SimNewB™

ENGLISH Directions for Use
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Introduction and Intended Use

SimNewB™ Neonatal Simulator
SimNewB™ is an interactive simulator designed by Laerdal with the American Academy of Pediatrics to meet the training requirements of the Neonatal Resuscitation Program (NRP). With realistic newborn traits and lifelike clinical feedback, SimNewB is ideal for training for the specific needs of neonates.

Scalable Training Solution
SimNewB is available in standard and advanced versions enabling instructors to vary simulations from the delivery room to the NICU. The basic version utilizes a handheld Remote Control with preset patient states while the advanced version operates the simulator via SimNewB PC Software.

SimNewB System Description
The SimNewB Control Unit connects to the manikin and allows operation of the simulator. The Control Unit can be battery operated, allowing simulations to be performed anywhere. The operator controls simulations with a user-friendly Remote Control, communicating with the Control Unit through radio frequency (RF) communication. RF communication allows the operator to move freely around the scene, up to a distance of 10 meters (30 ft.) from the Control Unit.

The SimNewB Advanced Neonatal Simulator system allows operation of the simulator from either the PC User Interface or the standard Remote Control.

Note:
- When using the PC User Interface, the Remote Control should not be used.
- When using the Remote Control, the PC User Interface should not be connected to the Control Unit.

Included in the system is a PC-based Scenario Builder program, allowing the user to preprogram simple, linear scenarios. These custom built scenarios may then be downloaded and run by the SimNewB system. Scenarios can control all output parameters of the SimNewB system and make parameters change based on certain events. The SimNewB system will also generate logs that can be uploaded to a PC for review and printing.

Important Information
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by Laerdal could void the user’s authority to operate this equipment.

Hereby, Laerdal Medical AS declares that when carrying the CE-mark, the SimNewB system product is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Use with Laerdal Manikins
SimNewB system will only work with SimNewB system elements (Manikin, Control Unit, Remote Control). Do not attempt to use similar looking Laerdal VitalSim system elements with SimNewB elements.

RF Communication
Communication between the Remote Control and Control Unit is based on low power radio frequency communication. The equipment meets the standards and requirements of FCC and EC. If SimNewB system is used in an environment where RF communication is not desirable, or where interference from other sources makes SimNewB system inoperable, it is recommended to use cable connection between the Remote Control and the Control Unit. Using the direct cable connection disables the RF circuits in both units. The cable is included in the SimNewB system package.
SimNewB™ Neonatal Simulator Features

Airway Features:
• Anatomically accurate, realistic airway
• ET tube insertion
• LMA insertion
• Sellick Maneuver
• Positive pressure ventilation
• Right mainstem intubation
• Suctioning
• Variable lung resistance
• Gastric tube insertion

Breathing Features:
• Spontaneous breathing, with variable rate
• Bilateral and unilateral chest rise and fall with mechanical ventilation
• \( CO_2 \) exhalation
• Normal and abnormal breath sounds
• Oxygen saturation (Advanced version only)

Breathing Complications:
• Central cyanosis presentation
• Pneumothorax
• Unilateral chest movement with mechanical ventilation
• Unilateral breath sounds
• Unilateral needle thoracentesis, mid-axillary

Cardiac:
• Extensive ECG library with rates from 10 – 300 /min.
• ECG monitoring via 3 lead monitor

Circulation:
• Heart sounds
• Umbilical and brachial pulse
• Blood pressure measured manually by auscultation of Korotkoff sounds

Vascular Access:
• Patent, cuttable umbilicus with venous and arterial access for bolus or infusion
• Intraosseous access, bilateral
• Simulated blood flashback upon cannulation

Sounds:
• Vocal: grunt breathing, crying, hiccups and others
• Lung: normal, stridor, pneumonia and others
• Heart: normal, systolic murmur and others

Remote Control:
• Easy to use Remote Control with icons
• Preset patient states on Remote Control map to NRP Simulation Support Materials
• Can be operated wirelessly

NRP Simulation Support Materials:
• Materials mapped directly to the NRP course
• Instructor support for consistent delivery of course content

Other Features:
• Interchangeable pupils with normal, dilated and constricted pupils
• Movement in all four limbs: limp, tone, spontaneous motion and seizure

Software Features: (Advanced version only)
• Easy to operate software based on well proven SimMan/SimBaby software
• Manual control over all parameters or
• Scenario, with Trends and Handlers, can be preprogrammed by the user

Debriefing viewer: (Advanced version only)
• Web-camera recording
• Review event log together with synchronized recording of the patient monitor and in-room video
• Stand alone debrief viewer for off-site review

Simulated Patient Monitor: (Advanced version only)
• Highly configurable
• Simulates several parameters including:
  • Heart rate
  • NIBP
  • ECG
  • \( SPO_2 \)
  • \( ETCO_2 \)
• Respiratory rate
• Multi-level alarm
• Touch screen operation
**SimNewB™ package contents**

The following parts are included in the SimNewB shipping carton. The kit may change over time.

**Cat.no.** | **Description**
--- | ---
220-00150 | Umbilical Cords (4)
220-00550 | Blood Pressure Cuff
220-00250 | IV Bag and Tubing Kit
220-00750 | Blanket
220-00650 | Baby Pants
220-00450 | Hat
220-03050 | Eye Kit
250-21050 | Airway Lubricant
300-00750 | Red Simulated Blood, 4 oz
240-00250 | Umbil Simulated Blood, 4 oz
276-15550 | Liquid Soap
220-00350 | Kit, Right IO Mandrel and Leg Skin
220-00150 | Baby Powder
220-29950 | SimNewB CD
381220 | CO₂ Regulator
220-04450 | CO₂ Connector Tube
220-01550 | Air/CO₂ Tubes
220-19050 | Directions for Use
5527 | Laerdal Global Warranty
8953 | WEEE Statement
220-10050 | Self-Directed Education CD
220-19550 | Neonatal Resuscitation Program Scenarios

**Cat.no.** | **Description**
--- | ---
381850 | Portability Kit
381220 | Regulator
220-05350 | Transportation Case (Manikin)
210-05250 | Transportation Case (Peripherals)
220-19650 | Advanced Neonatal Resuscitation and Stabilization Scenarios

**Optional Accessories:** (not shown)

- Portability Kit
- Regulator
- Transportation Case (Manikin)
- Transportation Case (Peripherals)
- Advanced Neonatal Resuscitation and Stabilization Scenarios

**NOTE:** For additional parts provided with the SimNewB ADVANCED, please see the SimNewB Advanced system Installation Guide. This is a brochure shipped with your manikin.
Overview of Control Unit

A  On/Off button and indicator light
   Press once to turn the Control Unit on.
   Press again to turn the Control Unit off.

   The indicator light is steady green if the Control Unit has contact with the Remote Control. If there is no contact with the Remote Control the indicator will blink green. If battery needs to be replaced, the indicator will blink, alternating between green and red.

