- Intraosseous access (tibia)
- Drugs - use of Automatic Drug Registration System (identifies drug & measures dose) and preprogrammed drug responses.



### Consumables and Spare Parts

- Laerdal Artificial Blood
- Fill Units
- Wound modules
- Replacement trauma arm/leg

 *Note:* In LLEAP a variety of settings in the Circulation and fluids window can be made. See LLEAP Help for further information.

## Sounds

Two types of sounds can be used in a scenario:

- Body sounds
- Vocal Sounds

The sounds can be triggered by the scenario or controlled by the instructor.

### Body Sounds

The body sounds are simulated sounds from a human body, like heart, lungs, and bowel sounds. The sounds are integrated and generated in the Patient Simulator and transferred through the integrated speakers.

### Vocal Sounds

The vocal sounds are sounds from the throat like coughing, moaning, and crying as well as spoken words. The sounds are integrated in LLEAP and transferred to the Patient Simulator.

In addition, the instructor can communicate through a microphone and the voice is then transferred to the Patient Simulator through the VCA.

 *Note: In LLEAP a variety of settings in the Sounds window can be made. See LLEAP Help for further information*

## Eyes Settings and Configurations

The calculated Glasgow Coma Scale score for the Patient Case is displayed in LLEAP. The following sources of information help the learner to judge the state of disability:

### Eyes

- Blinking eyelids
- Eyelids: open, closed or partially open
- Eyelids can be opened for examination by the learner
- Pupil dilation: constricted, dilated or in between
- Pupillary accommodation
- Synchrony / asynchrony
- Normal and sluggish speed of response

 *Note: In LLEAP a variety of settings in the Circulation and fluids window can be made. See LLEAP Help for further information.*

## Drugs and IV

Drugs used by the scenario and corresponding drug concentrations can be registered manually by the instructor in the Event window in LLEAP or automatically, if you use RFID tags. For further information, see LLEAP Help.

### Patient Monitor Features – Drugs

- Train-of-Four (TOF)
- in N<sub>2</sub>O, et N<sub>2</sub>O
- Anesthesia agents
- Lab reports

### User-replaceable items, Spare Parts

- IV catheter (US and International versions)
- IV fluid filter
- Intra-muscular pad

### Vascular Access (IV and IO) Locations

Intraosseous access with needle insertion is possible through the left tibia. The IO pads may be punctured numerous times before being replaced.

To replace the IO modules, see the *Simulation Setup* section.

 *Caution: Do not inject fluids into these pads unless approved IO modules with fluid outlets are in place.*

### Intra-muscular (IM) Injection

Use the pad placed under the torso skin on the right buttock for intramuscular injection training. Max 15ml.

# Features

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## SimMan 3G Clothing

Included with the Patient Simulator:

- Shirt, with side zippers
- Trousers, with full-length side zippers
- Boxer shorts underwear
- Belt



*Note: For washing instructions see care labels.*

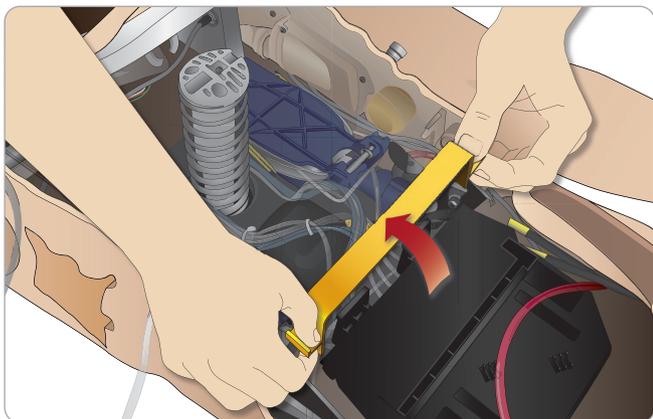
## Simulated Removal of the Clothes

To simulate cutting with scissors: unzip the zippers placed alongside the seams on both sides.

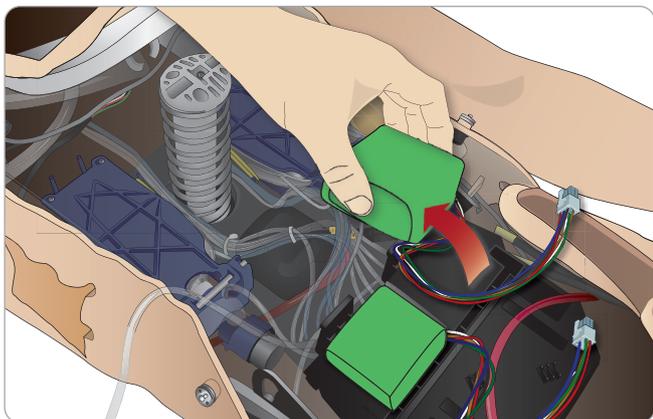
## Inserting and Connecting the Batteries

Open the torso as described in steps 1 - 4, *Opening the Torso*. To remove the batteries, follow the same procedure in reverse.

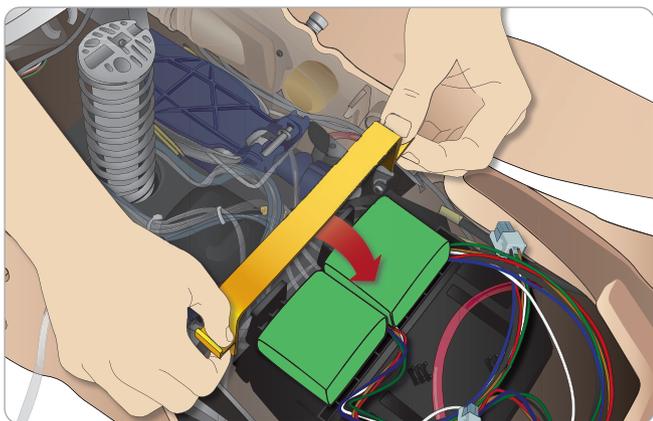
- 1 Release the battery clamp by unhooking the clips on either side.



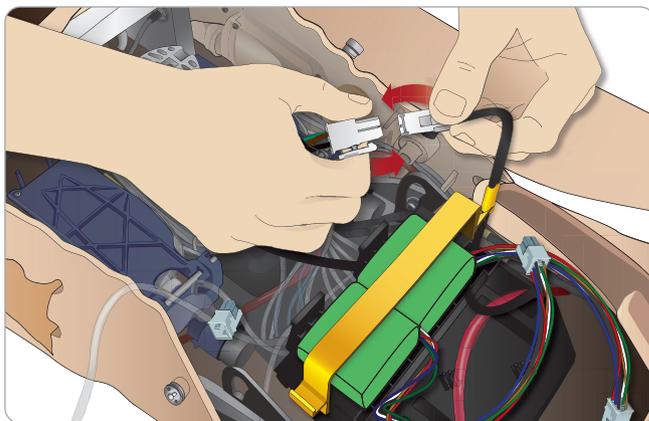
- 2 Insert both batteries into the battery tray.



- 3 Snap the battery clamp back into place over the batteries.



- 4 Connect the corresponding battery cables from the batteries to the torso.



After connecting the batteries, connect the Patient Simulator to the external power supply (12V to 24V) while turned OFF.

The batteries will charge if the Patient Simulator is ON and connected to an external power supply in the range of (20V - 24V).

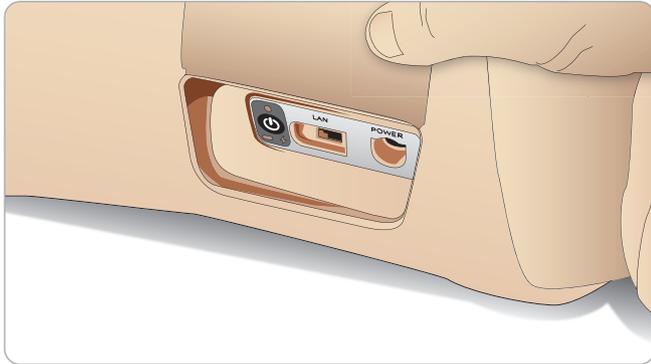
### Battery - Cable and Tube Descriptions

Name/Label	Tube/Cable Color	Connector Description
Battery 1	Black harness cable	Black rectangular connector; 6 lead
Battery 2	Black harness cable	Black rectangular connector; 6 lead

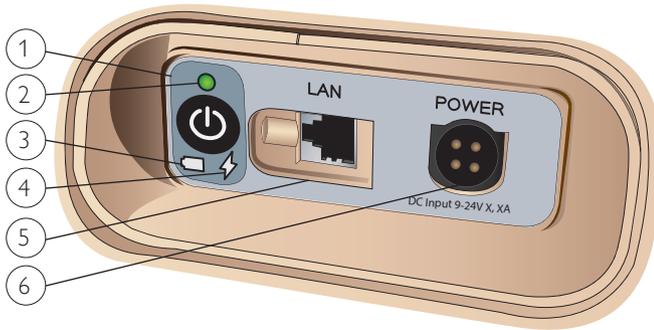
# Setup

## The Power Panel

The power panel is found on the right side of the Patient Simulator, under a loose skin flap. Lift the skin flap and pull out the protective cover.



To ensure easy access, use the zippered clothing provided with the Patient Simulator.



### Power panel overview

- 1 Power ON / OFF button
- 2 Power status indicator
- 3 Battery status indicator
- 4 Charging status indicator
- 5 LAN network cable connector
- 6 External power supply connector

### Power Status Indicator Description

Indicator Light Color	Power Status	Battery Status	Charge Status
Red	Power save*	0% - 20%	Not charging**
Yellow	Start up	20% - 70%	Charging
Green	Running	70% - 100%	Charge almost complete***
No light	Off	Off	No charge****

\* Blinking light

\*\* One or both batteries missing, overheated, damaged or otherwise not able to charge

\*\*\* Not recommended to charge the batteries too long

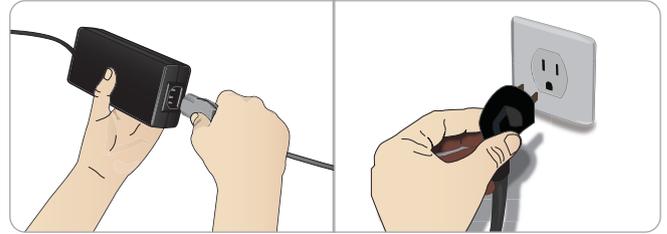
\*\*\*\* No power input, batteries are charged.

Power Save is activated whenever Patient Simulator is paused.

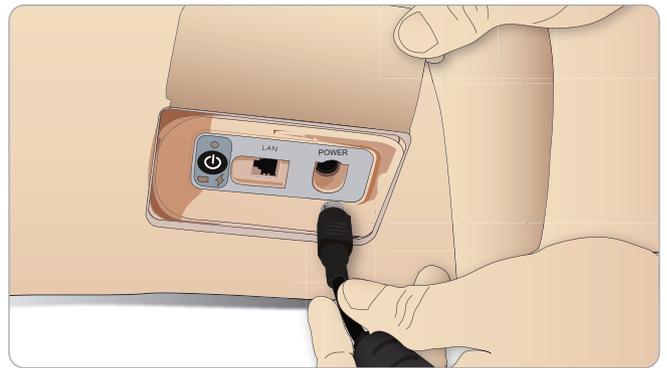
## Charging the Batteries

### Inside the Patient Simulator

- 1 Connect the Patient Simulator to the external power supply with a power cord and plug that meets local specifications.



- 2 Plug the power supply into a wall outlet and connect the power cable to the power inlet on the Patient Simulator's power panel.



- 3 Press the ON button to power on the Patient Simulator:



Note: During startup, the Patient Simulator's eyes will blink and the power status indicator light will be yellow.

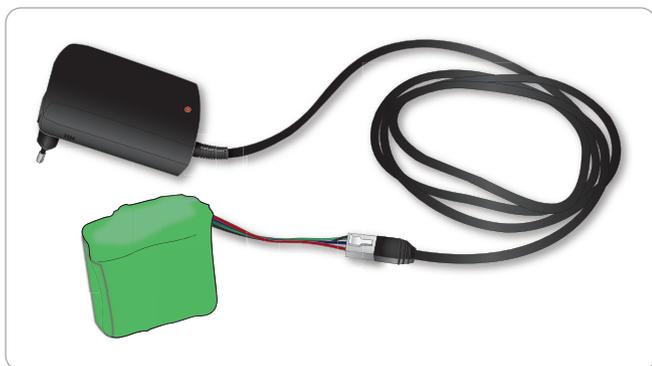
Caution: After Patient Simulator is turned off, wait 20 seconds before restarting. If not, Patient Simulator may not function properly.

## External Battery Charging

The battery charger comes with 5 international plugs. Connect the appropriate plug to the charger:



- 1 Connect the charger to a power outlet and connect the Patient Simulator battery to the charger.



- 2 The indicator light on the battery charger shows charge status.
- 3 Battery charging time is approximately 3 hours.

The external battery charger should only be used with SimMan 3G batteries.

### Charger light showing battery sign

Light Code	Light Color	Characteristic
Standby	Yellow	Steady
Pre-charge	Yellow	Normal Blink
Rapid charge	Green	Rapid
Maintain	Green	Normal Blink
Ready	Green	Steady
Wait	Alternating	Alternating
Error	Yellow	Rapid

## Battery Use

- Always use two SimMan 3G batteries to power the Patient Simulator
- Ensure that the batteries are properly connected
- Charge the batteries regularly
- Check LEDs on Patient Simulator's power panel for battery status
- Charge both batteries before the battery charge drops below 15% or the battery light indicator is red. This can be monitored in the technical status window on the Instructor PC
- The Patient Simulator will automatically shut down if: Battery temperature rises above 60°C (140°F) or the remaining charge falls below 6% on one of the two batteries

### View Battery Status in LLEAP

Check the power indicator in the Simulator Status window in LLEAP according to the instructions in LLEAP Help.

### Changing Batteries during a Simulation Session:

- 1 Press <Pause Session> on Instructor PC. Access the batteries as described in *Inserting and Connecting the Batteries*
- 2 Replace one battery at a time to avoid loss of simulation data

### Storage and Transportation

- Never store fully charged batteries for longer than a month
- Never store the batteries inside the Patient Simulator
- Store batteries in a refrigerator i.e. temperature 0°C - 4°C (32°F - 40°F)
- The two simulator batteries can be transported in the Patient Simulator during air freight
- When transporting spare batteries please contact the airline or freight company for the latest transport regulations

### Battery Maintenance

- On approximately every 30th charge cycle, drain the battery completely before recharging. To drain the batteries, run the Patient Simulator on both batteries until automatic shutdown
- Expected battery life: 200 charge cycles
- Replace only with Laerdal SimMan 3G batteries

## Battery Warnings

 *Warning: Do not run the Patient Simulator for more than 1 minute on a single battery.*

 *Warning: If both batteries are removed while the simulation is paused, the Patient Simulator will shut down and simulation data will be lost.*

 *Warning: Dispose of batteries in accordance with local regulations.*

 *Warning: The external battery charger is for indoor use only.*

 *Warning: The batteries should only be charged in temperatures ranging from 0 °C - 40°C (32 °F - 104 °F).*

 *Warning: Inserting and connecting batteries incorrectly, short circuiting or exposure to fluids pose an explosion hazard.*

 *Warning: Do not mistreat, disassemble or attempt to repair the battery.*

 *Warning: Do not use the batteries if they are visibly damaged, malfunctioning or appear to leak electrolyte.*

 *Warning: Take extreme care to avoid direct contact with electrolyte, hot or smoking parts. In case of the above, disconnect and remove the battery when it is judged safe to do so.*

## Using the Internal Compressor

The SimMan 3G Patient Simulator's chest movements, airway modes and fluid systems are driven by compressed air. The right leg contains a compressor and tank with separate reservoirs for clear and simulated blood fluids.

For extended periods or stationary use, it is recommended to connect to an external source of compressed air. This reduces wear on the internal compressor and extends battery life of the Patient Simulator.

For instructions on connecting an external compressor and adjusting compressor default settings, see *Air/CO<sub>2</sub> Panel* section.

