

EasySim[®] SL-9H Patient Simulator Operator's Manual



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CAUTION:

Risk of explosion if lithium battery is replaced by an incorrect type. Dispose of used batteries according to country and state specific laws and regulations.

Compliant products conforming to the relevant standards and directives required for CE have a CE Mark label, as shown below, affixed to the unit. CE Marked products also comply with the WEEE directive for category 9 Monitoring and Control Instrumentation products. Do not dispose of this product as unsorted waste. To dispose, contact Pronk Technologies at support@pronktech.com. A Return Material Authorization will be issued to return the unit for disposal.



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Introduction

The **EasySim** simulator is a compact, rugged, easy to use full, featured training simulator with the features listed below. EasySim should be used for education and training purposes only and should not be used for testing where a NIST traceable calibration is required.

- 10 Snap/Banana plug ECG, Resp and Pacer Simulation.
- 4 Invasive Blood Pressure Channels via four 6 pin mini-din connectors.
- Cardiac Output Simulation.
- YSI 700 and 400 Temp Simulation via two 3.5mm stereo jacks.
- Up to 5 Year Battery Life (no charging or changing required).
- 4mm and 1/8in banana plug grooves for easy hook up to 12 lead carts.
- Hundreds of different simulations at the press of a button.

Getting Started

1. Turning the EasySim Simulator on/off

- You never have to. The EasySim simulator runs all day, every day for up to 7 years on its internal battery.

2. Remote Control Keypad Selections

•The Remote Control Key Pad has 48 keys providing user control of ECG and Respiration rates, Rhythms, Invasive Pressure and Cardiac Output simulated values. The first 7 rows of keys (background is green) are for ECG simulations. The 8th row (blue background) gives the user control of respiration simulations. Rows 9, 10 and 11 (pink background) allow control of 4 independent invasive blood pressure channel simulations. The 12th row (yellow background) provides CO as well as a LV/AO pull back simulations.

3. Combining Features

- Many EasySim features can be combined by pressing multiple keys. Examples include:
 - o Tachy, ST Elevation, Bigeminy, Muscle Noise and Ventricular Pace.
 - o Brady, ST deviation Trigeminy, and Atrial-Ventricular Pace.
 - o ECG HR increased to 160 bpm, periodic runs, Aflutter and 2nd degree block type II.
- *Simulations of PVC based rhythms will function up to 170 bpm.

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4. Go Back Feature

- Hitting a rhythm key once enters that rhythm; pressing that key a second time goes back to the prior rhythm.

5. Clear All Feature

- NSR resets all ECG, Resp and IBP features previously pressed.

6. Power Save Feature

- After 2 hours with no key presses, the EasySim simulator will return to the NSR 60 mode.

7. Zeroing Invasive Blood Pressures

- Press the IBP ZERO ON/OFF key once, Zero the pressure channel(s) on the monitor. Once the monitor has zero'd, press the IBP ZERO ON/OFF key a second time or press IBP NORM.

8. Cardiac Output Readings

- Connect Blood Temperature (BT) catheter connection to the EasySim connector labeled C.O.
- If necessary, attach a temperature probe to the Injectate Temperature (TI) connection on the C.O. cable.
- Read room temperature on the monitor.
- Find that temperature (TI) on the chart located on the back of the Remote Key Pad.
- Program the Computational Constant (CC) specified on the chart into the monitor.
- When the monitor is ready for a C.O. run, press the C.O. value desired on the bottom row of the Remote Control Keypad.

Detailed ECG Operation

• Connecting the ECG Leads

ECG lead wires with snaps can be connected directly to the SimSlim simulator snaps. The snaps are clearly labeled with the name and color code of the lead. If your lead wires have banana plugs rather than snaps, the banana plugs are slid into the grooves under the snap such that the metal part of the plug is against the underside of the snap. Two different size grooves provide for different size banana plugs.