B  DC power supply input: Used for stationary training and to limit battery consumption.

C  Manikin connector: Connects the Control Unit to the manikin.

D  Microphone input: External microphone attachment.

E  USB port: For connection to PC.

F  Remote Control connector: Used for direct connection with the Remote Control. RF communication is disabled when the units are connected via cable.

G  Blood Pressure connector: Connects the clear pneumatic tube from the manikin blood pressure connector.

H  Battery case: Holds 6 replaceable C-cell batteries.

Overview of Remote Control

I  LCD display: Displays status and operation information.

J  Quick Execution keys: Function keys. The function of each key is labeled on the display directly above the key.

K  Navigation keys: Use keys to navigate and select functions on the display.

L  OK/Select key: Use this key to activate selected functions.

M  Cancel / Back key: Go back from submenus without any changes.

N  Numerical keys: Use these keys to enter numerical data or to select numbered parameters.
   Can also be used as alphanumerical keys to enter file- and event-names.

O  Menu/Setup: Enter Setup Menu.

P  Scenario: Use this key to start a scenario.

Q  Shift key: Displays alternative quick execution functions.

R  On/Off key: Press once to turn the Remote Control on.
   Press again to turn the Remote Control off.

S  Remote Control connector: Used for direct connection with the Control Unit.

Use of the remote control with the SimNewB™ manikin is described in detail in section “Remote Control”.

Battery Insertion or Change

Remote Control
The battery status in the Remote Control is indicated in the upper right corner of the display. Batteries should be replaced immediately when battery empty is indicated. When the battery is totally empty, the Remote Control will turn itself off without any warning.

Replace the Remote Control batteries with 4 AA size alkaline batteries.

Control Unit
When the battery for the Control Unit has reached a state where less than 20% capacity remains, a “Battery low” message will be displayed by the Remote Control.

When the remaining capacity in the Control Unit battery is less than 10%, a “Replace battery” warning will be given on the Remote Control, and the indicator light in the Control Unit will be flashing alternating between red and green.

When the battery is totally empty, the Control Unit will turn itself off without any warning.

Replace the batteries in the Control Unit battery case with 6 C-cell alkaline batteries.

When the Control Unit is connected to the DC power supply, the Control Unit does not need batteries. No battery low message will be given when the DC power supply is used, even though the batteries may be empty.
**Operation of Compact Compressor Unit**

The Compact Compressor provides air for the SimNewB™ manikin’s breathing, movements and pulses, and CO₂ to be mixed into the manikin’s expired air.

**Setup procedure:**
1. Check that Power switch (1) is set to OFF position.
2. Plug power supply cable into plug (4).
3. Plug power supply cable into power source.
4. Connect the Air/CO₂ tube to the *Output to Manikin* connector (2).

Optional - this is not required for operation if CO₂ detection is not used:
5. Connect the CO₂ regulator to a suitable CO₂ tank.
6. Connect the blue CO₂ tube between the CO₂ regulator and the *Input CO₂* connector (3) at the back of the compressor.

**Compressor start:**
Press Power switch (1) to ON position.
The compressor will run continuously when turned on.
The flow of CO₂ to the manikin valve will begin.

**Compressor stop:**
Press Power switch (1) to OFF position.
The compressor will stop and vent automatically.
The flow of CO₂ will stop.

**Cautions:**
Safety may be compromised if the System or any of its components are used in a manner other than specified by Laerdal.
- *Do not open compressor housing. Dangerous voltage inside. Only to be opened by authorized personnel.*
- *Do not use in an explosive environment.*
The Compact Compressor must be powered from a grounded outlet with the appropriate specified voltage and current.
Do not use an adapter or cord other than provided unless installed by a qualified electrician according to relevant electrical codes.
- *The Compact Compressor must be positioned to easily access and disconnect the power cord.*
- *To comply with CE Standards, the Compact Compressor must be positioned within 3 m/9 ft of the electrical outlet.*
- *Position Compact Compressor to prevent blocking air vents.*

No external ventilation is required to operate the system. If CO₂ is attached, small amounts will be released during use.
If CO₂ is attached and the Compact Compressor is operated without the Output Hose connected to both compressor and manikin, a substantial quantity of CO₂ will be released.
Manikin Connectors

The SimNewB™ manikin is shipped ready for use. It must be connected to the SimNewB Control Unit and the Compact Compressor Unit to function.

The manikin’s control cable and tube bundle has the following connectors:

A - Blood Pressure Cuff connector
B - Manikin connector
C - Manikin Blood Pressure connector (to Control Unit)
D - Air exhaust tube (no connections)
E - Manikin Air/CO₂ connector
F - Umbilical Reservoir Overflow tube

Extension cables are used to connect the manikin to the Control Unit and the Compressor Unit.

G - Manikin cable with Blood Pressure tube (from Manikin Connector and Manikin Blood Pressure connector to Control Unit)
H - Air/CO₂ tube (from Manikin Air/CO₂ connector to Compressor Unit)

Setting up the SimNewB Neonatal Simulator System

Check that the Control Unit and Remote Control have batteries and that any battery protection tape inside the battery case (when new) is removed. The Control Unit can also be connected to external power using the DC Power Supply.

1 - Connect the Manikin cable to the Control Unit and the Manikin connector.
2 - Connect the Blood pressure extension tube to the Control Unit BP connector and the Manikin Blood Pressure connector.
3 - Connect the Air/CO₂ double-lumen tube to the Compressor Unit and the Manikin Air/CO₂ connector.
4 - Switch the Control Unit and the Remote Control on.
5 - Switch the Compressor Unit on, as described on page 7.
6 - Connect the Blood Pressure Cuff’s connector to the Manikin Blood Pressure Cuff Connector. The BP cuff may be wrapped around the right upper arm.
7 - Connect the empty IV-bag set to the Umbilical Reservoir Overflow tube.

Note - The overflow tube has a valve to prevent leakage from the tube when not attached to IV-bag set.

NOTE: For set up and assembly of the SimNewB ADVANCED, please see the SimNewB Advanced system installation guide. This is a trifold brochure shipped with your manikin.
Remote Control - Setup Menu

The Remote Control setup is voluntary. Only the Calibrate BP procedure need be performed before simulation use.

To activate the Setup Menu, first turn the Remote Control on by pressing the on/off key (R). Then press the Menu key (O).

Use the navigation keys (K) to select function. Use Quick Execution keys (J) or the navigation keys (K) to make a selection. Press OK (L) to save.

Pressing C (M) will take you back to the Main display without activating any selections.

Pressing the on/off key (R) will switch off the remote Control.

Language
One of several languages can be selected. Language selection affects the text on the Remote Control display.

Factory setting is English.
**Display backlight** can be turned on or off. Unless used in a dark room, it is recommended to have the backlight off to conserve batteries.

Factory setting is off.