### To avoid overheating and reduce wear

- If using the Patient Simulator in high temperatures, always allow the simulator to cool down between training sessions.

## Turning the Internal Compressor OFF Using LLEAP

To switch OFF the internal compressor (to conserve the simulator batteries and reduce wear), do the following:

- 1 In LLEAP, select the <Tools> menu.
- 2 From <Simulator Setup>, click the Turn off internal compressor.

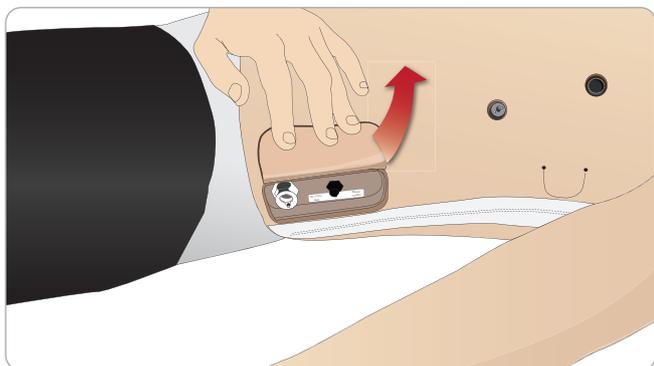
## Changing Default Compressor Settings Using LLEAP

Change default compressor settings via the Profile Editor:

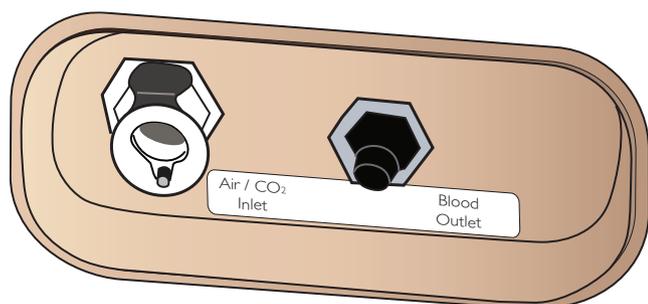
- 1 Open the *Profile Editor* from the <Tools> menu in LLEAP.
- 2 Select the <General> tab in the *Profile Editor*.
- 3 From the compressor setup option, choose the Internal or External compressor as default.

## Air/CO<sub>2</sub> Panel

The Air/CO<sub>2</sub> panel is located on the left side of the torso. To access the panel, lift up the simulator skin flap and remove the protective covering. Connect external Air / CO<sub>2</sub>.



Air/CO<sub>2</sub> panel has 2 connection ports



### Connecting External Air and CO<sub>2</sub> Supply

An internal compressor is located in the right leg of the Patient Simulator. It is recommended to use an external source of compressed air whenever the Patient Simulator is stationary over extended periods of use.

If the Patient Simulator is required to exhale CO<sub>2</sub> with each ventilation, connect external CO<sub>2</sub>. Connect CO<sub>2</sub> only if the Patient Simulator is required to exhale CO<sub>2</sub> with each ventilation. Exhaled CO<sub>2</sub> can be detected with a real capnographic device. The Patient Simulator will only exhale CO<sub>2</sub> when a capnograph is registered as being connected to the system.

- 1 Connect a suitable CO<sub>2</sub> source to a Laerdal external compressor or regulator panel.
- 2 Connect a Laerdal double-lumen Air/CO<sub>2</sub> tube from the external compressor or regulator panel to the Air/CO<sub>2</sub> inlet on the panel.

For more information on external compressors and regulator panels compatible with SimMan 3G, contact your local Laerdal representative.

## Blood and Fluid System

The Patient Simulator has two internal reservoirs, one for blood and one for fluids/secretions. *Patient Simulator* is also supplied with two fill units - one *Blood Fill Unit* for blood and one *Fluid Fill Unit* for fluids/secretions.

### SimMan 3G Right Leg Fill Panel

The right leg fill panel is located at the top of the right leg near the pelvis. The fill panel contains connectors for filling the blood and fluid reservoirs.

*Note: Make sure the Patient Simulator power is on.*

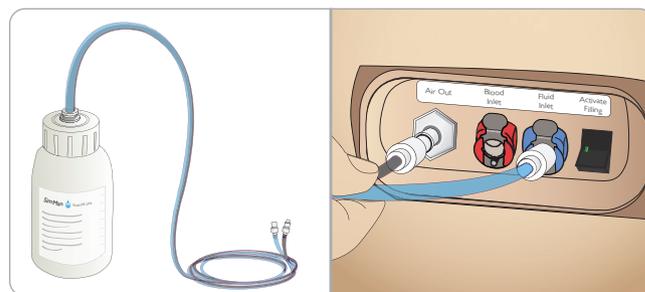
#### Fill Internal Fluid Reservoir

- 1 Roll the right leg skin down to expose the fill panel.
- 2 Connect fluid fill unit tubes to the fluid and air connectors in the right leg panel.
- 3 Push the fill button on the panel. The button will light up and fluid will flow into the Patient Simulator.
- 4 When the flow stops, disconnect the fill unit.
- 5 Push the fill button on the panel. The light will go out.

*Note: Disconnect tubes from the Patient Simulator before pushing the fill button. Pushing the button before disconnecting the tubes will initiate draining of the tank.*

#### Empty Internal Fluid Reservoir

- 1 Connect an **empty** fluid fill unit to fluid connector in the right leg panel.
- 2 Fluid from the internal reservoir will drain into the bottle.
- 3 When the flow stops, disconnect the fluid connector.



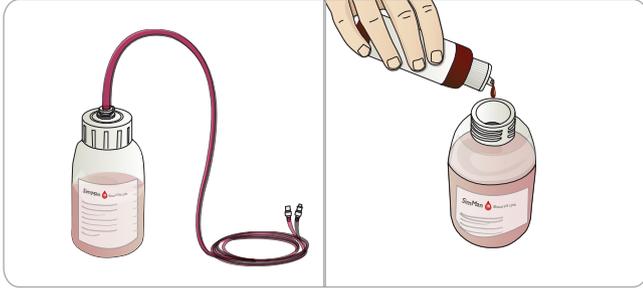
### Run Patient Simulator with External Fluid

- 1 **Drain the internal reservoir.** Follow instructions for "Empty Internal Fluid Reservoir".
- 2 After draining the internal reservoir, fill the fluid fill unit and connect to the Patient Simulator.
- 3 Push the fill button on the panel. The button will light and fluid will flow into the Patient Simulator.
- 4 Charge the system for 60 seconds before starting simulation.

**Warning:** Connecting a full fluid fill unit to a Patient Simulator with a full internal reservoir will result in system overflow. Fluid will drain out of the right leg. Repeatedly overflowing the system may damage the product.

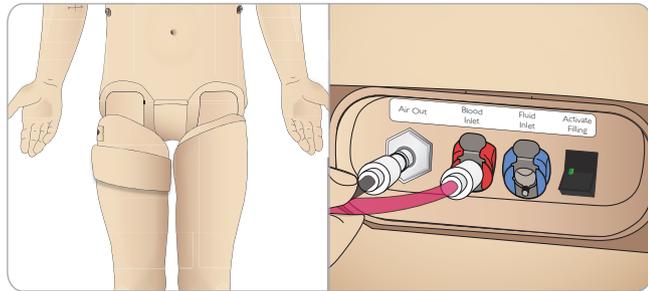
# Setup

## Fill Internal Blood Reservoir



- 1 Roll the right leg skin down to expose the fill panel.
- 2 Connect blood fill unit tubes to the blood and air connectors in the right leg panel.
- 3 Push the fill button on the panel. The button will light up and blood will flow into the Patient Simulator.
- 4 When the flow stops, disconnect the fill unit.
- 5 Push the fill button on the panel. The light will go out.

*Note: Disconnect tubes from the Patient Simulator before pushing the fill button. Pushing the button before disconnecting the tubes will initiate draining of the tank.*



## Empty Internal Blood Reservoir

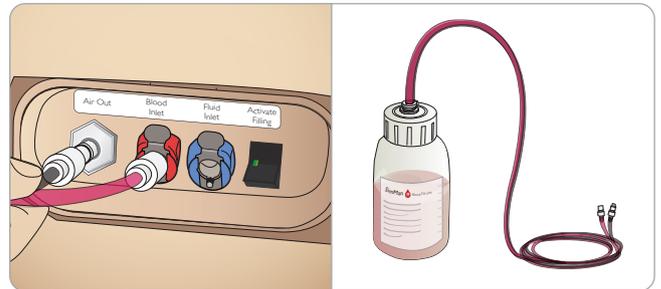
- 1 Connect an **empty** blood fill unit to blood connector in the right leg panel.
- 2 Blood from the internal reservoir will drain into the bottle.
- 3 When the flow stops, disconnect the blood connector:

## Mixing of Blood and Fluid



To simulate clear fluids and secretions: Fill the *Fluid Fill Unit* with de-ionized water (approx  $\frac{3}{4}$  full) only and tighten the cap.

To mix simulated blood: Fill the *Blood Fill Unit* with de-ionized water. Add 5-10 drops of Laerdal Blood colored concentrate, mix and tighten the cap.



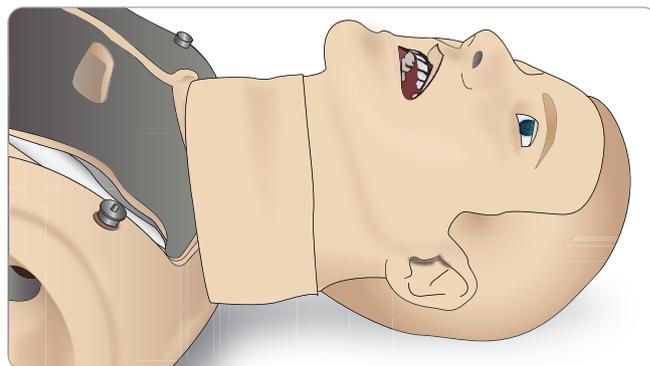
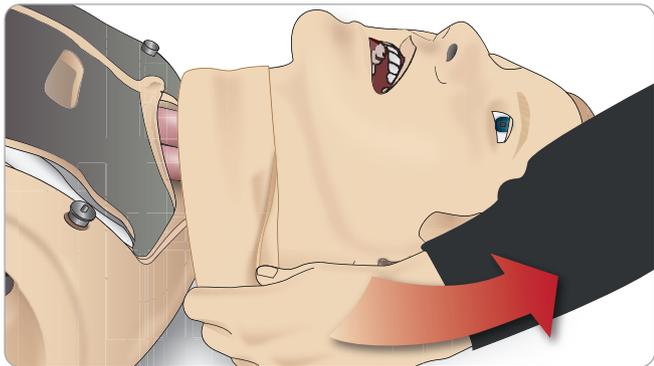
## Run Patient Simulator with External Blood

- 1 **Drain the internal reservoir.** Follow instructions for "Empty Internal Blood Reservoir".
- 2 After draining the internal reservoir, fill the blood fill unit and connect to the Patient Simulator.
- 3 Push the fill button on the panel. The button will light and blood will flow into the Patient Simulator.
- 4 Charge the system for 60 seconds before starting bleeding simulation.

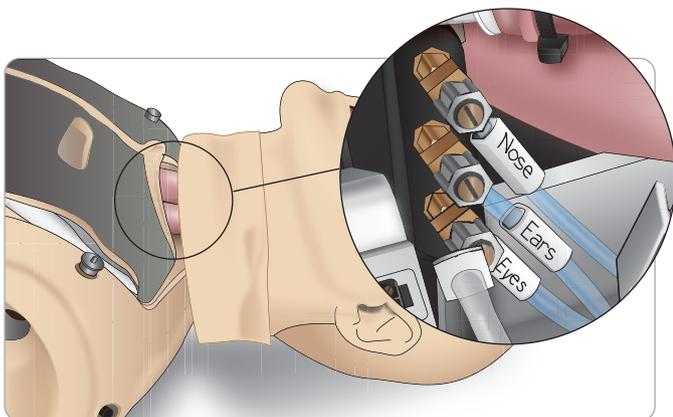
**⚠ Warning:** Connecting a full blood fill unit to a Patient Simulator with a full internal reservoir will result in system overflow. Blood will drain out of the right leg. Repeatedly overflowing the system may damage the product.

## Adjusting Fluid Flow

- 1 Remove the neck skin.



- 2 Locate the restrictor valves in the left and right clavicle area.



- 4 Replace the neck skin.

- 3 Activate secretion in the Circulation and Fluids Tab, then tighten or loosen the actual valve as until desired flow rate is achieved.



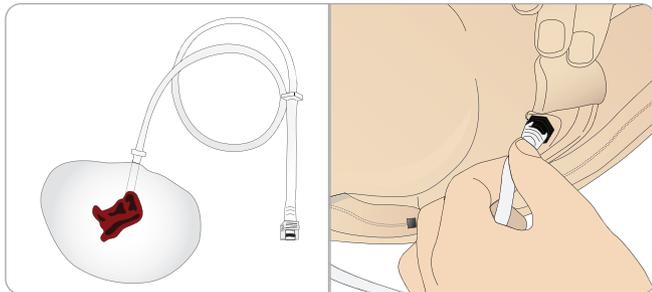
 *Note: Do not unscrew completely. Please note that only slight adjustment should be necessary.*

# Setup

## Connecting Wounds Kit

SimMan 3G comes with a wounds kit that includes 2 wounds and double-sided tape to attach wounds to the Patient Simulator skin. Connect wounds to the bleeding ports on the Patient Simulator torso to simulate a bleeding patient.

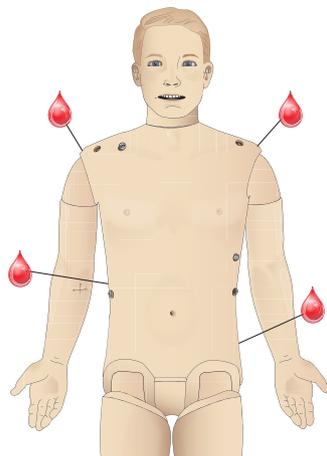
- 1 Select a wound from the wounds kit.



- 2 Connect the tube from the wound, to the nearest blood port.

There are four blood ports with twist and lock connectors, as illustrated on the right.

- Ensure the area to which the wound will be attached is clean and dry.
- Apply adhesive tape to the back side of the wound.
- Remove the protective liner from the adhesive tape on the wound and fix it in the desired position on the skin.



## Removing Wounds

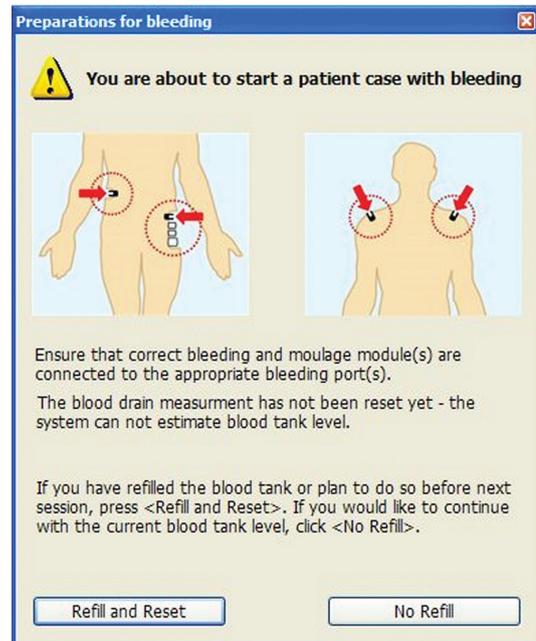
Flush all blood ports and tubes with distilled or de-ionized water while the wounds are still attached. When the fluid runs clear, disconnect the tube from the fluid outlet. After the wound is removed, any tape residue can be cleaned from the Patient Simulator skin with Laerdal Manikin Wipes.