• ECG Size

ECG size is 1mV in Lead II in all modes. Resp size is 1.9 Ohms in all modes.

• ECG Rate Selection

The label on the front of the remote control provides 5 keys outlined in black in the upper left hand corner for selecting different ECG heart rates (NSR 60, Tachy 145, Brady 45 and HR▲and ▼ by 10 bpm).

Examples:

To simulate 125 bpm press Tachy 145 then press HR ▼ two twice.

To simulate 55 bpm press Brady 45 then press HR ▲ once.

To simulate 205 bpm, press Tachy 145 then press HR ▲ 6 times.

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• ST elevation and deviation

In the upper right hand corner of the front of the remote control label, there are 3 ST keys (ST▲, ST▼ and ST 0) outlined by a white border. ST▲ increases the ST segment (elevation) by approximately 1.0mm and the ST▼ key decreases the ST segment (deviation) by approximately 1.0mm. To return to normal ST, press ST 0.

Example:

To simulate an ST elevation of 3.0mm, press ST▲3 times.

• ECG Rhythm Selection

There are a total of 16 Rhythm selection keys outlined by both yellow and blue. Those rhythm keys outlined in yellow (PVC, Couplet, Run and Pause), if pressed, will trigger a single event on the waveform. Those rhythm keys outlined in blue (NSR+PVC, VTACH, VFIB, Asystole, BIGEMINY, TRIGEMINY, AFIB, AFLUTTER, 1st DEG BLOCK, 2nd DEG BLOCK TYPE I, 2nd DEG BLOCK TYPE II and 3rd DEG BLOCK) represent simulations that will run continuously until another rhythm is pressed (or NSR 60).

Examples:

To simulate couplets, press the COUPLET key. Each key press will result in a single couplet. To simulate 2nd DEG BLOCK TYPE 1 with a periodic PAUSE, press 2nd DEG BLOCK TYPE 1 then press PAUSE periodically. 2nd degree block rhythm will continue until the key is pressed a second time, another rhythm is selected or NSR 60 is pressed.

ECG Noise and Pace Selection

There are 4 keys outlined with a white border providing the user with control of ECG muscle noise, baseline noise and Paced patient simulations.

Examples:

Pressing MUSC NOISE ▲ once will produce muscle noise. A second, third, fourth and fifth press of MUSC NOISE will step up the muscle noise in increments. A sixth press, or pressing NOISE OFF, will return the level of muscle noise to normal.

Pressing BASELINE NOISE once will produce baseline noise. A second press, or pressing NOISE OFF, will return the level of baseline noise to normal.

PACE SELECTION provides simulations of Atrial, Atrial-Ventricular and in SW versions 1.5 or later, Ventricular pacemakers. Pressing PACE SELECTION once simulates Atrial, twice simulates Atrial-Ventricular (AV), a third press simulates Ventricular (in Software versions 1.5 or later). A subsequent press turns Pace simulations off.

Detailed Invasive Blood Pressure Operation

• Connecting the Cables

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You will need a monitor specific adapter to connect the EasySim simulator IBP channels to your monitor. A variety of these adapters are available from Pronk Technologies and other sources. A 3' (1m) extension cable is also available from Pronk Technologies since the simulator itself can be very close to the monitor. Most simulator cables with 6 pin mini-din connectors will work, as the 6 pin mini-din simulator IBP pin-out is fairly standard. Wiring is as follows: + Excit = pin 1, - Excit = pin 4, + Sig = pin 3, -Sig = pin 6. Contact Pronk Technologies Inc. at (800) 541-9802 for more information.

The IBP connector channels are labeled on the bottom of the simulator.

- **Sensitivity**

The EasySim simulator simulates 5uV/mmHg transducers.

- **Zeroing Simulated Blood Pressures**

A single press of the IBP ZERO ON/OFF key will force all four IBP channels to 0mmHg for 15 seconds. Zero your monitor at this time. If you desire to return to normal operation prior to the 15 second timeout, a second IBP ZERO ON/OFF key press, or pressing the IBP NORM key will 'unzero' all channels.