**Display Contrast** can be adjusted between 9 (darker) and 1 (lighter).

Factory setting is 5.

The Control Unit has no autopower off function. System status is stored in the Control Unit, so turning the Remote Control off will not affect operation or settings. To conserve batteries, the **Autopower off** function turns off the Remote Control if there has been no keyboard activity for the set number of minutes. A warning will be given one minute before the unit turns off.

Factory setting is 15 minutes.

**Com. Channel**

To be able to operate several SimNewB™ or VitalSim systems by wireless remote control in the same vicinity, it is possible to select 5 different communication channels.

Factory setting is channel 1.

Communication channels can only be changed if the Remote Control and Control Unit are connected via cable.

**Calibration of Blood Pressure**

To ensure correct measurements of simulated BP, the sphygmomanometer used with the cuff needs to be calibrated to the pressure sensor in the SimNewB system. This is done by selecting the **Calibrate BP** function, inflating the cuff to 100 mmHg and pressing the **Calibrate** quick execution key as the pressure is held at exactly 100 mmHg.
Clinical Simulation Using the SimNewB™ Manikin

I. General Handling
The Neonatal Simulator is the size and weight of a newborn baby girl delivered at term with approximately 3.5 kg (7 lbs) body weight and 51 cm (21 inches) length.

The arms, legs and neck articulate realistically and encourage care and proper handling. The simulator can be handled appropriately for care and resuscitation of a normal newborn. The SimNewB manikin can be carried to the resuscitation table, for a realistic start of the resuscitation case. Ensure that the control cables are free and do not snag.

Muscle tone and motions:
The muscle tone of the SimNewB’s limbs can be set to represent either a limp (poor muscle tone) or a normal newborn. The muscle tone impression can be enhanced with spontaneous vigorous motions.

The SimNewB manikin can also be set to have seizure-like movements of the limbs.

Umbilical cord: The SimNewB manikin has a replaceable umbilical cord which can be clamped, tied, cut, sutured, catheterized, or palpated for the umbilical pulse.

IV fluids or medications may be injected into the vein in the umbilical cord.

Interchangeable pupils:
The SimNewB manikin is delivered with normal pupils mounted in the head. A separate case contains 3 sets of plastic pupil inserts (normal, constricted and dilated pupils) for use in simulating different patient conditions.
Clothing: The SimNewB™ manikin is delivered with baby pants with snaps at the bottom to allow cable and tubes to pass through.

For more realism at the resuscitation table, the control cables to the simulator can be hidden under the blanket provided with the manikin.

2. Preset Patient State Levels
The NewSimB Neonatal Simulator system has six predefined patient state levels, L0-L5. For each level, seven clinical parameters are set, as defined in Table 1. Progressing between the levels simplifies running resuscitation simulations.

Table 1

<table>
<thead>
<tr>
<th>PATIENT LEVEL</th>
<th>CYANOSIS</th>
<th>HEART RATE</th>
<th>MUSCLE TONE</th>
<th>RESPIRATIONS</th>
<th>VOCAL SOUNDS</th>
<th>LUNG SOUNDS</th>
<th>BLOOD PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L5</td>
<td>Off</td>
<td>140/min</td>
<td>Motion</td>
<td>Regular 40/min</td>
<td>Strong cry</td>
<td>Normal</td>
<td>60/40</td>
</tr>
<tr>
<td>L4</td>
<td>On</td>
<td>160/min</td>
<td>Motion</td>
<td>Regular 60/min</td>
<td>Grunting</td>
<td>Coarse crackles</td>
<td>60/40</td>
</tr>
<tr>
<td>L3</td>
<td>On</td>
<td>120/min</td>
<td>Tone</td>
<td>Irregular 10/min</td>
<td>Weak cry</td>
<td>Coarse crackles</td>
<td>45/20</td>
</tr>
<tr>
<td>L2</td>
<td>On</td>
<td>70/min</td>
<td>Limp</td>
<td>Gasping 4/min</td>
<td>-</td>
<td>Coarse crackles</td>
<td>30/20</td>
</tr>
<tr>
<td>L1</td>
<td>On</td>
<td>40/min</td>
<td>Limp</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>30/20</td>
</tr>
<tr>
<td>L0</td>
<td>On</td>
<td>0</td>
<td>Limp</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>0/0</td>
</tr>
</tbody>
</table>
3. Airway Simulation Features

Caution:
Do not use for mouth to mouth.

Opening the airway
The neck of SimNewB™ manikin is realistically flexible, from hyperextension to flexion. The simulation team members may demonstrate correct head position for opening of the airway.

Clearing the upper airway
Simulated meconium (Meconium aspiration module) may be suctioned from the SimNewB manikin’s mouth and nose using a bulb syringe or suction catheter.

By using the Meconium Aspiration module, the simulation team members can assume that there is meconium in the trachea, instigating proper procedures for removal of meconium.

The head can be turned to the side as normal.

NOTE/Warning:
Do not insert fluids into the SimNewB manikin’s airways.

Clearing the lower airway
One can dry simulate removal of meconium from the SimNewB manikin’s mouth and trachea by laryngoscopy, using a suction catheter to clear the mouth.

NOTE/Warning:
Do not insert fluids into the SimNewB manikin’s airways.

Securing the airway
The SimNewB manikin’s neck, jaw and airway is modeled to enable a normal newborn intubation scenario. The airway can be intubated either by direct laryngoscopy (straight blade size No. 1 recommended) and an uncuffed ET tube (size ID 3.5 mm recommended), or with the LMA (size #1 recommended).

Nasal intubation can be done.

NOTE:
Lubricate the ET tube or LMA before insertion.
The "sniffing" position aligns the trachea for the best view of the glottis and vocal cords when properly using a laryngoscope. Cricoid pressure may be used by the simulation team member.

The SimNewB™ manikin jaw is realistically hinged and flexible, for airway and intubation maneuvers.

The SimNewB manikin vocal cords are realistically shaped and at a depth of 9.5 cm from the upper lip. If the ET tube is inserted too far, it will pass into the right main bronchus, giving only right side chest rise during positive-pressure ventilation. The breath sounds on the left side of the chest then disappear.

An ET tube may be secured by means suitable for a neonatal baby. Tape residues should be cleaned off the skin with soap and water.

To simulate airway obstructions or very low lung compliance, the instructor can select the lungs to be partially or fully closed.

Oropharyngeal or nasal pharyngeal airways suitable for neonates may be used.

*Lubricate the oropharyngeal or pharyngeal airways before insertion.*

**Detection of esophageal intubation**

If the esophagus is intubated instead of the trachea, the abdomen will then visibly distend for each positive-pressure ventilation.

Stomach ventilation is detectable with the stethoscope.

A capnographic sensor suitable for neonatal use can be used to detect ETCO₂ output, for example as a means to confirm tracheal intubation contrary to esophageal intubation.
4. Breathing

Spontaneous breathing
The SimNewB™ manikin’s breathing activity can be assessed from visible chest movement, from vocal sounds (grunting, crying, etc) and from breath sounds audible with a stethoscope.