*Note: When removing wounds from the blood ports, cover the Patient Simulator skin with a cloth to prevent staining.*

*Note: Trauma modules can be purchased separately to replace default limbs to add realism to simulation.*

## Simulate Severe Bleeding Using LLEAP

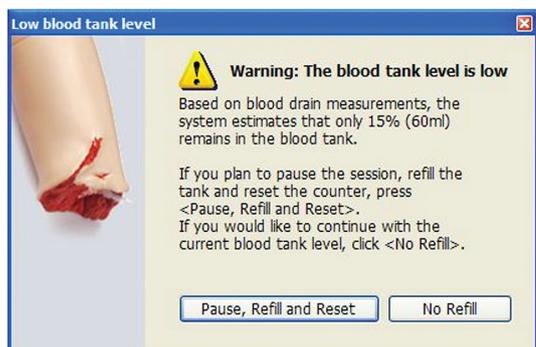
Start a Bleeding patient case from LLEAP



To extend bleeding patient simulations, a scale factor can be used.

Ensure, when the external Blood fill Unit is empty; replace it with another Blood fill Unit filled with simulated blood. Repeat this process for as many times as is necessary.

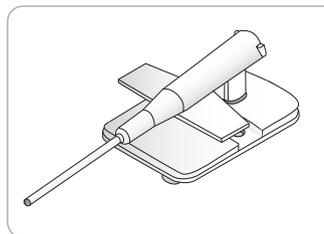
*Note: If the external fill unit runs empty, during a bleeding scenarios, air will be introduced to the blood system, causing inaccurate reading.*



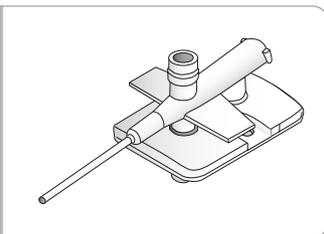
## The IV Catheters

The right IV arm comes with a US catheter type as default. This can be replaced with an international catheter type (commonly used in Europe) with an extra flush port.

### US Catheter



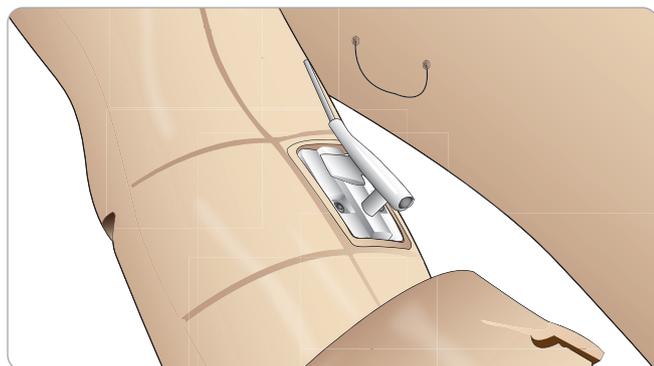
### International Catheter



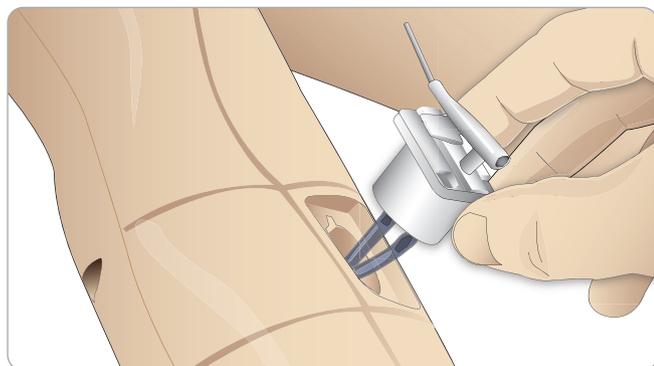
**Note:** remove arm skin before changing the catheter. Use caution when handling the Patient Simulator skins.

## Changing IV Catheters

- 1 Unzip and fold down the IV arm skin to expose the IV catheter module.



- 2 Using a #4 Phillips screwdriver; unscrew the two screws of the module and pull the IV module out of the arm.

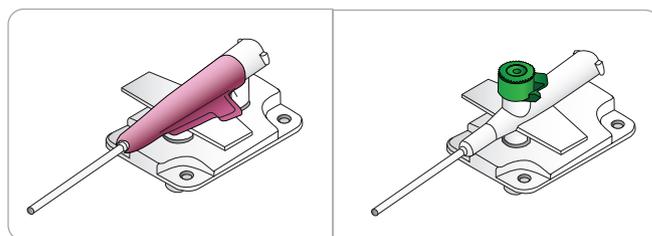


- 3 Disconnect the two fluid tubes from the IV module
- 4 Discard the old module and insert it into the IV arm.
- 5 Fasten the two screws and zip the skin back into place.

## Identifying IV Catheter Sizes

The IV modules come with colored IV caps for US and International IV modules. This simulates different catheter sizes.

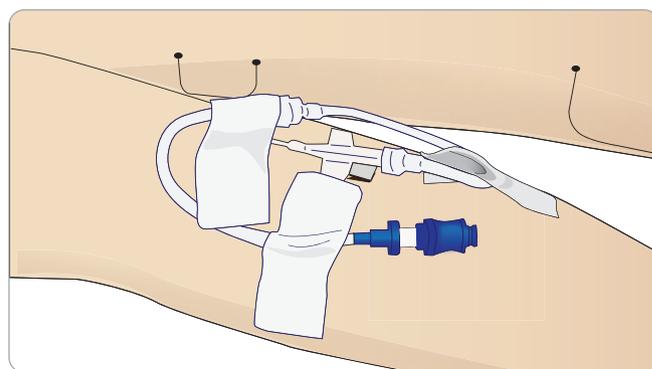
### US IV Caps / International IV Caps



## US IV Catheter Setup

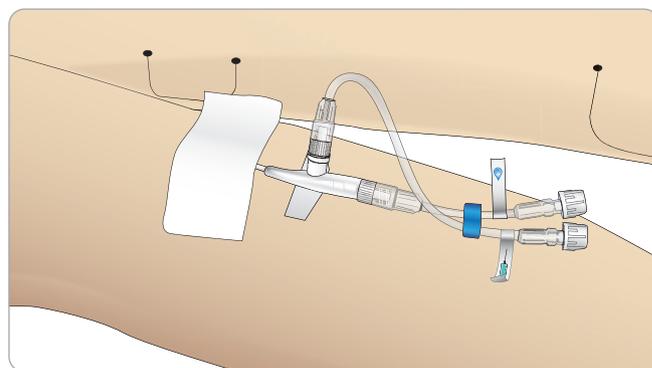
### Setup for drug administration

To administer simulated drugs using the RFID system, the SimMan 3G US IV catheter comes with one inlet for drug administration.



### Setup for IV drip and drug administration

To simulate an IV drip, connect the international catheter and tube setup as shown.



The drip port may also be used with fluids other than distilled water while only purified water should be used in the injection port.

For more information on connecting the US IV drip catheter, contact your local Laerdal service centre.

# Setup

## Administering IV Fluids

To prevent clogging of the IV system, use only purified water to simulate IV drugs with SimMan 3G.

### Acceptable Types of Purified Water:

- Distilled water OR
- De-ionized water:

Do not apply force when administering drugs to the IV arm.

### Priming the IV Arm System

It is essential to prime the IV arm before first session each day. Before administering any simulated drugs and to prevent backflow, inject purified water in a continuous stream into the IV system.

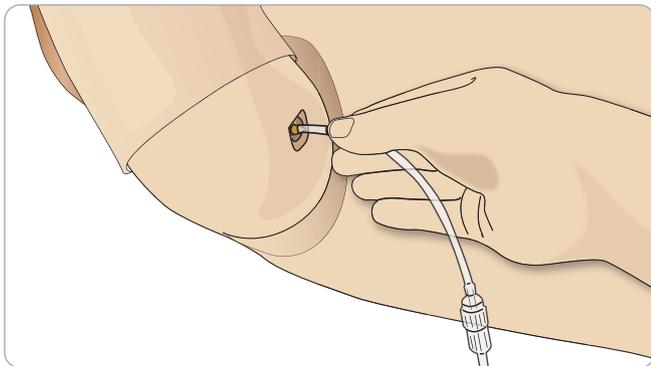
Major movement/transportation of the Patient Simulator can result in air pockets being introduced into the IV system and may require additional priming.

## Draining Excess IV fluid

The IV fluid system is an open system. IV fluids are drained as they are administered.

### Before Each Session

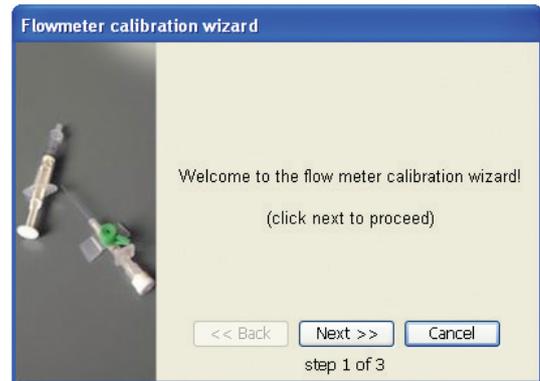
- 1 Attach the IV overflow tube to the fluid drain under the Patient Simulator's right arm.
- 2 Allow excess fluid to drain into a container during the simulation.



## Calibrating the IV Arm Flowmeter Using LLEAP

To calibrate the flow meter in the IV arm:

- 1 Click on the <Tools>, <Maintenance> menu in LLEAP, then select the <Calibrate IV flow meter...> option.



- 2 Follow the on screen instructions in the Flowmeter calibration wizard.
- 3 A confirmation message will appear if the calibration was successful.

## RFID Tag Setup

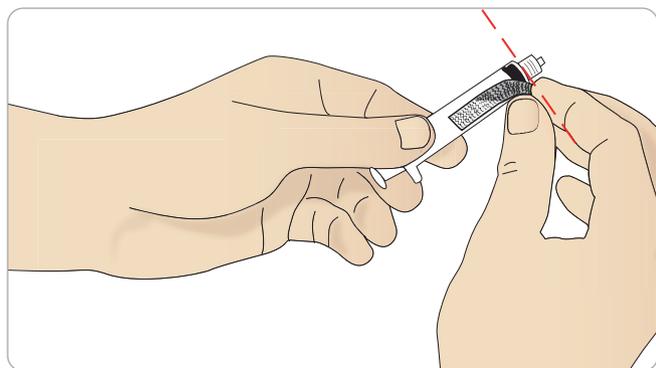
The SimMan 3G RFID (Radio Frequency Identification) system, features two antennae locations: one in the mouth and another in the right arm. Whenever a RFID tagged device comes within range of the antenna, it is automatically registered by the system. For automatic drug recognition to function, ensure that all syringes or devices carry an RFID tag.

### RFID tagging Syringes / Airway Devices

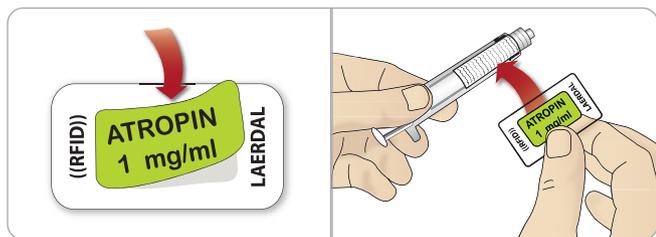
The RFID tags come as part of the SimMan 3G *Drug and Airway Tag Kit*. Tags are pre-printed with information to identify drugs, drug concentration or device names.



- 1 Attach a strip of hook and loop tape (i.e. Velcro) to the syringe or airway device of your choice.



- 2 If you are using stickers, place the RFID sticker on the pre-printed RFID tag.



*Note: When applying tags to syringes, ensure that the tag is as close as possible to the needle end.*

*Note: When applying tags to other devices, place them on the part of the device that is closest to the Patient Simulator.*

You can choose to use your own drug labels on the RFID tags. Ensure that the drug identification and concentration is consistent with that of the RFID tag's coding.

## Using RFID Tags

See the *Instructor Mode* help file for more information on how drugs and drug concentrations can be registered manually by the instructor.

### RFID Tag use for Airway Devices

For reliable RFID recognition in the mouth region, ensure that the RFID tagged device is brought within range of the antenna. The range of the mouth antenna is approximately 10cm.

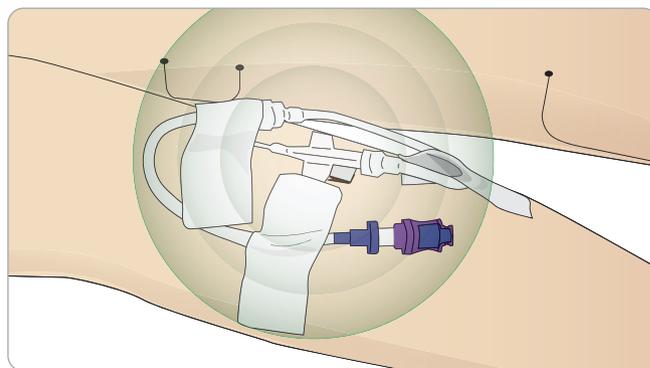
### IV Setup for RFID Recognition

You can use your own equipment to set IV extension tubing. Keep in mind that the point of insertion must be within range of the antenna located around the IV port. If the point of insertion is out of range, drugs will not be registered.

See the correct and incorrect IV setup for US catheter below:

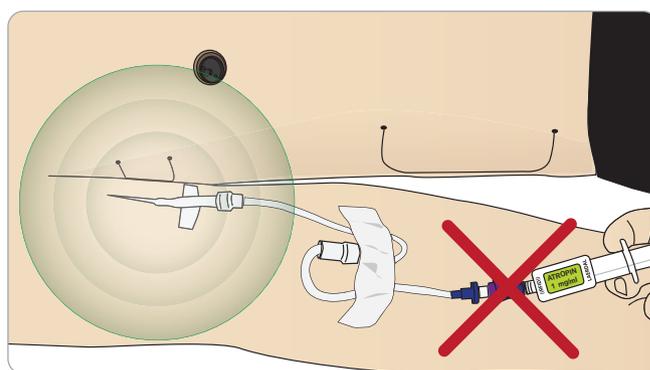
#### Correct

In range of antenna



#### Incorrect

Out of range of antenna



It may take some seconds before the RFID tag is registered.

*Note: Only one RFID device can be registered at a time. Allow only one device at a time to come within range of the antenna.*

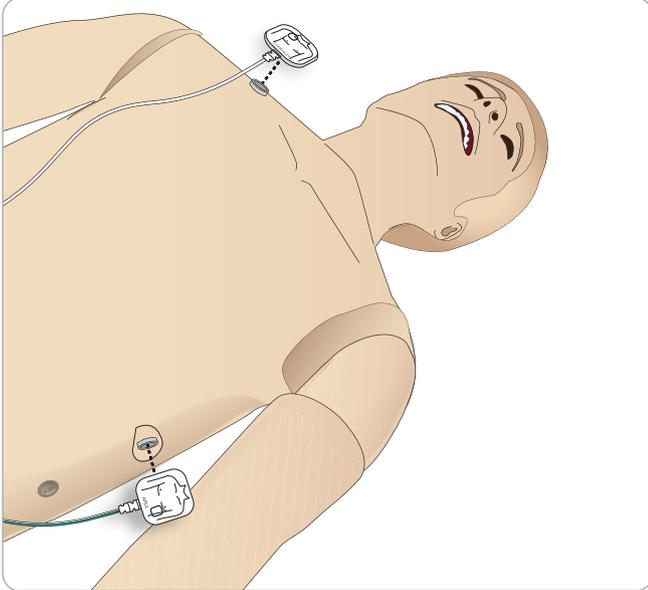
# Setup

## Connecting Defibrillation Pads or Adapter Plates

The Patient Simulator can be defibrillated with semi automatic defibrillators and manual mode defibrillators.