- **Invasive Pressure simulations**

Default simulations:

- ART pressure of 120/80 with a mean of 93
 - PA pressure of 32/15 with a mean of 22
 - CVP Pressure of 10/5 with a mean of 8
 - LVP Pressure of 125/1 with a mean of 46
- Each key press of ART▲ or ▼ results in a change of approximately 4 mmHg of mean pressure.
 - Each key press of PA▲ or ▼ results in a change of approximately 1 mmHg of mean pressure.
 - Each key press of CVP▲ or ▼ results in a change of approximately 1 mmHg of mean pressure.
 - Each key press of LVP▲ or ▼ results in a change of approximately 2 mmHg of mean pressure.

Pressing IBP Norm returns all four channels of Invasive Pressure to the default values.

- **CVP SWAN MOVE**

Each key press of CVP SWAN MOVE will advance IBP on CVP port to: CVP, RV, PA, Wedge, PA, RV, CVP. Adjusting the pressure values during the CVP SWAN MOVE simulation can be made using the PA UP/DOWN arrow keys for the RV, PA and Wedge parts of the sequence. The CVP part of the sequence can be size using the CVP UP/DOWN arrow keys.

Respiration artifact will also be present for the PA and Wedge sequences of the CVP SWAN MOVE but not on RV and CVP.

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- **LV to AO Pull Back**

Each key press of LV/AO PULLBACK will advance IBP on the LV port to: LV, AO, LV, and AO. Adjusting the pressure values during this simulation can be made with the LV UP/DOWN arrow keys for the LV part of the sequence and the ART UP/DOWN arrow keys for the AO portion.

NOTE: In order to display an AO waveform during this sequence, the LV systolic value must be equal to or greater than the diastolic value of the AO simulation. Otherwise the AO systolic and diastolic pressure displayed will be equal values and the AO waveform will be static.

- **Arterial Intra-Aortic Balloon Pump Feature**

Pressing the ART IABP ON/OFF key simulates a waveform on the Arterial pressure channel representing the change in waveform resulting from an intra-aortic balloon pump. Pressing the key a second time, or pressing IBP NORM, will turn off this feature.

Detailed Cardiac Output Operation

- **Connecting the Cables**

The EasySim simulator is designed to operate with or without a custom C.O. cable. You can use the monitor's normal C.O. cable if a custom cable is not available. The connections are as follows:

1. Connect the Monitor's C.O. cable to the monitor.
2. Connect the Catheter connector on the C.O. cable to the C.O. port on the EasySim simulator.
3. Make sure the normal injectate temp sensor/probe is connected to the C.O. cable. The injectate temp sensor should be left at room temperature. It need not be placed in a bath of any kind, but for best results place it somewhere the temperature will be room temperature and relatively stable (i.e. not directly under a hot lamp or in your hand).

- **Reading the Injectate Temp**

With the cables connected correctly, you should be able to read the room temperature as measured by the injectate probe from the monitor.

- **Looking up the Computation Constant (C.C.) Value**

Once you know the current injectate temp, look up the C.C. value from the table on the back of the EasySim Remote Key Pad. Once you have the correct C.C. value, enter it into the monitor.

The granularity of the C.C. table on the EasySim simulator can introduce up to a 3% error in the readings. This should be fine for most applications, but if you want better precision, you can interpolate between values. For example, if your injectate temp was 25.7C you would look up the value for 25.5 (0.522) and the value for 26 (.545) and split the difference (0.533).

If you want to use an injectate temp value that is not in the table, you can calculate the correct C.C. value according to $C.C. = 6 / (37 - T)$.

• **Starting a Simulated Injection**

Once you have programmed the appropriate computational constant into the monitor, and the monitor is "ready" for an C.O. injection, simply press one of the yellow C.O. keys on the remote key pad to simulate 3, 5 or 7 l/m.