The manikin’s spontaneous breathing can be initiated or stopped by the instructor. The breathing rate can be set to 0-100 breaths per minute, with 40 breaths per minute as the default setting.

The vocal and breath sounds are listed in the Detail Specifications section, page 36.

When connected to a CO₂ source, the SimNewB manikin can expire CO₂. This function can be turned on and off from the Remote Control or the PC Software.

Central cyanosis
To simulate central cyanosis, activate the SimNewB manikin cyanosis function, which changes the color of the face surrounding the lips to blue.

The brightness can be controlled from the Remote Control.

Assisted breathing
The SimNewB manikin is designed for airway devices such as face masks, ET tubes (size ID 3.5mm recommended) and LMA’s (size 1 recommended).

The manikin is suitable for use with self-inflating bags and flow-inflating bags. It is not designed for use with automatic ventilators.
Airway restrictions and different airway compliances can be simulated for each lung in 3 settings each:
- Fully open, with no noticeable restriction when ventilating
- Partially closed, with noticeable restriction when ventilating
- Fully closed, with no air movement when ventilating

A size 0/1 face mask is recommended for mask-ventilation with the SimNewB™ manikin. During mask ventilation with elevated airway pressure, air may realistically leak through the esophagus to the abdomen, visibly distending the stomach.

To vent out accumulating air from the stomach, an orogastric tube (size 8 FR recommended) can be in place simultaneously with mask ventilation.

**Breathing sounds audible by auscultation**
Breath sounds can be listened to with a stethoscope at the left and right mid-axillary areas and the mid-clavicular sites.

Breath sound alternatives for each lung are listed in the Detail Specifications section, page 36.

**NOTE:**
*Only use appropriate size neonate/infant stethoscope*

**Pneumothorax decompression**
The needle decompression procedure can be performed by inserting a needle at the left chest side (fourth intercostal space) into the pleural space. The rib structure can be palpated through the skin. The SimNewB manikin's pleural space is enclosed so that the needle can not damage the inner components of the manikin.
Oxygen Saturation

*SimNewB™ Advanced version only:*
A standard SPO₂ probe (not included) can be attached to the SimNewB system during the simulation to add visual realism only. There is no interface between the SPO₂ probe and the SimNewB system. It is up to the instructor to set the SPO₂ value that shall be visible to the simulation team members on the provided monitor.

5. Circulation

Heart rate and Pulse
The SimNewB manikin has a heartbeat and palpable umbilical and right brachial pulses. The palpable pulses can be switched on or off by the instructor. The heartbeat can be listened to using a stethoscope at the left side of the chest. The heart rate can be varied between 0 and 300 bpm.

Even if the Remote Control sets the pulse to off, palpating the brachial pulse will turn on all pulses unless the BP cuff is inflated to 10 mmHg or more.

**NOTE:**
*Only use appropriate size neonate/infant stethoscope*
Chest compressions
The SimNewB™ manikin has normal visible chest landmarks (xyphoid process, nipples) and underlying sternum structure. The SimNewB’s maximum chest compression depth is one third of the AP distance.

Each series of chest compressions is logged.

Blood pressure measurement
Using the blood pressure cuff supplied, the blood pressure can be measured on SimNewB manikin’s right arm. See the Setup guide, page 8, for connecting the NewSimB blood pressure cuff properly, and page 10 for calibration.

The Korotkoff sounds can be listened to with a stethoscope at the anticubital area.

Heart sounds
Heart sounds can be listened to with a stethoscope at the left side of the chest. The volume can be adjusted from level 1 to 9. Level 8 is default.

The available heart sounds are listed in the Detail Specifications section, page 35.

**NOTE:**
*Only use appropriate size neonate/infant stethoscope*

ECG rhythms
3-lead ECG can be connected to the SimNewB manikin. ECG can be monitored with normal ECG monitors or ECG-capable defibrillators.

The available ECG rhythms and QRS wave types are listed in the Detail Specifications section, pages 34-35.

In addition, pulseless electrical activity (PEA) can be set as the heart state.

Defibrillation
**Warning:** The Laerdal SimNewB must not be defibrillated or paced. The ECG electrodes are not designed to absorb high voltage / high energy shocks. Application of such shocks will cause a hazard and destroy the SimNewB system’s inner electronics.
6. Drug & IV Administration

**IV access via the umbilical vein**
IV fluids or simulated medications may be injected into the vein in the umbilical cord. The fluids will accumulate in an abdominal fluid reservoir (40 ml capacity), which must be emptied after use (see page 21). More fluid may be injected if the empty IV-bag is attached to the umbilical reservoir overflow tube (see page 8).

Cannulation of the umbilical vein can be performed with an umbilical catheter (size 3.5F or 5F).

Artificial blood can be added to the reservoir, so that simulation team members can draw simulated blood when testing the catheter for proper insertion depth.

**Intraosseous access**
Intraosseous access can be established bilaterally in the lower legs.

IV fluids or medications may be injected through the I/O needle. Each leg contains a fluid reservoir of approximately 35 ml.
To prevent leakage, it must be emptied after each use (see page 21).

**Stomach catheterization**
A feeding tube (size 8FR) can be inserted into the stomach.

**NOTE/Warning:**
*Do not insert fluids into the SimNewB manikin's stomach!*

A suction catheter (size 10FR) can be inserted into the stomach for simulation of stomach content removal. Suction can be applied to the catheter as normal.
**Manikin Preparation Before Use**

**Inserting fluids into the umbilical reservoir**  
Use a syringe to insert fluid into the abdominal reservoir. Do not fill more than 40 ml unless the IV bag is attached to the overflow tube.

**Attaching the umbilical cord**  
Lubricate the end of the umbilical cord to be inserted with liquid hand soap. Squeeze and press the umbilical cord into the umbilical opening. The cord should be pressed at least 50mm (2 inches) into the opening, but need not be pushed further down.

*Note: Ensure that the cord is properly inserted to the min. distance. Failure to do so will result in a moving umbilicus when pulse is on.*

To remove, gently pull on the umbilical cord.

**Changing eye pupils**  
1. Open the eyelids wide, take care not to rip the faceskin.  
2. Using the suction cup provided in the kit or the edge of your fingernail, remove the pupil from the eye.  
3. Replace with the pupil of choice, using the small suction cup provided or press into place with finger.

**Inserting the meconium module**  
1. Insert the module with a finger - do not use force.  
   *Note: Do not add lubricant to the module.*  
   *Note: Do not insert the meconium module past uvula.*  
2. A suction catheter @ 100 mmHg will remove the meconium module.  
3. A tether has been added to ensure removal of the object.

For intubation following the removal of the meconium module, add lubricant to the ET-tube before intubation.
**Maintenance After Use**

The maintenance tasks listed below should be performed after the training session.