### Using Defibrillation Training Cables

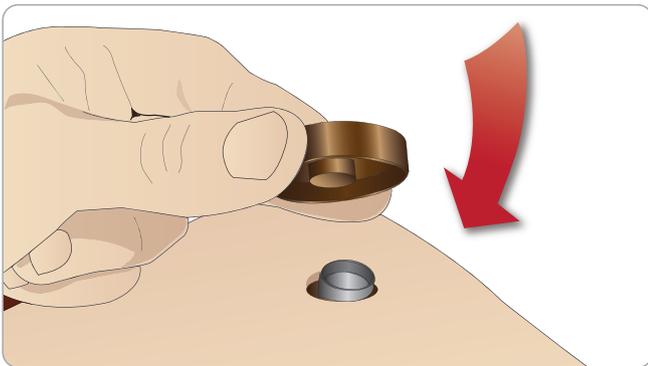
The Patient Simulator is fitted with two defibrillator connectors (Apex and Sternum) for attachment of a Defibrillator Training Cable. Laerdal can provide adapters that make the Defibrillation Cable fit several defibrillator brands.



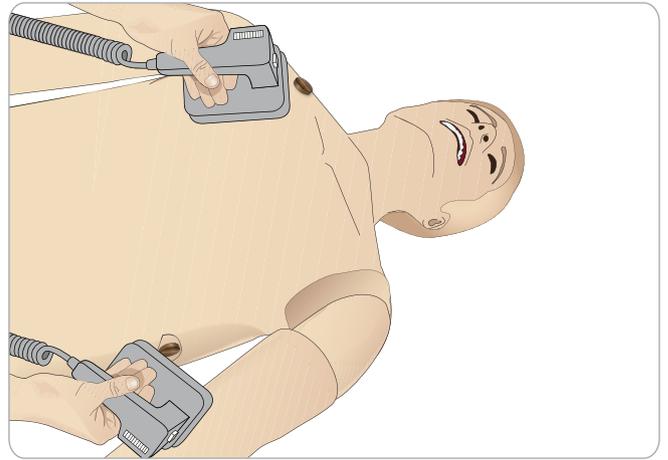
The Patient Simulator is not designed for use with single use real adhesive defibrillation electrodes.

### Using Defibrillation Adapter Plates

To use a defibrillator with defibrillator paddles on the Patient Simulator, the defibrillator connectors must be fitted with designated Training Defibrillator Adapter Plates.



Press the Adapter Plates firmly into place.



**Note:** Always follow the safety instructions from the defibrillator manufacturer when using the defibrillator on the Patient Simulator.

### During Defibrillation

During live defibrillation, the defibrillator and Patient Simulator may present a shock hazard. All standard safety precautions must be taken when using the defibrillator on the Patient Simulator.

**Note:** Defibrillation must be performed on the defibrillator connectors only.

To prevent overheating during defibrillation, do not exceed a defibrillation sequence of 3 shocks in 45 seconds followed by 1 minute of CPR.

After 30 minutes there must be at least 15 minutes pause in defibrillation before starting a new sequence.

**Note:** Do not repeat this for more than a 4 hour period.

### Warnings and Cautions

- Warning:** Do not spill fluids on the defibrillator connectors. Wet defibrillator connectors may lead to a shock hazard during defibrillation of the simulator.
- Warning:** The Patient Simulator must not be in contact with electrically conductive surfaces or objects during defibrillation.
- Warning:** Do not defibrillate the Patient Simulator when it is OFF or if it is not functioning normally.
- Warning:** Do not defibrillate the Patient Simulator without the torso skin.
- Warning:** Do not defibrillate the Patient Simulator in a flammable or oxygen enriched atmosphere.
- Warning:** The Patient Simulator torso must always be kept dry. Allow the Patient Simulator to acclimate before defibrillating. Sudden changes in temperature (moving the Patient Simulator from a cold environment to a warm environment and vice versa) may result in condensation collecting on the base board and pose a shock hazard.

SimMan 3G will automatically shut down whenever it detects a significant increase in internal temperature. If automatic shutdown occurs, allow the Patient Simulator to cool down before resuming the training session. Open the torso skin to speed up the cooling process.

**Warning:** Ensure that the Patient Simulator defibrillators connectors are securely tightened before connection of the Defibrillation Training Cable or Manual Defibrillation Adapters. Loose connectors may represent a shock hazard.

**Caution:** Do not defibrillate on the ECG connectors on the Patient Simulator. This will damage the Patient Simulator.

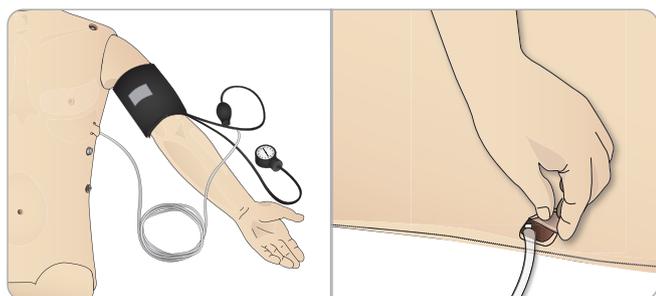
**Caution:** In hot conditions, intensive defibrillation may cause thermal shutdown of the Patient Simulator.

**Caution:** To prevent torso skin electrode pitting, do not apply conductive gel or conductive defibrillation pads intended for patient use.

**Caution:** Do not use automated chest compression machines on the Patient Simulator.

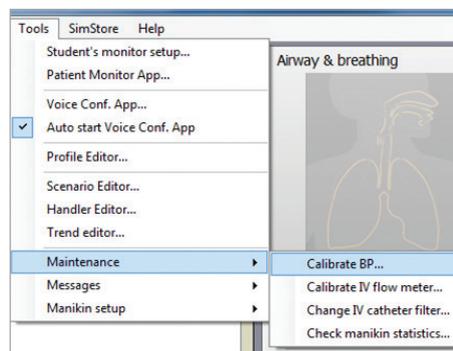
## Connecting the Blood Pressure Cuff

The Patient Simulator is delivered with a specially adjusted blood pressure cuff. Connect the tube to the white BP connector at the side of the Patient Simulator before use.



## Calibrating the Blood Pressure Cuff Using LLEAP

- 1 Select <Tools> <Maintenance> and choose <Calibrate BP...>



- 2 Follow the onscreen wizard instructions to perform the calibration.



## Connecting the SpO<sub>2</sub> Probe

The SimMan 3G SpO<sub>2</sub> probe is made up of a light diode and light sensor. When the beam between the diode and sensor is broken, the Patient Monitor Application registers that the SpO<sub>2</sub> probe is connected.



- 1 Connect the probe's USB plug to the Patient Monitor PC.
- 2 The probe can be placed on any suitable area on the Patient Simulator; Ensure that the probe is always firmly fixed in position.

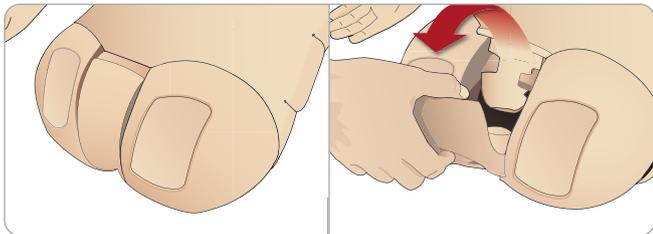
# Setup

## Changing Genitalia Modules

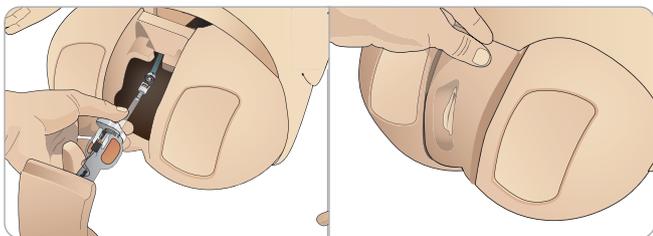
The SimMan 3G is shipped with a neutral genitalia pad as its default. The pad can be exchanged for a male or female genitalia pad with urine catheter to simulate urine flow and catheterization.

 *Note: The Patient Simulator legs do not need to be removed before the genitalia pad can be replaced.*

- 1 Remove the Patient Simulator's genitalia pad by gripping the pad at the top and pulling forward and down.



- 2 Disconnect any tubes or cables.
- 3 Connect the new genitalia module's urine tube and the catheterization sensor cable from inside the Patient Simulator pelvis to the urine bladder module.



- 4 Place the new genitalia module back into the Patient Simulator's pelvis.

## Inserting Urine Catheter

Always use a water based lubricant liberally when inserting a urine catheter.

Use the following catheter sizes:

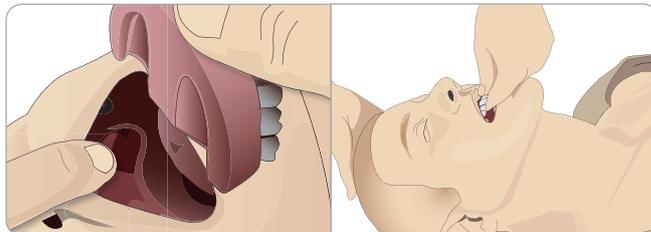
Female genitalia – Foley 14Ch and Lofric 16Ch

Male genitalia – Foley 16Ch and Lofric 16Ch

## Changing the Upper Dentures

The SimMan 3G Patient Simulator comes with a set of soft upper teeth as default. The soft set may be replaced with a hard set of teeth.

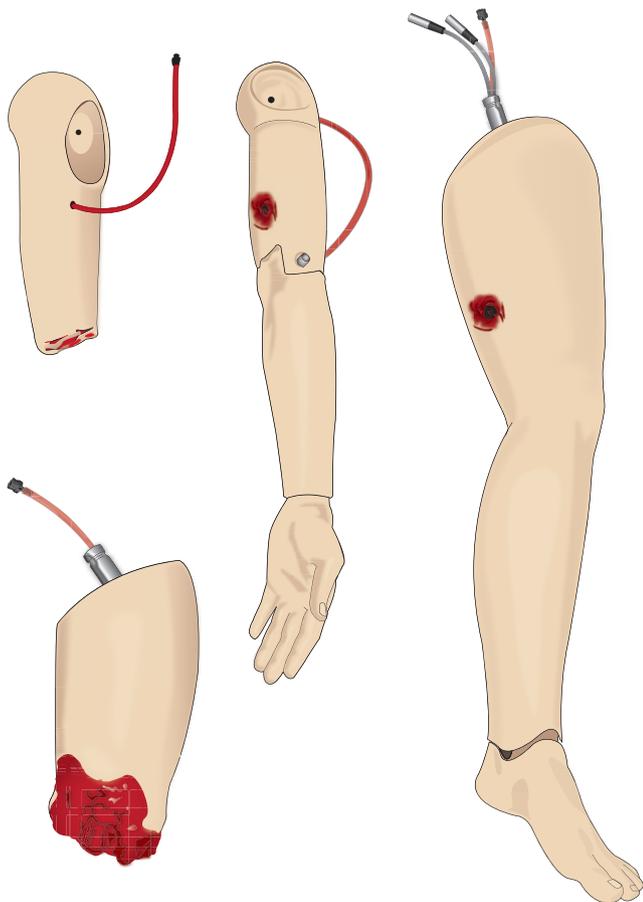
- 1 Remove the teeth from the mouth.
- 2 Align the new set of teeth with the gums and push them back until the teeth engage and lock onto the gums.
- 3 Ensure that the new set of teeth is properly aligned with the gums before pushing them into places.



## Bleeding Modules (Optional)

### Introduction

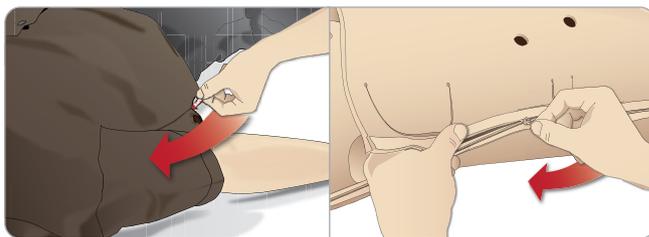
The SimMan 3G Bleeding Module kit includes trauma modules which can be fitted to SimMan 3G to simulate bleeding patient cases. After the simulation is completed, leave the trauma modules connected, and perform the cleaning instructions as stated in *Maintenance*.



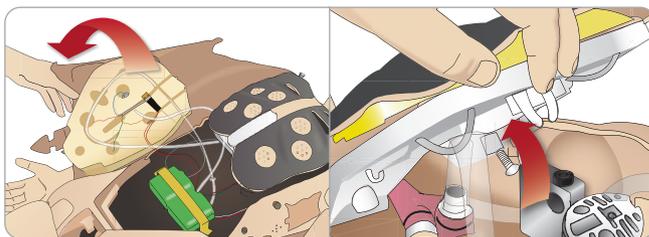
- Amputated Arm SimMan 3G
- Gunshot Arm SimMan 3G
- Amputated Leg SimMan 3G
- Gunshot Leg SimMan 3G

### Removing SimMan 3G Left Arm

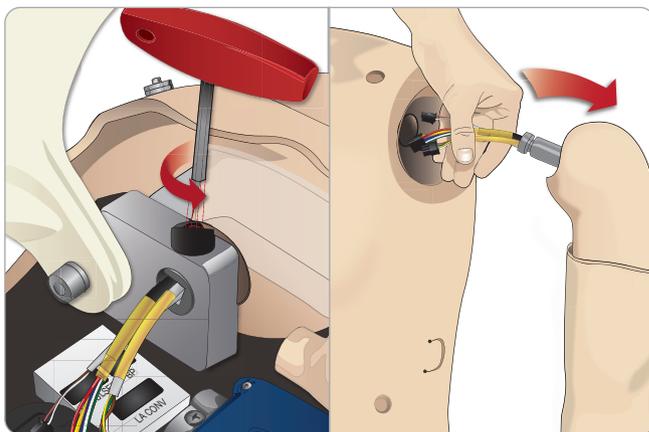
- 1 Unzip the clothing zippers on the right side. Remove the shirt.



- 2 Unzip the zippers on the left side of the torso. Open the Torso Skin to one side.
- 3 Open the Stomach Foam to one side.



- 4 Lift the hinged chest plate to access the arm bolt.
- 5 Unscrew the left Arm Screw with the allen key and disconnect all Arm cables.



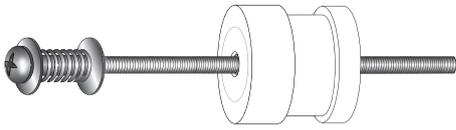
- 6 Remove the arm with cables from the arm socket.

 Note: Do not unscrew the Arm Screw fully.

# Setup

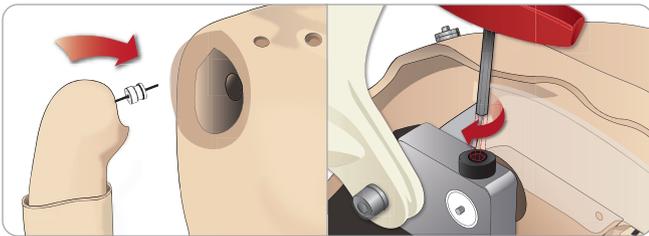
## Attaching SimMan 3G Amputation or Gunshot Arm SimMan 3G

The Arm Adapter and Adapter Screw are designed to attach an Amputation or Gunshot Arm to the Patient Simulator.

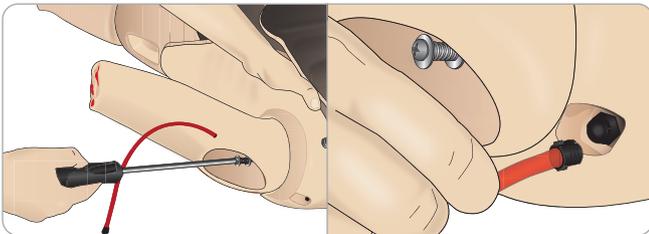


- 1 Fit the Arm Adapter into the hole in the arm bracket from inside of the torso.

Note: Ensure that the flat edge of the adapter is facing the chest hinge.



- 2 The Adapter is now in place and the Trauma Arm can now be connected with the Adapter Screw.
- 3 Tighten or loosen to simulate more or less range of motion in the arm.



- 4 Secure the Adapter with one hand from inside the torso. Screw the Adapter Screw using the Phillips screwdriver.

Note: Tighten screw as desired to simulate more or less Arm Range of Motion.

- 5 Connect the red tube from the Amputation Arm to the nearest blood port on the torso.