If you are doing C.O. simulations for a long period of time, keep in mind that the injectate temperature may drift and the C.C. value may have to be updated from time to time for best accuracy.

• **Using an Injectate Temp Simulator**

It is possible to use an injectate temp simulator rather than the actual injectate temp probe. Unfortunately, different monitor vendors use such a wide variety of thermistors and connectors for injectate temperature, that Pronk Technologies cannot supply these. One solution is to fabricate an injectate temp simulator locally from an injectate probe and some resistors. Some vendors use YSI 400 or YSI 700 thermistors for injectate temp. In these cases, the internal YSI temp simulator in the EasySim simulator can be used.

Detailed YSI Temp Operation

• **Connecting the Cables**

The EasySim simulator has two 3.5mm temp ports. The upper port is YSI 400 and the lower port is YSI 700. The EasySim simulator comes supplied with a 3.5mm male to male stereo extension cable and 3.5mm to 1/4" stereo plug converter. This should be everything you need to simulate temperature on monitors which use 1/4" or 3.5mm stereo jack for temperature monitoring. Some monitors use different connectors and these will require additional adapters.

• **Selecting the Simulated Temperature**

Move the slide switch to select the desired temperature simulation values.

Troubleshooting Tips

TROUBLESHOOTING TIPS	
SYMPTOM	SOLUTION
Not calling VTACH or VFIB	Some arrhythmia systems will not call VTACH on a straight jump out of clean NSR. In some cases it may be necessary to let the arrhythmia system see some PVCs prior to transitioning into VTACH.
Not picking RESP waveform	Most monitors look for respiration drive across RA/LA leads. Some do not. If RESP waveform is not picking, try swapping the RL and LL leads.
No Heart rate on EASI configured telemetry	When viewing AVR or V2 lead, change the V1 lead to V6 snap.
Unable to resolve problem	Contact Pronk Technologies Technical Support at: (800) 541-9802

EasySim Simulator Limited Warranty

The EasySim simulator is warranted against defects in materials and workmanship for a period of forty-eight (48) months from the date of shipment to the original purchaser. Warranty is valid only to the original buyer. Defective equipment should be returned freight prepaid to Pronk Technologies. Equipment returned with defective parts and assemblies shall be either repaired or replaced at the manufacturer's sole discretion. This warranty is not applicable if the unit has been opened, if repair has been attempted, if the unit has been damaged due to operation outside the environmental and power specifications for the product, or due to improper handling or use.

If any fault develops, notify Pronk Technologies (see Returns and Repairs, below) giving full details of the difficulty, and include the model and serial number of the device. Upon receipt of shipping instructions, forward the device prepaid and repairs will be made at the factory.

The foregoing warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty or merchantability, fitness or adequacy for any particular purpose or use. Pronk Technologies shall be liable only for repair or replacement of the EasySim Simulator and optional features. Pronk Technologies shall not be liable for any incidental or consequential damages.

Order Cancellation and Refund Policy

You may return your item within 14 days of delivery for a full refund. We are unable to exchange items (however, if you received a defective or incorrect item, we will be happy to make an exchange). Item(s) returned for refund must be in its original condition, undamaged and with no missing parts, packed in its original packaging, and include both the original receipt and an RMA number.

We will notify you via e-mail or fax of your refund once we have received and processed the returned item. You can expect a refund in the same form of payment originally used for purchase within 7 to 14 business days of our receiving your return.

Returns and Repairs

Please call Pronk Technologies' Service Department at 800-541-9802 to obtain a Return Merchandise Authorization (RMA) number and the shipping address. Returns should be packaged securely in the original packaging materials. The RMA number should be clearly marked on the packaging. If the return is for a new item and is a result of our error, we will make arrangements for payment of return shipping. Otherwise, items should be returned freight prepaid to Pronk Technologies.

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