For other service needs, contact your local Laerdal Technical Service Center.

**Tucking in the neck skin**
If the manikin's neck has been extended, the neck skin's lower edge may need to be tucked in under the body framework's collarline.

**To extend the cleanliness of your manikin**, use a small towel and lightly dust the manikin head and chest with a small amount of powder (provided). Wipe away any excess.

**Apply baby powder beneath the body skin at the neck, shoulder and hip joints to prevent sticking.**

**Emptying the abdominal reservoir for fluids**
Remove the umbilical cord, rinse and wipe it clean, and let it dry. Suction fluids from the reservoir overflow connection. Add clear or soapy water and suction until the reservoir is clean.

**Emptying leg for fluid**
If fluid is present in the legs, open the plug behind the knee and remove fluid with a syringe.

**NOTE: Always remove fluids from the umbilical and IO reservoirs after use.**

**Periodic Maintenance**

**Changing Lower Leg Mandrels and Skins**
After multiple uses with IO needle injections to the lower legs, the lower leg mandrels and skins should be replaced if fluid leakage is prominent during use.

1. Pull the leg skin carefully off the leg.
2. Unscrew and remove the knee bolt holding the lower leg.
3. Exchange the lower leg with a new one of the same type (right/left foot).
4. Reinsert the knee bolt and tighten carefully.
5. Apply Baby Powder to the inside surfaces of the leg skin.
6. Pull a new leg skin (same type left/right) over the foot/leg.
Remote Control of the SimNewB™ Manikin

Start
Once the SimNewB manikin has been connected to the SimNewB Control Unit, turn the Control Unit and Remote Control on. The Control Unit will automatically detect the connected manikin and set the parameters to the default values.

Information on battery insertion or change, system setup and the Setup Menu for the Remote Control, see the Setup Guide section (pages 4-10).

Main Display Elements
The main screen shows the current overall status of the manikin, and allows for modification of parameters using the quick execution keys.

The main display is divided into six functional areas and a Quick Execution function line:

1. **Log** functional area shows the log clock, log status, and if the log has been saved, the current log's file name.

2. **Radio reception indicator**

3. **Battery status indicator**

4. **Cardiac** functional area shows the set heart rate.

5. **Breathing** functional area shows the set breathing rate, lung closure state and if manikin CO₂ output is on.

6. **Preset Patient State** functional area.
   (see chart page 12)

7. **Blood Pressure (BP)** functional area shows the set BP and pulse on/off status.

8. **Patient Motions** functional area shows the manikin limb motion and chest-rise settings.

9. **Quick Execution functions/keys**
   The function of the keys will change with the selected functional area.
Operation
Use the left / right / up / down navigation keys to move selection box (see Figure 3) to the desired functional area of the display.

Once the desired area is selected, there are several options for editing the settings:

1. Quick execution functions can incrementally alter parameters, turn functions on/off, or lead to submenus. Pressing and holding the shift key gives access to a second set of quick execution functions.

2. Numbered parameters can be altered directly with the numeric keys.

3. Pressing the OK key will take you to the functional area’s submenu (not for Preset Patient State functional area), where additional parameters can be changed.

When the selection is complete, press OK to implement the new selection and return to the main display.

To cancel the selection, press C to return to the main display with the previous setting unchanged.
**Preset Patient States**

On the main display, use the navigation keys to select the Preset Patient States functional area (Figure 4).

Use the  and  quick execution keys to incrementally change between states L0-L5 and Off.

Each Preset Patient State level simultaneously sets seven manikin parameters. The levels are described on page 12.

**Simulation timer**

A simulation timer becomes available as a quick execution function only when the Preset Patient States functional area is selected. Depression of the quick execution key starts the timer. A second time stops the timer.

The timer is reset if the key is pushed and held for 1 second.

**Airway and Breathing Parameters**

On the main display, use the navigation keys to select the Breathing functional area (Figure 5), which shows the current breathing rate, lung closure state (see Table 1), and if the manikin’s CO₂ output is on, the CO₂ symbol is visible.

**Set Breathing Rate**

Use the  and  quick execution keys to change the breathing rate in steps of 5, or enter the breathing rate directly with the numeric keys when the Breathing functional area is selected. The breathing rate can be set between 0 and 100 breaths per minute.

Breathing rate is automatically set to 0 if BP is 0. The breathing rate is set to the original value if a BP is reset.

Pressing the Shift key reveals the alternative quick execution functions (Figure 6):
- **Intub / Extub** turns vocal sounds off/on
- **Pulse** toggles the manikin’s palpable pulses on/off.
- **Auscultate** toggles auscultation focus mode. If enabled, a stethoscope icon will appear in breathing functional area and all manikin pneumatic functions will be disabled (pulse, breathing, CO₂, motion).
- **Selected Lung Closures ( )** quick execution functions. See Table 1 for the interpretation of the lung closures symbols.

**Set Airway Parameters Menu**

When the Breathing functional area is selected, Press OK to open the Set Airway Parameters menu (Figure 7). Use the left / right navigation keys to select the functional area, and then use the quick execution functions to change settings of the parameters.
Set Lung Closures

When the Lung Closures functional area is selected (Figure 7), the lung closure states can be set bilaterally (default) using the quick execution functions Open - Partial - Closed. When both lungs are blocked the breathing rate is set to 0.

Select the Unilateral quick execution function to set lung closure state for each lung individually. Use the up / down navigation key to select between the left or right lung. Selecting the Bilateral quick execution function returns to bilateral setting mode.

The Cyanosis functional area is used to set the manikin cyanosis function on / off using the Set On / Set Off quick execution keys. Cyanosis brightness can be adjusted from 0-9 using the Bright- / Bright+ quick execution keys.

CO₂ output can be set with the Set On / Set Off quick execution keys when the CO₂ functional area is selected. Press OK to activate selections.

Set Lung Sounds

From the Set Airway Parameters menu, pressing the icon quick execution key opens the Set Lung Sound menu (Figure 8). Pressing C (no change) or OK (activate change) returns you to the Set Airway Parameters menu.

Use the up / down navigation keys to select lung sound. The arrow on the bottom right of the selection field indicates that there are more selections than presented on the screen. You can also enter the numeric identifier directly with the numeric keys.

The and quick execution keys changes the lung sound volumes.

Lung sounds can be set unilaterally for the Left Lung (LL) and the Right Lung (RL), or bilaterally if the sound type shall be the same for both lungs (RL=LL).

Use the quick execution keys Set LL, Set RL and Set RL=LL to set the lung sounds.

If the lung sounds and volumes have been individually set, and then bilateral sound setting is selected, the sound for the left lung will be used for both lungs. The sound volumes will remain at the individually set values, and will retain the difference between them if the volume is adjusted further in the bilateral setting mode.