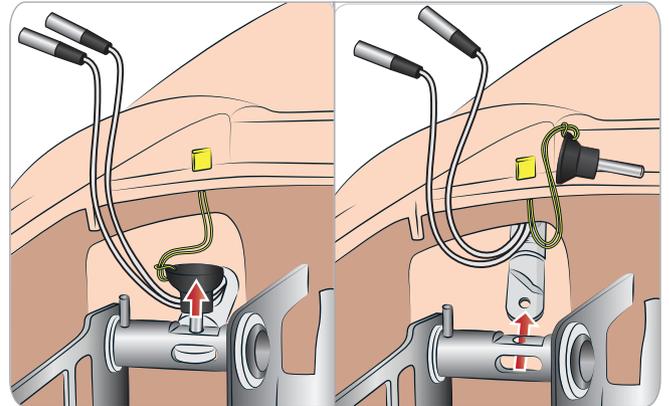
Caution: Do not over rotate arm. Over rotating the arm may cause the red vinyl tubing to disconnect.

## Replacing SimMan 3G Left Leg with Trauma Leg

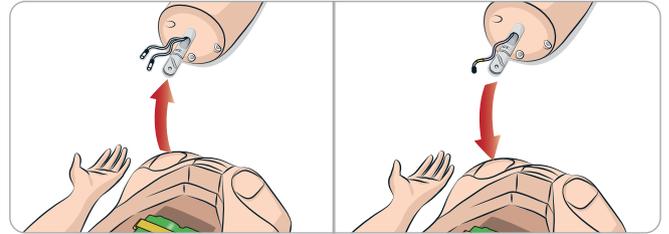
Caution: Make sure the thumb lock pin is correctly inserted, ensuring the leg is properly fixed.

Note: Assemble the Patient Simulator on a large flat surface. Attach the left leg before the right leg.

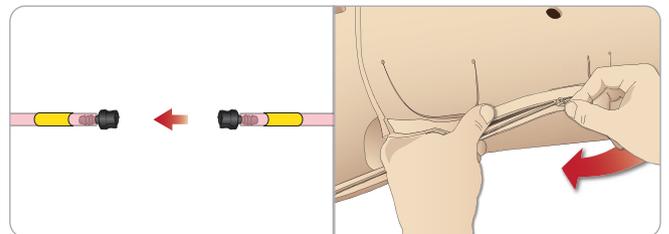
- 1 Remove the SimMan 3G default leg. Open Torso Skin and stomach foam as shown in Maintenance.



- 2 Disconnect the cables and tubes routed to the left leg. Pull the thumb lock connecting pin up and out.
- 3 Carefully remove the left leg with cables and tubes.

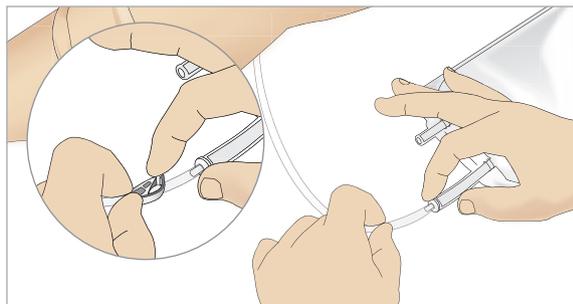


- 4 Insert the Amputation or Gunshot Leg with blood tube into the leg socket.
- 5 Re-insert the thumb lock connecting pin, making sure the leg is properly connected.

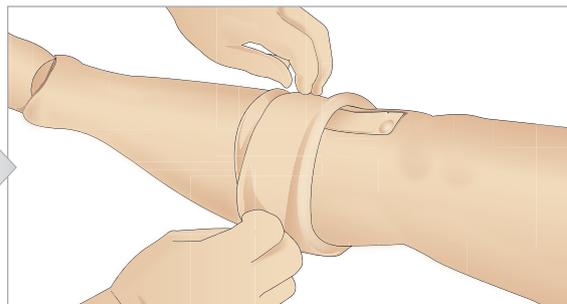


- 6 Connect the leg tube to the corresponding tube, as labelled inside the torso.
- 7 Close the Stomach Foam and zip the Torso Skin back into place.

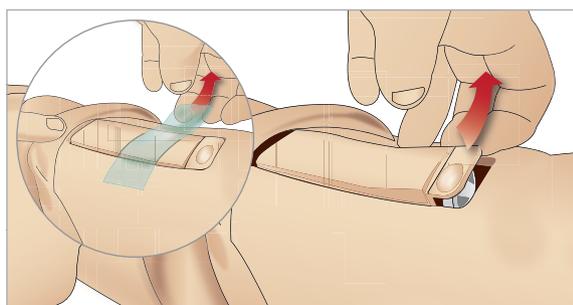
## Replacing and Filling Tibial IO Module with Blood



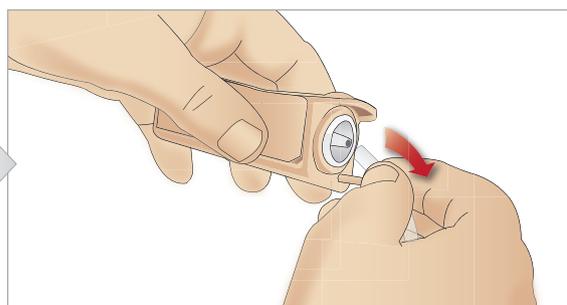
1 Attach the Tibial IO bag to the Tibial tube and close off the pinch clamp.



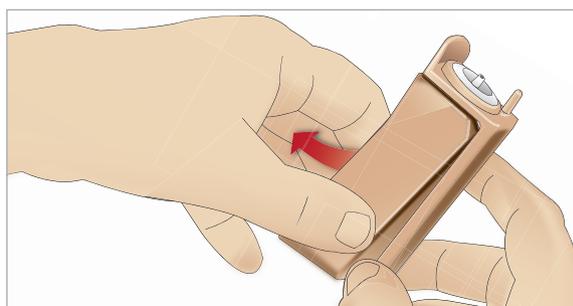
2 Roll the leg band, to expose the Tibial IO module.



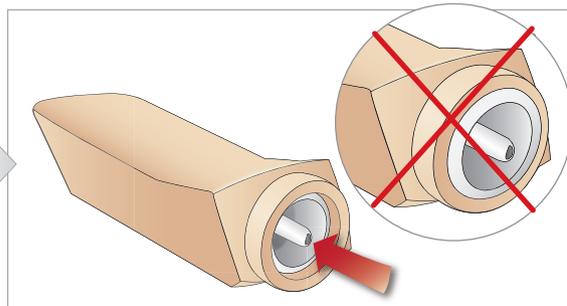
3 Remove the IO tape. Then remove the Tibial IO unit from the leg.



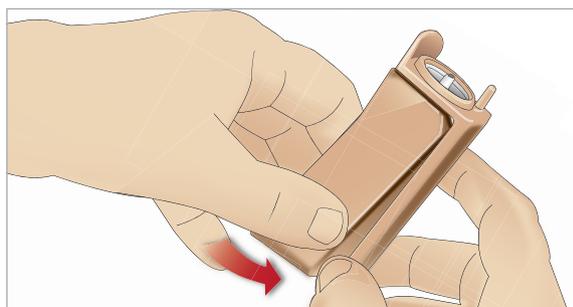
4 Remove the tube from the Tibial IO module.



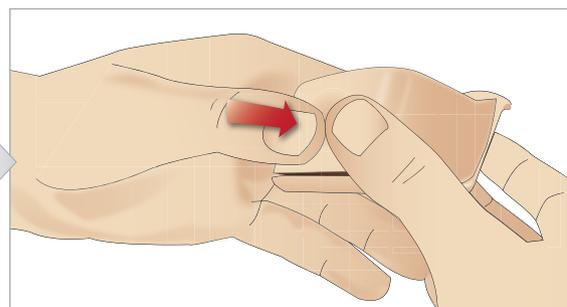
5 Remove the Tibial IO Pad from the Tibial IO chassis.



6 Before replacing the new Tibial IO, ensure that the nipple is retracted in the Tibial IO Pad.

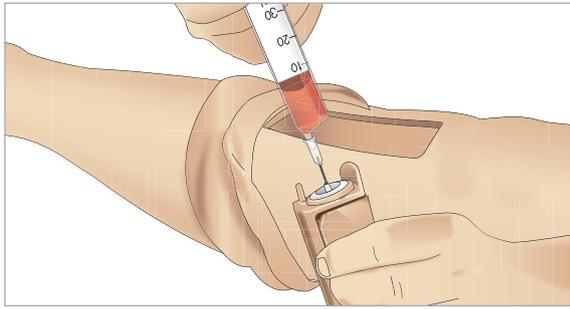


7 Fit the new Tibial IO pad into the chassis.

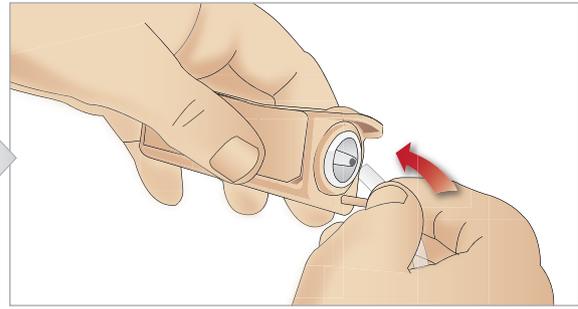


8 Secure the Tibial IO pad in place by pressing the rear of the pad with thumbs until the nipple moves forward and locks the unit in place.

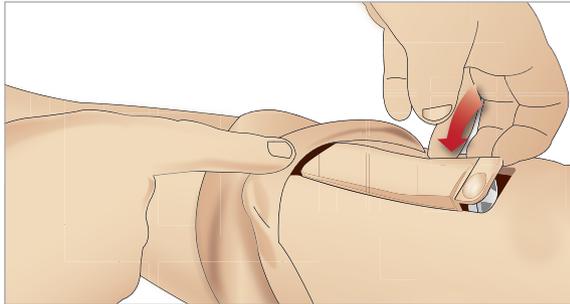
# Setup



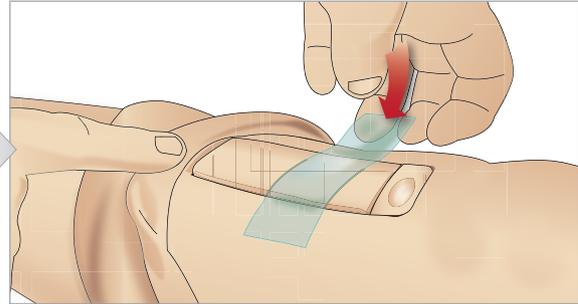
9 Fill the Tibial IO unit with 30 - 35ml of blood, ensure the Tibial Pad is completely full.



10 Connect the Tibial tube to the Tibial IO unit.



11 Replace the Tibial IO Pad and chassis, into the leg cavity.



12 Affix the tape to keep the module in place.

Roll the leg skin up over the Tibial module. The Tibial IO is now ready for simulation.

The following devices have been tested and are approved for use with the simulator:

- BIG Automatic Intraosseous Device
- EZ-IO-G3, 15G x 1", 1.8mm x 25mm
- Jamshidi® Illinois Bone Marrow Aspiration/Intraosseous Infusion Needle. 18 Ga. 9/16" (14mm)-1 1/2" (38mm).



*Note: in some cases, there will be no blood backflow when using the BIG Automatic Intraosseous Device*

## Transporting SimMan 3G

The SimMan 3G Simulation System consists of two cases for easy transport and storage; one for the Patient Simulator legs and one for the torso.



Each case has an extendable handle and may be stacked onto the integrated wheel frame for increased mobility.

**Note:** The SimMan 3G System exceeds the weight allowance on most commercial airlines. Some parts may have to be transported separately. For more information on weight restrictions contact the relevant airline.

Disassemble the legs from the torso and pack them into their respective cases before transportation or storage.

For instructions on how to disassemble the legs, see section: *Attaching the Left and Attaching the Right Leg*.

### Warnings

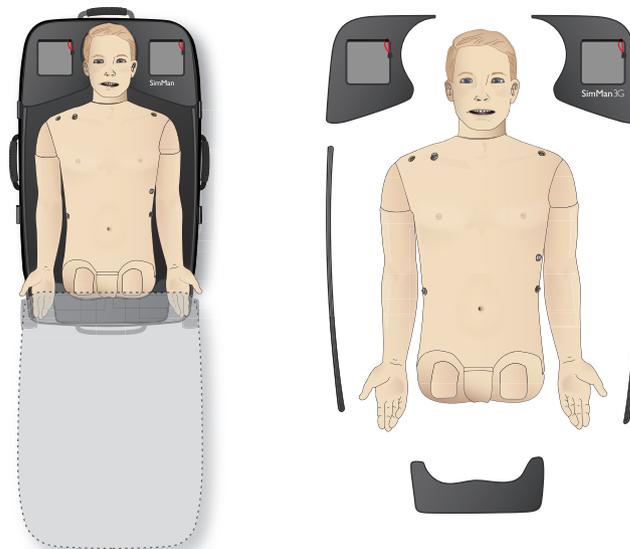
- The suitcases are heavy. Always ensure that they are firmly secured during transportation and storage so as not to cause personal injury or damage to the product.
- When unpacking the torso, do not use the leg openings as lifting points, use the genitalia opening! The slides might come loose and cause personal injury or product damage.

Please be aware that both cases appear identical. Each case contains compartments for all accessories.

### Caution

Always keep the thumb lock pins inserted in the hip joint (leg) connections. The pins could wrap around internal cables and tubes, risking damage.

### Torso Case with Foam Inserts



### Leg Case with Foam Inserts



For more information on SimMan 3G accessories, see section *Spare Parts & Accessories*.

**Note:** Do not store or ship the simulator with Isopropanol or liquid in any of the fluid/liquid systems.

## Unpacking the Patient Simulator

Unpack the Patient Simulator torso and legs following the instructions in reverse order of packing.

# Maintenance

## Daily Maintenance

The following preventive measures are required to ensure longevity of the SimMan 3G Patient Simulator.

### IV Arm

When the day's sessions are done, flush the IV Arm with air to remove any fluid/liquid in the system. Connect a syringe filled with air to the IV catheter, and flush the IV Arm with air until only air exits the overflow tube.

### Fluid System

After each session where the fluid system has been used, drain the internal fluid reservoir. See: *Empty Internal Fluid Reservoir*.

### Blood System

When the day's sessions are done, flush the Blood System with distilled or de-ionized water, with the wounds connected. This is to remove remains of Laerdal blood in the Blood System, and prevent clogging of valves and tubing.

### Power off the Patient Simulator and PCs

Charge batteries if necessary.

### Clean the Skin

Wipe the skin with a moist cloth to remove stains. Remove wet clothes or linens. Glue residue from the wound module tapes may be removed with a moist cloth.

### General Clean-up

- Return Patient Simulator and PCs to original state
- Collect all RFID tags and prepare them for next session.

### Single use Modules

Based on the use of the Patient Simulator, replace modules that are spent or damaged:

- Cricothyrotomy: Crico-tape and neck-skin
- Chest drain module pleura

### Multiple use Modules

- Fluid filter
- IV catheter filter
- IV catheter
- Pneumothorax bladders
- IO-modules (tibia)
- Chest rise bladders
- Lung bladders
- Patient Simulator skins (body, legs, arms)
- IM Pad

## Before Storage or Shipping

### IV Arm

Flush the IV Arm system with Isopropanol 60%-70%, and then flush with air. See *Regular Cleaning of IV Arm*.

### Fluid and Blood System

Before storage, the simulator's fluid and blood systems should be flushed with Isopropanol 60%-70%, and then leave to dry to remove any Isopropanol residue from the system.

Follow the procedure *Cleaning of Fluid and Blood System*.

 *Note: Do not store or ship the simulator with isopropanol or liquid in any of the fluid/liquid systems.*

Detach the Patient Simulator's legs from the torso and pack into the transport cases as illustrated in *Transporting SimMan 3G*

## Regular Cleaning of Fluid and Blood System

Regular cleaning of the Fluid and Blood System is recommended as part of proper care of the product. Once or twice a month, the Fluid and Blood System should be cleaned thoroughly.

 *Note: For additional maintenance information related to the Fluid and Blood System, see Daily Maintenance.*

### Fluid System

To clean the Fluid System follow these steps:

#### Empty the system of fluids

- 1 Ensure that the simulator's power is ON.
- 2 Ensure that the simulator's internal fluid reservoir is drained. See: *Empty Internal Fluid Reservoir*.
- 3 Press the fill button located on the fill panel. The LED indicator on the fill button will light up.
- 4 Connect an empty fill bottle to the fluid and air connector in the fill panel, and the filling of air into the internal reservoir will start.
- 5 We recommend covering the simulator's head with a towel, as pumping air through the system might cause some squirting.
- 6 With the fill button activated, open the Circulation and Fluids tab in LLEAP and check the boxes for Sweat, Ears, Eyes, Nose, Mouth and Urine (polyuria).
- 7 Wait until there are no more fluids emitted from the simulator, then uncheck all boxes.
- 8 Disconnect the empty fill bottle.

#### Flush the system with isopropanol

- 9 Connect a fill bottle with isopropanol to the fluid and air connector in the fill panel, and the filling of isopropanol into the internal reservoir will start.

- 10 In LLEAP, again check the boxes for Sweat, Ears, Eyes, Nose, Mouth and Urine (polyuria).
- 11 Wait until isopropanol is emitted from all the fluid outlets.
- 12 When the system is flushed with isopropanol, press fill the button again to deactivate the filling of isopropanol to the reservoir. The LED indicator on the fill button will now be off.
- 13 Leave the isopropanol fill bottle connected for approx. 30 seconds to let the internal reservoir drain completely.
- 14 Uncheck all of the secretion boxes in LLEAP and disconnect the fill bottle.

## Empty the system of isopropanol

- 15 Connect an empty fill bottle to the fill panel and repeat steps 3-7 above to get the isopropanol out of the fluid system, using air.
- 16 Press the fill button once again so that filling is disabled (LED indicator should be off) and disconnect the empty fill bottle.

 *Note: Never store the simulator with isopropanol or liquid in the Fluid System.*

## Blood System

To clean the Blood System follow these steps:

 *Note: During the cleaning procedure – Tank empty warning - may occur in LLEAP Software. This message can be disregarded during the cleaning procedure.*

### Empty the system of fluids

- 1 Ensure that the simulator's power is ON.
- 2 Ensure that the simulator's internal blood reservoir is drained. See: *Empty Internal Fluid Reservoir*.
- 3 Connect Laerdal Wounds to blood outlets. See *Connecting Wound kits*.
- 4 Press the fill button located on the fill panel. The LED indicator on the fill button will light up.
- 5 Connect an empty fill bottle to the blood and air connector in the fill panel, and the filling of air into the internal reservoir will start.
- 6 With the fill button activated; open the Circulation and Fluids tab in LLEAP. Check the boxes for Upper and Lower port, then select Venous from the adjacent drop-down menus. Move the sliders to the right to get maximum bleeding rates.
- 7 Wait until there is no more blood emitted from the simulator; then uncheck all boxes.
- 8 Disconnect the empty fill bottle.

### Flush the system with isopropanol

- 9 Connect a fill bottle with isopropanol to the blood and air connector in fill panel and the filling of isopropanol into the internal reservoir will start.

- 10 From LLEAP, again check the boxes for Upper and Lower port (making sure Venous bleeding and maximum blood rates are still selected)
- 11 Allow the blood system to flush until clear fluid runs out of all outlets.
- 12 When finished, press fill button to deactivate the filling procedure. The LED-indicator on the fill button will be off.
- 13 Leave the isopropanol fill bottle connected for approx. 30 seconds to let the internal reservoir drain completely.
- 14 In LLEAP uncheck all boxes and move the sliders all the way to the left. Disconnect the fill bottle.

## Empty the system of isopropanol

- 15 Connect an empty fill bottle to the fill panel and repeat the steps 4-6 above to flush the isopropanol out of the Blood System, using air.
- 16 Wait until there is no more fluid emitted from the simulator; then press the fill button once again so that filling is disabled (LED indicator should be off).
- 17 In the LLEAP Software uncheck all boxes and move the sliders all the way to the left. Disconnect the fill bottle and wounds.

 *Note: Never store the simulator with isopropanol or liquid in the Fluid System.*

## Regular Cleaning of IV Arm

Regular cleaning of the IV arm system is recommended as part of proper care of the product. Once or twice a month, the IV Arm system should be cleaned thoroughly.

 *Note: Do not use force if the IV fluid system seems blocked; it is likely that the simulator is not turned on.*

- 1 Ensure that the simulator's power is ON, and that the IV Arm is properly connected, see *Attaching the Right Arm*.
- 2 Connect a syringe filled with Isopropanol 60%-70% to the IV catheter; and flush the IV Arm System with it.
- 3 Connect a syringe filled with air to the IV catheter; and flush the IV Arm until only air exits the overflow tube.

 *Note: Never store the simulator with isopropanol or liquid in the IV Arm System.*

## Installing and Upgrading SimMan 3G Software

SimMan 3G software comes pre-installed. When updating LLEAP, check if updates for Patient Monitor, SimDesigner and SessionViewer/SimView are also available.

All available software must be updated at the same time. Install or update the software in the following order:

- 1 Update the Software on the instructor PC. See *Instructor PC and Patient Monitor PC* section.
- 2 Update the Software on the Patient Monitor PC. See *Instructor PC and Patient Monitor PC* section.
- 3 Update the Software on the Patient Simulator. See *Simulator Firmware & Network Wizard* section.

## Instructor PC and Patient Monitor PC

- 1 Power on computer and ensure no SimMan 3G applications are running.
- 2 DO NOT uninstall the SimMan 3G software from your computer. Visit [www.laerdal.com/downloads](http://www.laerdal.com/downloads) to download the latest version of SimMan 3G and Laerdal DebriefViewer. Select SimMan 3G and press "Click to Download" then follow the on-screen instructions to install.
- 3 In the installation menu – click the <Install SimMan 3G Software> button once. This will start copying files to your computer.

 *Note: The copying process takes approximately 2-3 minutes. Once the copying process has finished, please follow instructions in the installation wizard.*

 *Note: The software will update automatically if started whilst connected to the Internet.*

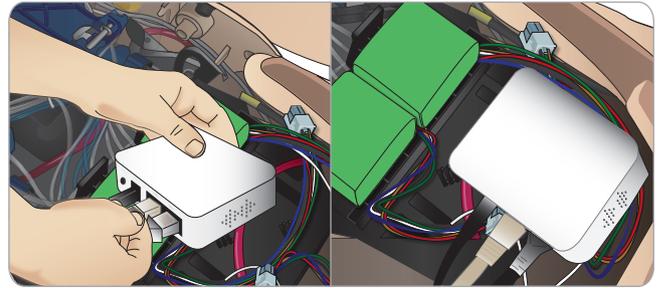
## Simulator Firmware & Network Wizard

The Patient Simulator software update is handled by the Simulator Firmware & Network Wizard application. To update the Patient Simulator software, follow the instructions in *Simulator Firmware & Network Wizard Help*.

 *Caution: Do not switch OFF the Patient Simulator while updating the Patient Simulator Software.*

## Removing or Changing Router

The router may be changed or removed. Turn off the Patient Simulator before doing so.



Open the pelvis and locate the router. Remove the two Ethernet cables and black power cable.

If you would like to operate the Patient Simulator without a router, then attach a through-adapter between the two Ethernet cables.

If you would like to install a new router, attach the power cable to the DC plug and the Ethernet cables back into the router again.

## Opening the Torso

Open the Patient Simulator torso for the following procedures:

### Attaching or Replacing Limbs

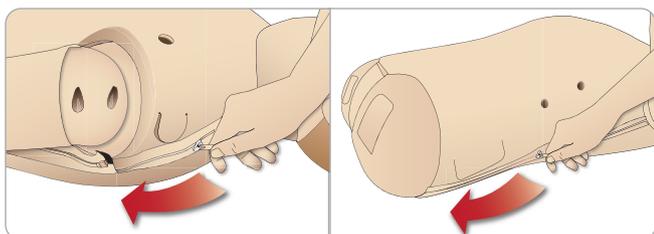
- Attaching or dismantling the Patient Simulator legs and arms
- Exchanging default arms for optional IV or trauma arms

### Maintenance Tasks

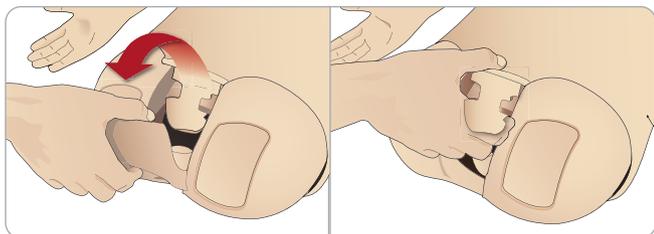
- Changing the Patient Simulator batteries
- Replacing the pneumothorax bladders, chest-rise bladders, lung bladders, IO modules and chest drain modules
- Replacing the Torso Skin
- Performing a general inspection
- Removing WLAN adapter

### To Open the Torso Skin

- 1 Unzip the zippers on the Patient Simulator's left shoulder and torso.



- 2 Remove the genitalia pad and release the skin flap from the pelvis.



- 3 Fold the Torso Skin over to one side.



- 4 Open the Stomach Foam to one side, taking care not to tug on the connecting tubes and cables.

**Note:** DO NOT disconnect the tubes and cables connecting the stomach foam to the Patient Simulator.

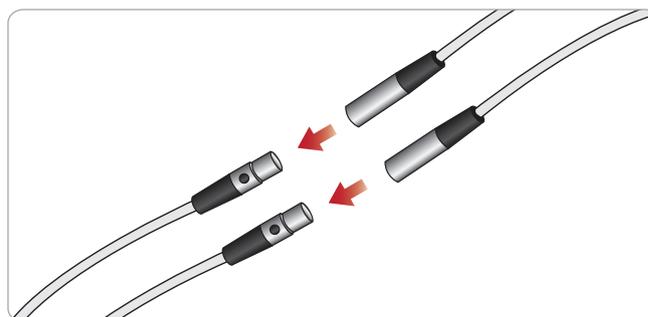
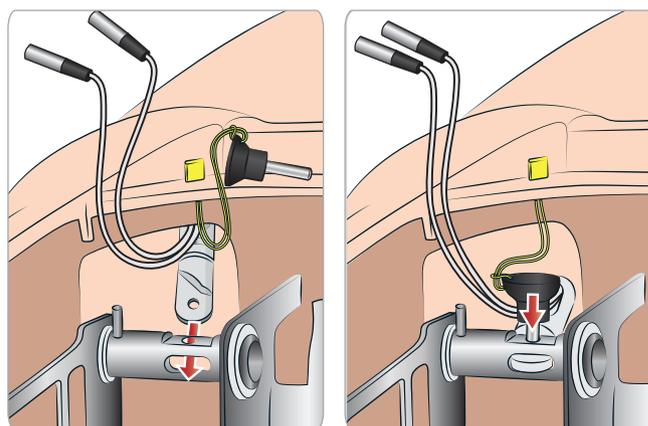
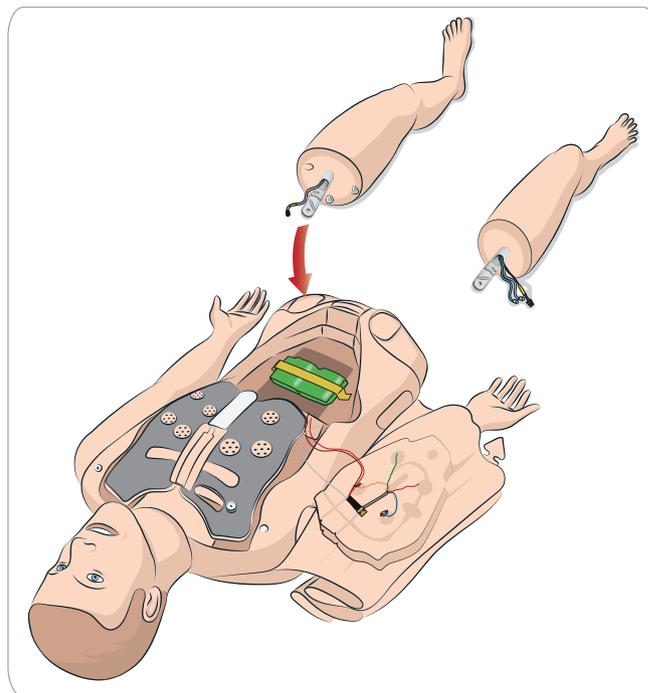
- 5 Replace the Stomach Foam and close the Torso Skin, perform steps 1- 4 in reverse.

## Attaching the Left Leg

**Caution:** Make sure the thumb lock pin is correctly inserted, ensuring the leg is properly fixed.

**Warning:** Whilst assembling the leg, it might require some manipulation to align and connect the hip joint system, which lends to a pinching risk. Take care.

Open the torso to access the hip joint connectors. To open the torso follow steps 1 – 4, *Opening the Torso*.

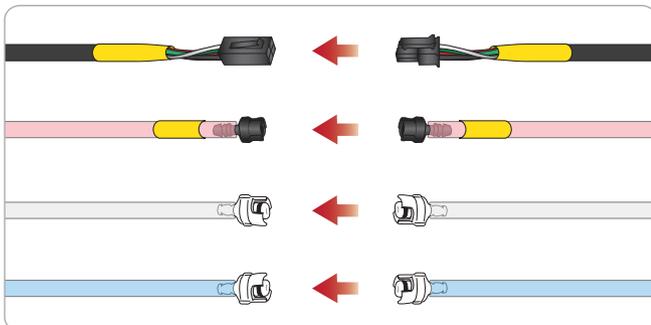
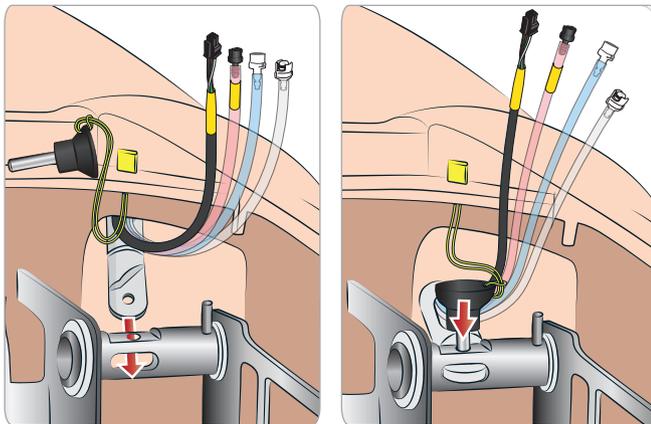
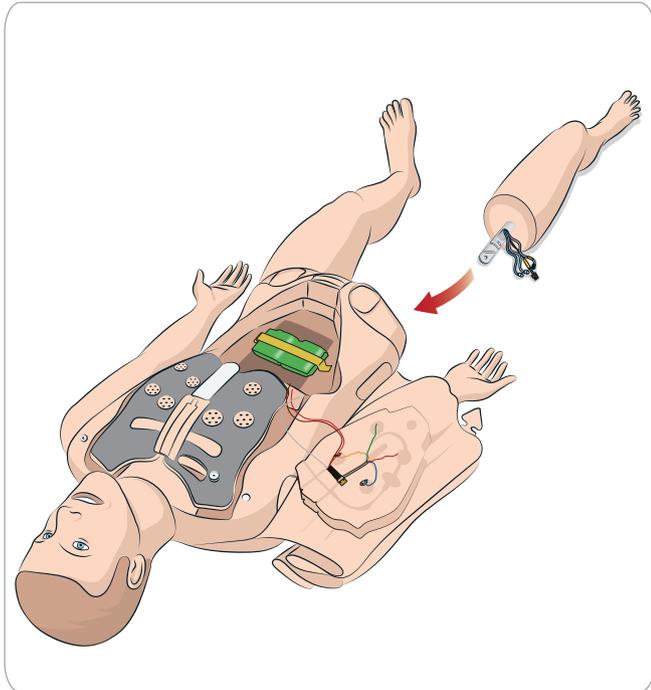


## Attaching the Right Leg

Please take the same precautions as when attaching the left leg.