The Set Lung Sound menus are also accessible from the Set Sounds menu (see page 28).
Cardiac Parameters
On the main display, use the navigation keys to select the Cardiac functional area (Figure 9), which shows the current heart rate.

Heart Rate
Use the – ♯ and ♯ + quick execution keys to change the heart rate in steps of 10, or enter the heart rate directly with the numeric keys when the Cardiac functional area is selected. The heart rate can be set between 0 and 300 beats per minute. The heart rate is automatically rounded to the nearest available rate.

Set Running Rhythm menu
When the Cardiac functional area is selected, press OK to open the Set Running Rhythm menu (Figure 10). Use the left / right navigation keys to select the desired functional area, and then use the up / down navigation keys or the quick execution functions to change settings of the parameters.

Running Rhythm:
Use the up / down navigation keys to choose rhythm. The arrow at the right of the selection field indicates that there are more selections than presented on the screen. You can also enter the numeric identifier directly with the numeric keys.

The heart rate, pulse (if active) and blood, heart sounds pressure will be affected by your choice of heart rhythm.

The Set PEA quick execution key sets PEA as the current heart state. Reset PEA returns affected parameters to their original values.

QRS: Types can be set to A through G (Figure 11). Use the up / down navigation keys to select type. Press OK to activate selections.

Set Heart Sound
Pressing the ♯ icon quick execution function opens the Set Heart Sound menu (Figure 12). Pressing C (no change) or OK (activate changes) returns you to the Set Running Rhythm menu.

Use the up / down navigation keys to select heart sound. The arrow on the bottom right of the selection field indicates that there are more selections than presented on the screen. You can also enter the numeric identifier directly with the numeric keys.

Use the – ♯ and ♯ + quick execution keys to change the heart sound volume.

Press OK to activate selections.
**Blood Pressure and Pulse Parameters**

On the main display, use the navigation keys to select the Blood Pressure (BP) functional area (Figure 13), which shows the current BP and the manikin’s pulse status (on / off).

Use the **BP-** and **BP+** quick execution keys to change both systolic and diastolic blood pressures in steps of 2, their original difference being maintained.

Pressing the **Shift**-key reveals the alternative quick execution functions (Figure 14). Selecting **Pulse** will toggle the manikin’s pulse function on / off, as indicated in the BP functional area: **P: On** or **P: Off**.

**Set Blood Pressure menu**

When the BP functional area is selected, press OK to open the Set Blood Pressure menu (Figure 15). Use the left / right navigation keys to select the parameter you wish to change, then use the up / down navigation keys or the numeric keys to adjust each setting.

**Using the **BP-** and **BP+** quick execution keys**

- When **Systolic** is selected (as in Figure 15), only systolic will change, but diastolic will be kept at least 10 mmHg below systolic.
- When **Diastolic** is selected, only diastolic will change, but systolic will be kept at least 10 mmHg above diastolic.
- When **Vol, Gap** or **Pulse** is selected, both systolic and diastolic will change, and will maintain the difference, each time the **BP-** or **BP+** quick execution keys, are used.

**Set PEA** quick execution key will set BP to 0/0 and breathing rate to 0. **Reset PEA** will set the parameters back to what they were before Set PEA was selected. Increasing the BP or breathing rate from a PEA state in the main display will automatically reset PEA.

If the running rhythm is a rhythm with no BP, i.e. VF or Asystole, BP will automatically be set to 0/0. The BP is not automatically set back to normal if a perfusing rhythm is chosen.

Use the **–** or **+** quick execution keys to alter volume of Korotkoff sounds directly.

Auscultatory **Gap** (Korotkoff sound disappears in part of Phase II) can be toggled on / off using the up / down navigation keys.

Press OK to activate selections.
**Sounds Control**

On the main display, pressing the quick execution key opens the Set Sounds menu (Figure 16). The icon is not available when the Preset Patient State or the Patient Motions functional area is selected.

**Adjusting sound volumes**
Select the sound channel with the up / down navigation keys. Use the and quick execution keys to adjust sound volume.

Press OK to activate selections.

The sound volumes for the lung sounds can be set unilaterally or bilaterally. Use Set Bilat. or Set Unilat. quick execution keys to choose the method.

**Set Vocal Sounds**
From the Set Sounds menu, select the Vocal status line (as in Figure 16) and press OK, which opens the Set Vocal Sounds menu (Figure 17).

Use the up / down navigation keys to select the desired sound. You can also enter the numeric identifier directly with the numeric keys. The arrow at the right of the selection field indicates that there are more selections than presented on the screen. Press OK to activate selections.

The last three vocal sounds used become available as quick execution functions (Figure 18) in the Set Sounds menu when the Vocal status line is selected.

Most sounds are continuous and can be toggled on / off. Pressing the active vocal sound's quick execution key will toggle the active vocal sound on / off.

Vocal sounds are muted when the Intub quick execution function is activated. Selecting Extub from the quick execution functions (see page 24) will cancel the muting.

The Set Lung Sounds menu is accessible from the Breathing functional area via the Set Airway Parameter menu's quick execution key. The Set Lung Sounds menu is fully described on page 25.

The Set Heart Sounds menu is similarly accessible from the Cardiac function area via the Set Running Rhythm menu's quick execution key. The Set Heart Sounds menu is fully described on page 26.
**Patient Motions Control**

On the main display, use the navigation keys to select the Patient Motions functional area (Figure 19), which shows the manikin’s current muscle tone and chest-rise settings as described below:

<table>
<thead>
<tr>
<th>Patient Motions</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limp</td>
<td>Chest-rise Off</td>
</tr>
<tr>
<td>Tone</td>
<td>Chest-rise On</td>
</tr>
<tr>
<td>Motion</td>
<td></td>
</tr>
<tr>
<td>Seizure</td>
<td></td>
</tr>
</tbody>
</table>

Use the Limp - Tone - Motion - Seizure quick execution keys to select muscle tone state.

The Resp quick execution key toggles the manikin’s chest-rise on/off. When breathing rate is 0 there will be no chest rise.

When the Patient Motions functional area is selected, press OK to open the Set Motion Parameters menu (Figure 20). The options are the same as above, but showing larger pictograms.

Press OK to activate selections.
Logging of Simulation Events

On the main display, use the navigation keys to select the Log functional area (Figure 21).

The SimNewB™ Neonatal Simulator automatically generates a log of events and parameter changes from the moment the system is turned on. Elapsed time, logging status and name for the current log is displayed in the upper left corner of the display. Unless saved, the log will be erased when the Control Unit is turned off.

The Pause function (also quick execution function stops the log clock. Any events or changes in settings are not logged. The Resume function (also quick execution function resumes logging and clock. The Restart function resets the log timer and erases the content of the current log.

When the log functional area is selected, press OK to enter the log control menu (Figure 22) or select functions directly from quick execution functions. To return to the main menu, press OK (activate changes) or C (no change).