**⚠ Caution:** Make sure the thumb lock pin is correctly inserted, ensuring the leg is properly fixed.

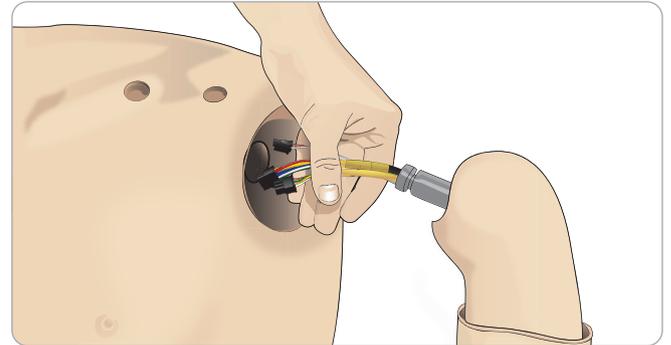
**⚠ Warning:** Whilst assembling the leg, it might require some manipulation to align and connect the hip joint system, which lends to a pinching risk. Take care.



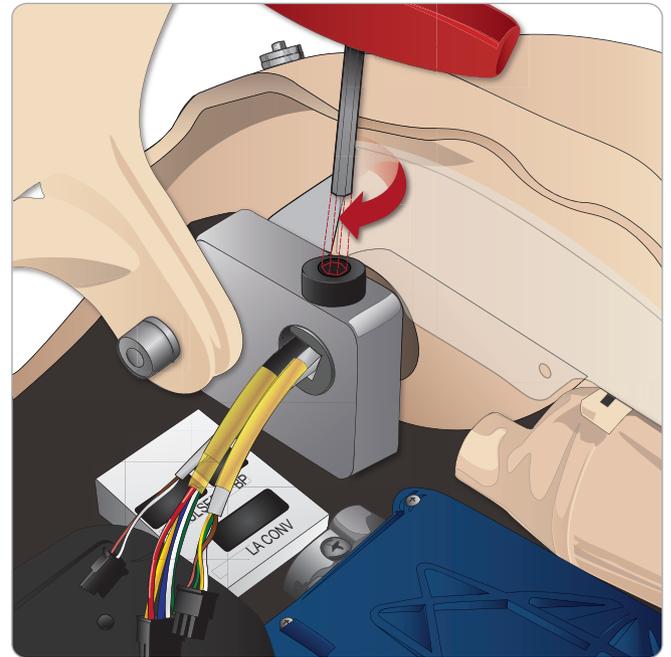
## Attaching the Left Arm

Open the torso as described in steps 1 - 4, *Opening the Torso*. Follow the procedures listed below in reverse to detach the arms.

- 1 Align the left arm axle with the shoulder socket.



- 2 Ensure that the shoulder screw is loose enough to allow the arm axle to slide easily into place.
- 3 Feed the cables from the arm axle through the shoulder socket.
- 4 Carefully push the arm axle into the shoulder bracket, so that the axle is flush with the inside of the bracket.
- 5 Tighten the shoulder screw with the Allen wrench.



- 6 Connect the arm cables to the corresponding connection points in the torso.

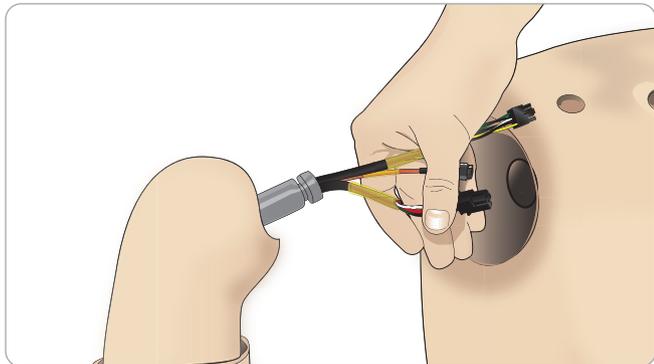
### Left Arm to Torso – Cable and Tube Descriptions

Name/Label	Tube/Cable Color	Connector Description
LA Pulses	Grey cable	Black rectangular connector, 6 lead
BP	Grey cable	Black rectangular connector, 2 lead
LA Conv	Black harness cable	Black rectangular connector, 8 lead

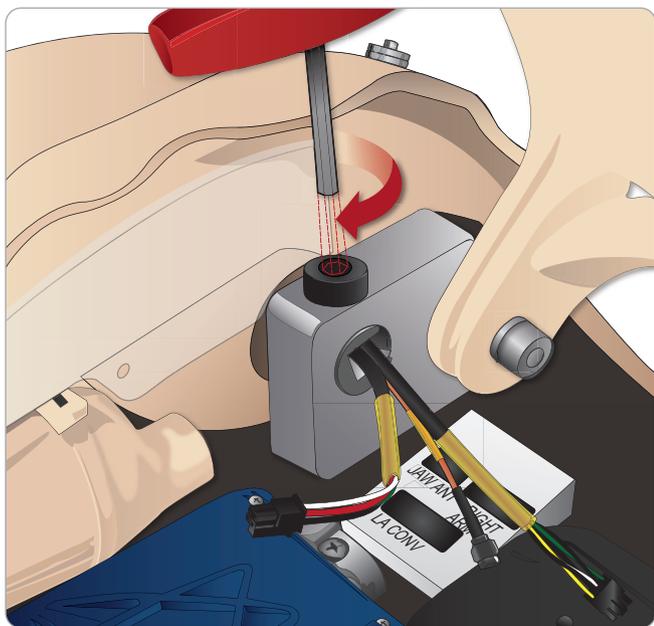
## Attaching the Right Arm

Open the torso as described in steps 1 - 4, Opening the Torso. Follow the procedures listed below in reverse to detach the arms.

- 1 Align the arm axle with the shoulder socket.



- 2 Feed the cables from the arm axle through the shoulder socket
- 3 Push the axle into the bracket until it is flush with the inside of the bracket.
- 4 Tighten the shoulder screw with the Allen wrench.



- 5 Connect the corresponding cables as shown below.

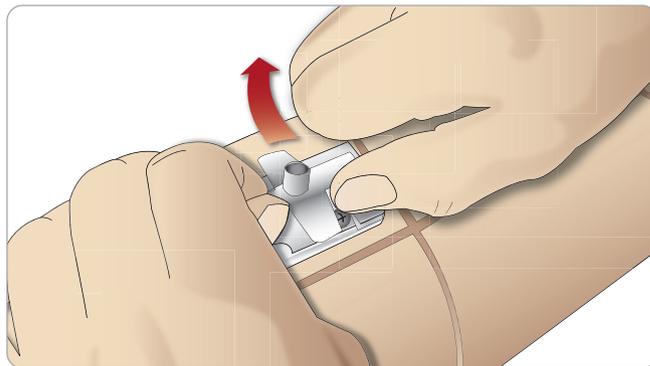
## Right Arm to Torso – Cable and Tube Descriptions

Name/Label	Tube/Cable Color	Connector Description
Right Arm	Black harness cable	Black rectangular connector; 4 lead
Jaw Ant	Coax	Round silver connector
To LA Conv	Black, insulation	Black rectangular connector; 8 lead

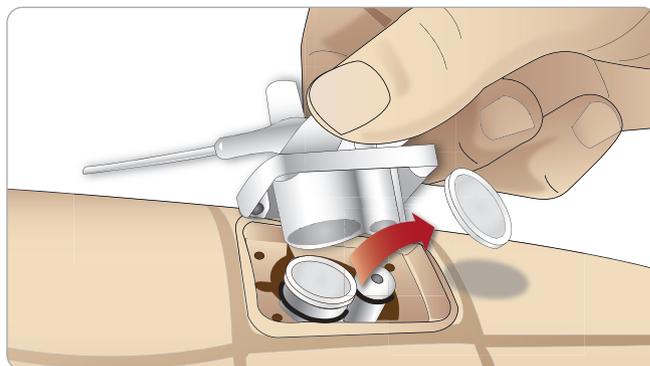
## Replacing IV Arm Catheter/Filter

Replace the IV catheter module if it is damaged or if resistance is unrealistically high when injecting fluids.

- 1 Unzip and fold down the IV arm skin to expose the IV catheter module
- 2 Using the no. 4 Phillips screwdriver; remove the 4 screws and pull the IV module out of the arm.



- 3 Lift the IV catheter up and out, exposing the recess where the filter is located.



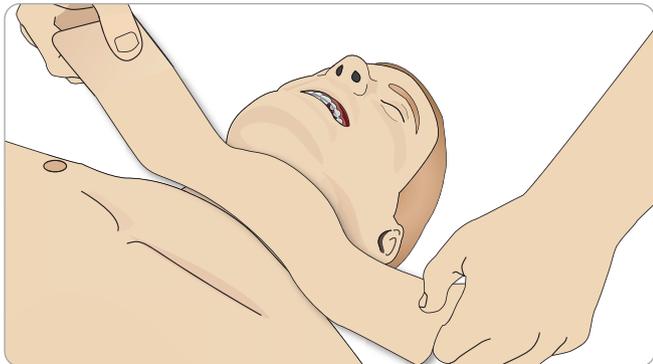
- 4 Lift out the IV filter and replace with a new filter.

# Maintenance

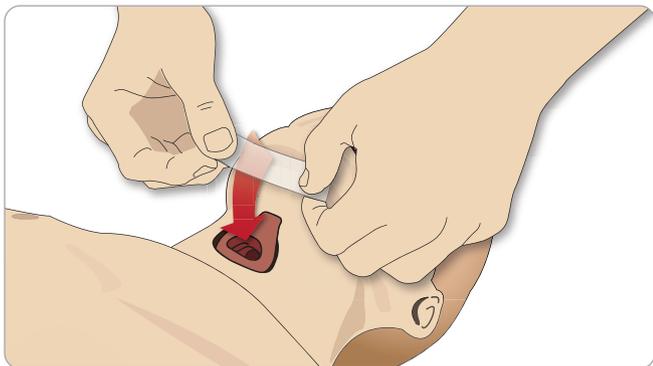
## Replacing Crico Tape/Neck Skin

After creating an emergency airway through the cricothyroid membrane, replace the perforated membrane before starting a new simulation session.

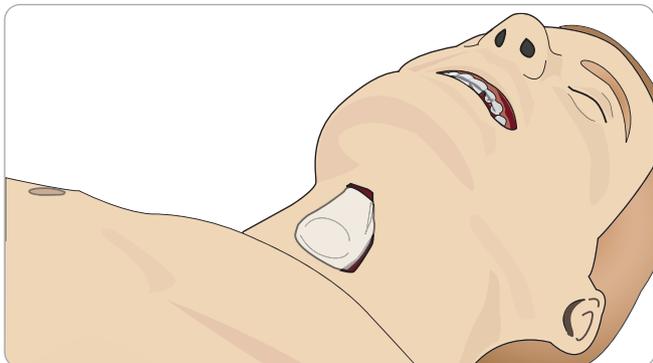
- 1 Remove the neck skin (hook and loop fasteners behind the neck).



- 2 Remove the old strip of Crico tape.
- 3 Replace with a new Crico tape.



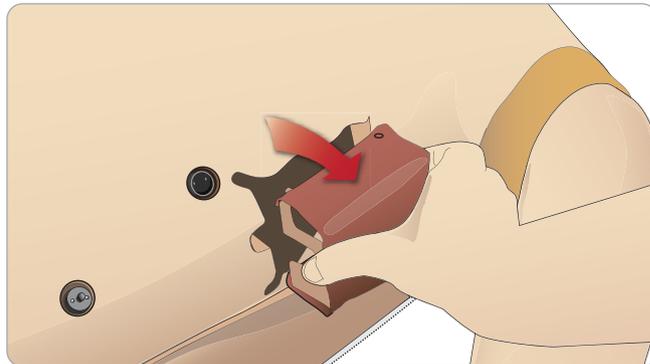
- 4 Ensure Crico Tape completely covers and seals the opening to prevent leakage while ventilating the Patient Simulator.



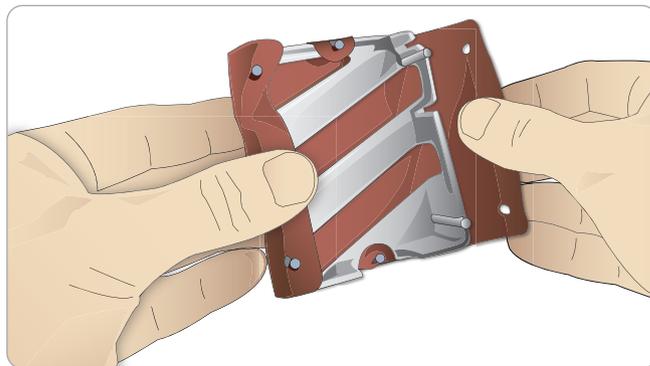
## Replacing Chest Drain Pleura

The chest drain module's pleura skin should be replaced after each use.

- 1 Open the Torso Skin and remove the module from the chest.



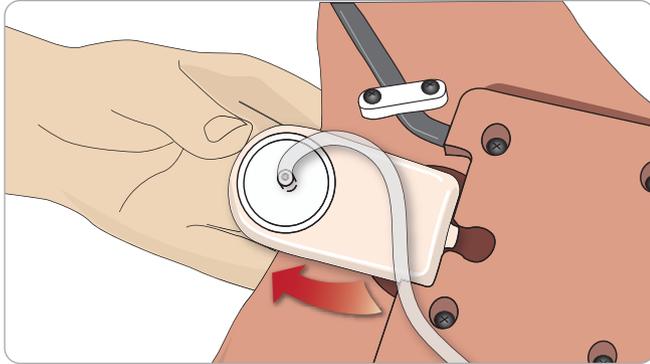
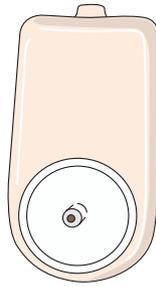
- 2 Remove the old pleura skin, and replace with a new skin and replace the module.



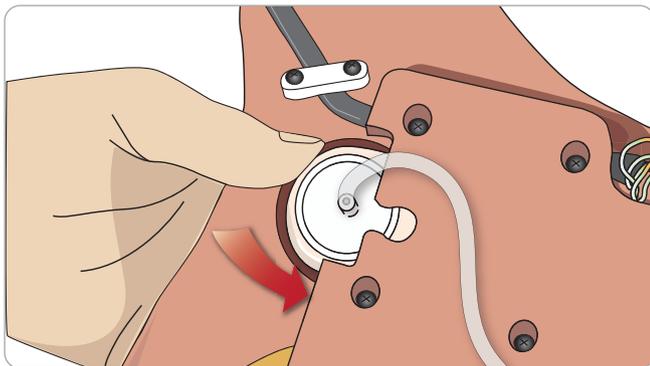
## Replacing Pneumothorax Bladders

After multiple pneumothorax decompressions, the bladders may need replacement:

- 1 Open the Torso Skin to expose the chest plate. Lift the chest plate to reveal the pneumothorax bladders located in slots in the side of the chest plate assembly.
- 2 Slide out the used pneumothorax bladder.
- 3 Disconnect the tube and discard the old bladder:



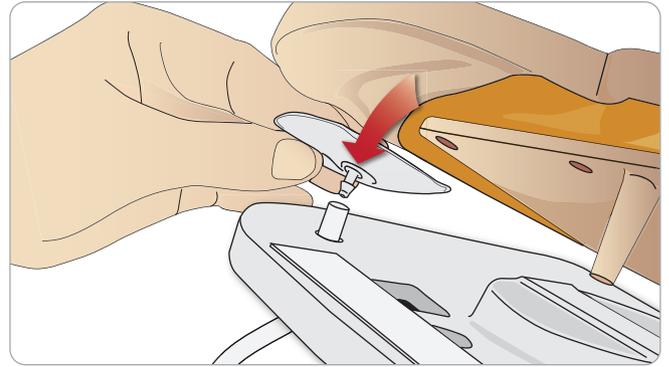
- 4 Insert the new bladder into the slot.
- 5 Reconnect the tube to the new bladder.