Save Log

The Save quick execution function pauses the log and opens the Save Log field. The log is given a default name by the SimNewB system, LOGxx, where xx is a sequential number. This name can be modified, using the backspace quick execution function and the alphanumeric keys. Press OK to save the log and return to main display, and press to resume the log.

Up to 25 logs can be saved in the Control Unit. Logs are erased when transferred to a PC, or they can be erased using the Clear All Logs function.

Saved logs can be retrieved later using the SimNewB system PC utility program. Logs can be transferred to the PC for permanent storage, additional comments and printing.

Log Events

The Event quick execution function opens the Log Event menu (Figure 23), from which you can enter simulation events into the log. The events are chosen from a list of up to 14 that are stored in the Remote Control. To log an event, select the event using the navigation keys, and press OK. You can also enter the numeric identifier directly with the numeric keys.

The first twelve events are preprogrammed. Events can be deleted using the Delete quick execution function.
The Default quick execution function restores the factory setting of preprogrammed events.

The last two events are left open ("---") for the user to program. To program an empty event, select the event and press the Add quick execution key.

Enter the event name using the alphanumeric keys and the backspace quick execution function. The shift key is functional for upper or lower case characters. Up to 13 characters can be used for the event name.

Scenario
The SimNewB™ Neonatal Simulator can run preprogrammed scenarios, generated on the PC-based scenario builder program (see page 33). These scenarios can be transferred to the Control Unit using the SimNewB Log and Scenario Control utility program (see page 33).

To start a scenario, press the Scen. key (see page 5). It may take a few seconds while scenario information is retrieved from the Control Unit. Select the desired scenario (Figure 25) and press OK. The scenario will start with the clock set to 00:00 and a new log will begin. The current log will be erased, unless it is saved before the scenario is started.

When running a scenario, the top line of the main display (Figure 26) shows the scenario name and number of the current scenario frame. The scenario will progress to the next scenario frame depending on the event or time conditions programmed into the scenario.

The log event menu is replaced by a scenario event menu (Figure 27) which has been defined when building the scenario.

It is highly recommended to have a print-out of the scenario available for reference.

Logs and scenarios are synchronized in the following manner:
• A new log is started when a scenario is started.
• Pause and Resume affects both scenario and log.

Selected events will go into the log, and can also be used as events in the scenario, transitioning the scenario from one frame to the next.

The Stop ( ) scenario quick execution key stops the scenario. Manual operation will be enabled. The log and clock will continue normally.
PC Software Utilities (Standard SimNewB™)
Included in the standard SimNewB Control Unit package is a CD with PC software supporting scenario and log functions. The software will run on Windows XP and Vista. The SimNewB system can be connected to the PC through the USB connector. Through this connection, scenarios made on the PC can be downloaded to the SimNewB system for execution. Logs generated and saved on the SimNewB system can also be uploaded to the PC for review, printing and permanent storage.

The software functions are fully documented through help functions and documents residing on the CD. The intention of this chapter is to give an overview.

Software Installation
Insert the software CD in the CD-ROM drive and wait for the installation program to start. If it does not start automatically, run the Setup.exe program located on the CD. Follow the instructions from the installation program.

Note: The SimNewB system requires Microsoft .Net Framework 2.0 to be installed on your PC. This will be installed as part of the SimNewB system software installation.

USB Driver Installation
The first time the SimNewB system is turned on and connected to the PC, Windows will detect that new hardware is connected.

On Windows XP a wizard for driver installation will be started. Follows the instructions from the wizard to install the SimNewB system USB driver. In some situations, the operating system will display a Found New Hardware Wizard screen that asks: “Can Windows connect to Windows Update to search for software?” Select “No, not this time.” Then, click “Next.”

On Windows Vista, the driver is installed automatically when you connect the SimNewB system.

PC Software Utilities (SimNewB™ Advanced)
For PC software operation and help, please see the help files on the SimNewB Advanced software CD.
Scenario Builder (Standard SimNewB™)
This is a graphical editing tool that allows you to create, edit and save scenarios to be downloaded and run on the SimNewB system.

Start the Scenario builder from the Windows Start key:

For further instructions on how to use the program, refer to the Help function in the Scenario Builder.

After you have built the scenario, save it and then use the Log and Scenario Control utility to load the scenario into the SimNewB system unit.

Log and Scenario Control
This utility is used to load scenarios into the SimNewB system, and to retrieve logs that have been saved in the SimNewB system.

Connect the SimNewB Control Unit to the PC using the USB cable. Turn the SimNewB system on, and start the Log and Scenario program from the Start Menu.

Scenarios and logs in the SimNewB system are presented when the PC has made connection with the SimNewB Control Unit.

To load a scenario, click Add and select the scenario from the file menu.

To transfer logs, click Transfer Logs and select the logs to transfer. Once logs have been transferred they are normally deleted in the SimNewB Control Unit.

Refer to the Help function for complete description.
### Remote Control

- **Battery:** 4 AA type (LR6) Alkaline batteries.
- **Battery life:** Approximately 20 hours.
- **LCD display:** High Resolution B&W LCD display. Backlight can be turned On / Off in Setup menu.

### ECG Rhythms

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>Rates</th>
<th>Default Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sinus</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Sinus w/ Unifocal PVCs*</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Sinus w/ Couplet, PVCs*</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Sinus w/ Multifocal PVCs*</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Sinus w/ PACs*</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Sinus w/ PJCs*</td>
<td>0-300</td>
<td>140</td>
</tr>
<tr>
<td>Atrial Tachycardia</td>
<td>140-320</td>
<td>180</td>
</tr>
<tr>
<td>Atrial Flutter</td>
<td>75-150</td>
<td>100</td>
</tr>
<tr>
<td>Atrial Fibrillation*</td>
<td>60-320</td>
<td>160</td>
</tr>
<tr>
<td>Junctional</td>
<td>30-160</td>
<td>50</td>
</tr>
<tr>
<td>Idioventricular</td>
<td>10-60</td>
<td>40</td>
</tr>
<tr>
<td>Ventricular Tachycardia</td>
<td>120-320</td>
<td>180</td>
</tr>
</tbody>
</table>

### RF Communication

- **Frequency ranges:**
  - Europe version: 868.0 – 868.6 MHz
  - US version: 915.5 – 916.4 MHz
- **Operation range:** 10 m (30 ft) max.

### Control Unit

- **Battery:** 6 C type (LR14) Alkaline batteries
- **Battery life:** 10 - 20 hours
- **DC input:** 9V DC, 1.5 A max
- **Sound input:** Line input level.

### BP cuff pressure input

- 0 – 300 mmHg.

### Vascular Blood Pressure (BP)

- **Vascular Blood Pressure (BP)**
  - **Range:** 0 – 300 mmHg.
  - **Accuracy:** ± 5 mmHg.

### Ventricular Fibrillation

- **Settings:**
  - Very Coarse, Coarse, Medium, Fine, Very Fine
  - **Max Rate:** 300

### Asystole

- **Rate:** N/A

### AV Blocks

- **1st AV-Block**
  - **Rate:** 20-200
  - **Max Rate:** 80

- **2nd AV-Block type 1**
  - **Rate:** 50 @ 5:4, 60 @ 4:3, 70 @ 3:2

- **2nd AV-Block type 2**
  - **Rate:** 44 @ 4:3, 55 @ 4.3/3.3, 56 @ 2.1

- **3rd AV-Block**
  - **Rate:** 30, 50, 60

### Torsade de pointes

- **Rate:** 180

---

* *Rates are nominal ventricular rates. Actual rate may vary.*
QRS Types
Seven different QRS waveforms named “A” to “G” can be selected. Available QRS types vary with each basic rhythm.

Supraventricular QRS types for: Sinus, A-tach, A-flutt, A-fib, Junctional, 1°AVB, 2°AVB types 1 and 2, 3°AVB (high rates), PACs and PJCs.

A. Normal upright QRS-T.
B. Upright QRS with ST depression and T inversion.
C. Upright QRS with ST elevation.
D. BBB. Broad R-wave with T inversion.
E. Biphasic QRS with T inversion.
F. QS with ST elevation.
G. BBB. Broad S-wave with upright T.

Ventricular QRS types for: Idioventricular, V.Tach. and PVCs:

A. Broad rS wave.
B. Broad R wave.
C. Broad QS wave
D. Broad QS wave. Same as C.
E. Broad R wave.
F. Broad Rr Wave.
G. Broad Rr Wave. Same as F.

Heart Sounds
Heart sounds are synchronized to ECG.

Normal
Aortic Stenosis
Austin Flint Murmur
Systolic Murmur
Stills Murmur
Atrial Septal Defect (ASD)
Ventricular Septal Defect (VSD)
Pulmonary Stenosis
Breath Sounds
Breath sounds are synchronized to breathing rates, adjustable from 0 – 100 breaths / min.

- Normal Breath Sounds
- Coarse Crackles
- Fine Crackles
- Pneumonia
- Wheeze
- Rhonchi
- Stridor
- Wheezes

Vocal Sounds

- Content
- Hiccups
- Grunting
- Strong Cry
- Weak Cry
- Cough
- Scream

Blood Pressure
Pressure range: 0 - 300 mmHg
Accuracy: +/- 4 mmHg
Calibration: Pressure sensor must be calibrated to sphygmomanometer. See Setup menu.

Default Blood Pressures (mmHg): 60/40

Pulse
Available pulses: Right Brachial and Umbilical
Palpated BP: Brachial pulse turns off at 10 mmHg.
Compact Compressor Unit

Specifications:

Model 1008519:
- Voltage: 115VAC
- Frequency: 60Hz
- Max. Current: 6A
- Fuse Rating: 250V, 6A, Slow Blow
- Air Outlet Pressure: 15 psi
- Air Flow: 9 L/min
- CO₂ Inlet Pressure: 60-90 psi
- CO₂ Outlet Pressure: 10 psi
- Dim: 7 5/8" X 9 1/4" X 12 1/8"
- Weight: 18 lbs/9 kg

Model 1008537:
- Voltage: 230VAC
- Frequency: 50Hz
- Max. Current: 3A
- Fuse Rating: 250V, 3A, Slow Blow
- Air Outlet Pressure: 1 Bar
- Air Flow: 9 L/min
- CO₂ Inlet Pressure: 4-6 Bar
- CO₂ Outlet Pressure: 0.7 Bar
- Dim: 19.4 cm X 23.5 cm X 30.8 cm
- Weight: 18 lbs/9 kg

Cleaning and Decontamination: Clean Compact Compressor outside only with a soft cloth, mild soap and water. Do not spray with liquid or immerse in liquid. The unit is not intended for use where it might require decontamination. User is responsible for supplying the CO₂. There is no preventative maintenance expected from user.

Environmental Conditions:

Temperature
- Operating: 10 - 40°C
- Storage: 15 - 50°C

Ambient pressure range for storage and use:
- Not applicable

Humidity range for storage and use:
- Humidity - non-condensing 0-90%
Trouble-shooting

SimNewB™ manikin not breathing?
#1  Check that the chest rise is turned on in software.
#2  Check that the compressor is on and is connected to the manikin.
#3  Check that there is a blood pressure - BP of 0/0 will set the breathing rate to 0.
#4  Check that a perfusing rhythm is set.
#5  Check the cable to the Control Unit.
#6  Check the batteries on the Control Unit.
#7  Check that exhaust hose is not occluded or kinked.
#8  Check that lung closures are set to open or partial.
#9  Still not working, call your local Laerdal Technical Support Office.

Control Unit and Remote Control not working?
#1  Check the batteries for both units. Check that the paper shipping strip has been removed from between batteries.
#2  Connect the phone cable from the Remote Control to the Control unit and confirm operation, if working properly, disconnect the phone cable from both Remote Control and Control Unit and check again.
#3  Check the communication from the Remote Control to the Control unit. The Radio Reception Indicator (see Figure 2, page 22) must indicate at least one bar of signal strength.
#4  Still not working, call your local Laerdal Technical Support Office.

Compressor not working?
#1  Check setup instructions.
#2  Check the power connection to the compressor unit.
#3  Check that the source of electrical power works with another device.
#4  Still not working: call your local Laerdal Technical Support Office.

Manikin not making vocal sounds?
#1  Ensure that the Intub/Extub quick execution function is set appropriately.
#2  Check that a breathing rate is set.
#3  Check that a BP is set.
#4  Check that a perfusing rhythm is set.
#5  Check that vocal sound volume is not set to 0.
Trouble-shooting

**Manikin not making heart sounds?**
#1 Check that heart sound is selected.
#2 Check that heart rate is not set to 0.
#3 Check that heart sound volume is not set to 0.
#4 Check that perfusing heart rhythm is set.

**Manikin not making lung sounds?**
#1 Check that lung sound is selected.
#2 Check that lung sound volume is not set to 0.
#3 Check that breathing rate is not set to 0.
#4 Check that lung closures are open or set to partial.

**Manikin not having pulse?**
#1 Check that compressor is on and is connected to the manikin.
#2 Check that pulse is enabled either through software or brachial switch.
#3 Check that BP cuff pressure is below 10mmHg.
#4 Check that perfusing heart rhythm is not set to 0.
#5 Check that umbilical cord is inserted all the way into reservoir.

**Manikin not having good motions?**
#1 Check that compressor is on and is connected to the manikin.
#2 Check that motion is enabled in software.
#3 Check that exhaust hose is not occluded or kinked.
#4 Check that limbs are not bound by cables or blanket.
#5 Powder limb joint areas to reduce friction.

**Laptop or any other peripherals not working?**
#1 Call your local technical product manufacturer for support.