## Replacing Chest Rise Bladder

If the chest rise bladders leak or are damaged:

- 1 Open the Torso Skin to expose the chest plate. There is one bladder on each side of the chest plate assembly.
- 2 Disconnect the tube from the bladder:



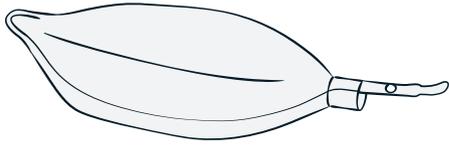
- 3 Discard the used bladder.
- 4 Insert new bladder.
- 5 Reconnect the tube to the new bladder.

## Left Leg to Pelvis – Tube Descriptions

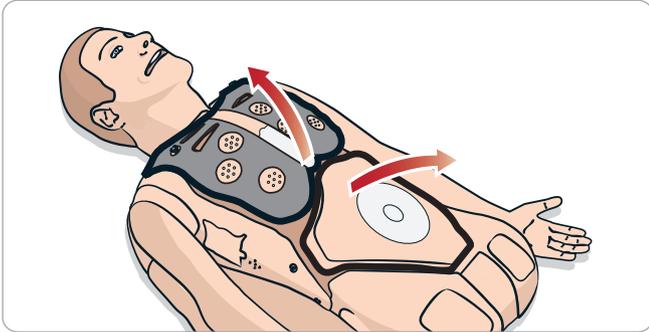
Name/Label	Tube Color	Connector Description
Pneum L	Silicon	Barb connector
Pneum R	Silicon	Barb connector
Chest L	Silicon	Barb connector
Chest R	Silicon	Barb connector

## Replacing Lung Bladders

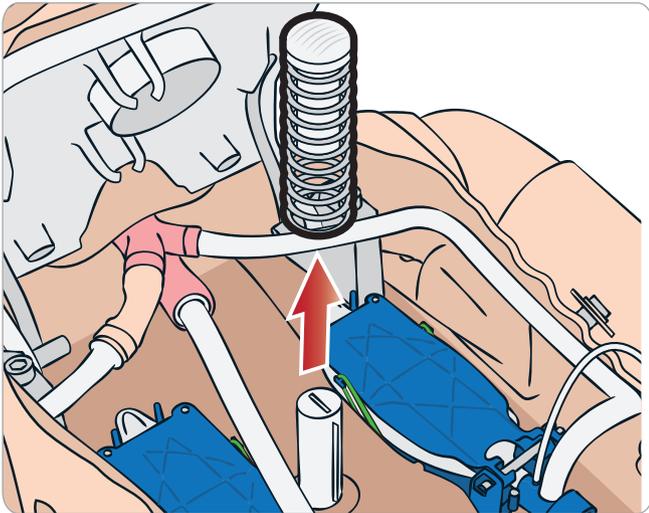
If leaking occurs, the lung bladders (in the chest cavity) should be replaced.



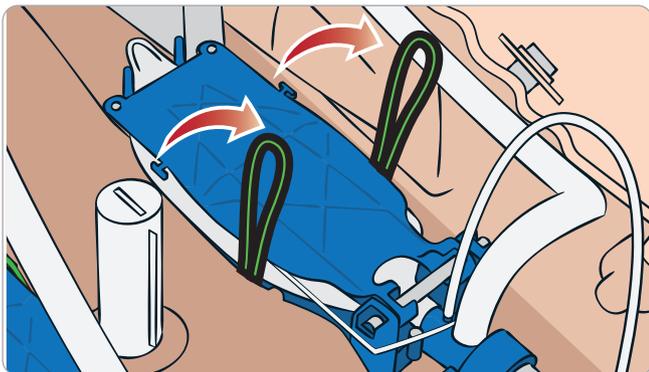
- 1 Open the Torso Skin and put the Stomach Foam to the side.
- 2 Open the hinged chest plate upwards, to access the lungs.



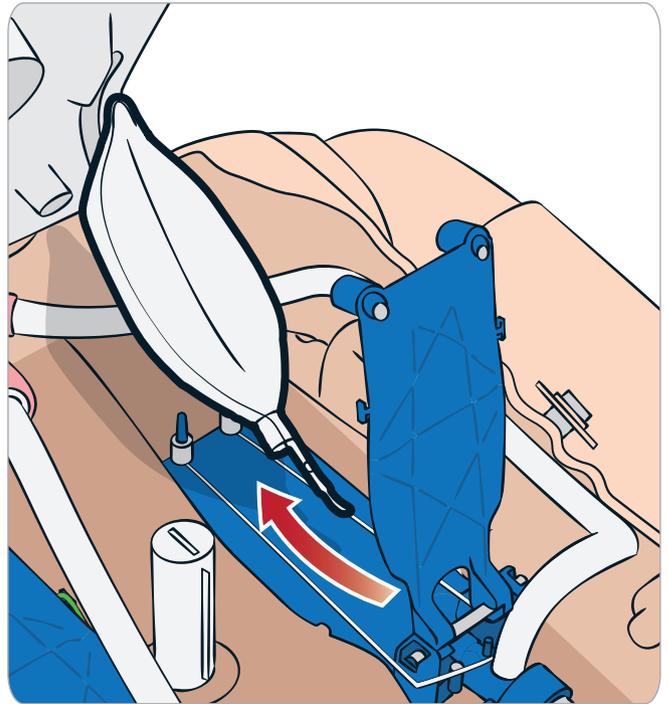
- 3 Remove the chest compression spring for easier access to the lungs.



- 4 Unhook the yellow lung compliance bands from each side of the lung assembly.



- 5 Open the hinged lung plate.
- 6 Pull the old lung out from its socket.



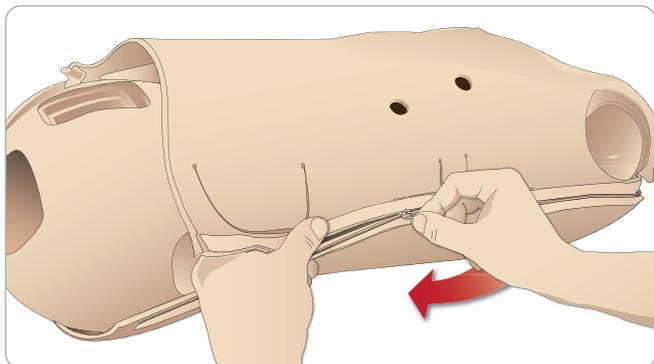
- 7 Reverse this process to insert a new lung.

*Note: Ensure that the compliance bands intersect between the two folds of the lung.*

## Replacing Simulator Skins

The simulator skins may need to be replaced if they become torn, perforated, or stained.

- 1 Unzip and unroll the skin.



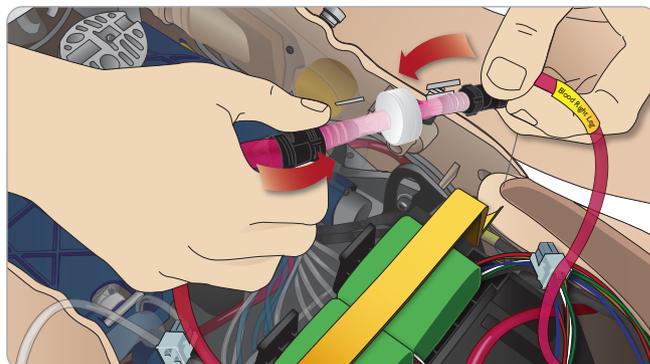
- 2 Applying powder to the inside of arm, torso and leg skins will help reduce friction and make replacing the skins easier.

To prevent the zippers from separating from the skin, make sure to properly position the skin halves and hold them together while zipping them closed.

## Replacing Blood System Filter

If reduced blood flow is experienced, the filter may be clogged and needs replacement.

 *Never run the Patient Simulator without a filter.*



- 1 Turn off the Patient Simulator.
- 2 Remove genitalia with the catheterization assembly for easy access.
- 3 Disconnect the filter from the right leg and pelvis blood tubes and remove it.
- 4 Connect a new filter by reversing the steps above.

## Servicing the Patient Simulator

A full service, including cleaning of the base board, should be performed at regular intervals.

 *Caution: All servicing must be performed by qualified service personnel.*

### Always Perform a Service:

- If liquids have been spilled in the Patient Simulator
- After use in dusty environments.

 *Caution: Do not use cables or connectors showing visible damage.*

# Troubleshooting

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## Troubleshooting

### System Setup

#### Problem

- Lost data or total system failure (General System failure).

#### Solution

- Should system shutdown or all data is lost or corrupted; please contact your local Laerdal Service Center.

### Stability and Connection in Access Point Mode (AP) (Patient Simulator created network)

#### Problem

- Connection between LLEAP and/or Patient Monitor and Patient Simulator is lost.

#### Causes

- Other software on PCs may interfere with our LLEAP or Patient Monitor.
- Multiple network connections may interfere with transmissions between our software and Patient Simulator.

#### Possible Solutions

- Remove unnecessary software on PCs.
- Disable other networks.

### Stability and Connection in Client Mode

#### Problem

- Connection between LLEAP and Patient Monitor and Patient Simulator is lost.

#### Causes

- Patient Simulator has been positioned where limited connectivity to external network exists.
- Other software on PCs may interfere with our LLEAP and/or Patient Monitor.

#### Possible solutions

- Move Patient Simulator to improve connectivity to external network.
- Remove unnecessary software on PCs.

### LLEAP

#### Problem

- Unable to log on to the computer.

#### Causes

- If the user decides to change the log on behavior it will require a password.

#### Solutions

- Default password is "SimUser".

See Software Help Files > LLEAP > Troubleshooting Guide (Help is accessible from Laerdal Simulation Home).

### Changing Patient Simulator Wireless

#### Network Display Name

If operating more than one Patient Simulator; ensure that each simulator has its own unique SSID name. For more information see Simulator Firmware & Network Wizard Help.

### Voice Conference Application

#### Problem

- Sound from Patient Simulator to LLEAP is not working.

#### Possible Solutions

- Check that the microphone has not slipped out of place. Open the head skin zipper, located at the back of the head, enough to reveal the ears.
- Ensure that the microphone is positioned in the cup located towards the top of the ear with the black surface facing outwards.

#### Problem

- Instructor microphone not picking up sound.

#### Possible Solutions

- Unplug and re-plug the headset to your computer
- Ensure correct sound device is selected. In Voice Conference Application main menu, select <Options>, <Select Device>.
- Check volume settings in Windows. Ensure microphone is not muted.

### Laerdal Patient Monitor

See See Software Help Files > Laerdal Patient Monitor > Troubleshooting Guide. (Help is accessible from Laerdal Simulation Home).

### Debriefing and Video Recording

See section for Troubleshooting in SimView Help (accessible from a link at the bottom of the screen in SimView) or Troubleshooting Guide from SessionViewer Help (accessible from Laerdal Simulation Home).

### Patient Simulator

#### Problem

- Unpredictable behavior

#### Possible Solutions

- Patient Simulator malfunctions may be caused by loose cables, tubes or connectors. Open the torso and check if any items appear to have become disconnected or are leaking. See *Opening the Torso*.
- In case of fluid leakage, power off the Patient Simulator and contact Laerdal Technical Service.

#### Problem

- Identifying a single Patient Simulator when there are multiple simulators on a network?

#### Solutions

- When checking the Patient Simulator's pulse, the <Select

Simulator> dialog on LLEAP will indicate which Patient Simulator is pulse palpated.

## Airway Contamination

### Problem

- Simulator airways have become contaminated from mouth-to-mouth rescue breathing

### Solution

- Clean the outside of the Patient Simulator with manikin wipes. Clean the inside of the oral cavity with manikin wipes. Change the lung bladders; see: *Maintenance - Replacing Lung Bladders*.



Note: The Patient Simulator airways are not designed for mouth to mouth rescue breathing or to be disinfected.

## Chest Movement

### Problem

- No chest rise on Patient Simulator.

### Solution

- Check that Patient Simulator is switched ON.
- Check that Patient Simulator is not in sleep mode due to inactivity. Reactivate the Patient Simulator.
- Check that awRR is not set to zero on LLEAP (Patient Case or scenario)
- Check that airway complications like maximum air resistance or laryngospasm are not set.
- Check if the internal compressor is switched off. See: *Turning the Internal Compressor Off/On*.
- Check that any external compressed air source is switched off and that the air tube is disconnected from the Patient Simulator.
- The internal compressor may have overheated. Wait approximately 20 minutes for it to cool down. Remove blankets or covers from the Patient Simulator; open the torso skin to facilitate cooling.
- Chest-rise is set to bilateral (for example if ET-tube is inserted too far into the bronchia).
- Chest-rise bladder is leaking or tubing to chest-rise bladder is twisted, kinked or disconnected. Replace chest-rise bladder if it is leaking, see *Maintenance: Replacing Chest Rise Bladders*.
- Check air tubing for leakage; check that all connections are intact. Replacing tubing if necessary.
- Shallow chest movements and the internal compressor runs continuously. The internal compressor may be worn - contact Laerdal Technical Service.

## Blood System

### Problem

- No blood flow.

### Solution

- Make sure that the internal reservoir is filled with fluid.

### Problem

- Too low flow.

### Solution

- Clean the blood system.
- Check the flow setting in the LLEAP.
- The blood system may need to be re-calibrated. Contact your local service representative.
- Replace filter in pelvis.

### Problem

- Air when bleeding

### Solution

- Bleed the blood reservoir empty, then refill.

### Problem

- Simulated blood is leaking from the back of the right leg during filling or when the Patient Simulator is turned off.

### Solution

- The internal reservoir may need to be replaced. Contact your local service representative.

### Problem

- Can't fill the blood reservoir:

### Solution

- The filter inside the fill bottle may be clogged. If so, order a new fill bottle

## Simulator Limbs

### Problems

- Lack of motion in the legs.

### Possible Solution

- Loosen and re-adjust the hip joint nuts on the inside of the pelvis. See *Maintenance* for details on how to attach the legs

# Troubleshooting

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## Lungs

### Problem

- Lungs not functioning properly.

### Possible Solution

- Check that the airway resistance is not set to maximum in the LLEAP.
- Open the torso and chest plate. Check that the lungs are free to expand and are not restricted by any cables.
- Check that the lung bladders are properly connected, and that the tubes are not twisted.
- Check that the lung bladders are in a horizontal position and inserted correctly. Ensure that the lung compliance O-rings lie between the folds of the lung bladders.
- Check for flaws or ruptures in the lung bladders.
- Check that the two lung compliance O-rings are fitted correctly. Replace O-rings if they appear to be damaged.
- Check that there are no obstructions inside the simulator airways which may block air flow.
- If there is no change when adjusting lung compliance, contact Laerdal Technical Service.
- If there is no change in lung resistance, contact Laerdal Technical Service.

## Mechanical Noise during Auscultation

In the LLEAP, click <auscultation focus>.

## Batteries

### Problem

- Battery life is less than 150 minutes with healthy patient and fully charged batteries.

### Possible Solutions

- Batteries may be old, (recommended lifetime is 200 discharge cycles). Insert new batteries.
- Compressor may not function properly; consult your local Laerdal Technical Services Centre.

## Pulses

### Problem

- Cannot feel pedal pulses

### Possible Solutions

- Skin may be too tight over pulse units – readjust skin and reboot.

## Clinical Features - Pneumothorax Bladders

### Problem

- Experience problems with pneumothorax bladders.

### Solution

- Check tubing connection at base of the bladder; to ensure that tubing has not been disconnected.

## Simulator Shutdown

### Problem

- The Patient Simulator is unresponsive.

### Solution

Press and hold the <ON/OFF> button for 10 seconds to force the Patient Simulator to shutdown.

## Spare Parts and Accessories

For latest version of Spare Parts and Accessories, visit  
[www.laerdal.com](http://www.laerdal.com)





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