

# Multi-Parameter Simulators

## Patient Simulator Series

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### Features - PS-2200 Series

- ◆ Simple to Operate
- ◆ Independent Lead Outputs produce a true 12 Lead ECG Signal
- ◆ 1, 2 or 4 Invasive BP Channels
- ◆ All BP Waveforms Available on all BP Channels
- ◆ 49 Arrhythmia Selections
- ◆ Respiration & Temperature Simulation
- ◆ ECG Performance Waveforms
- ◆ Dual Graphical Displays with Backlighting
- ◆ Drop Down Choice Screens List all Options for Parameters
- ◆ Special Power Up Feature allows user to choose to use default, last or custom settings
- ◆ Auto Sequences for BPM, Static-Pressure Levels & Performance
- ◆ 10 AHA & European Color Coded Universal Patient Lead Connectors (with enough space between posts for the large diameter connectors)
- ◆ Mini DIN Connectors Compatible with Standard BP Cables (Optional Mini DIN-M to DIN-F Cable Adapter)
- ◆ % Battery Life & Low Battery Indicator
- ◆ Powered by Two 9V Batteries or Included Universal Battery Eliminator
- ◆ Full Remote Operation via RS-232
- ◆ Flash Programmable, Field Upgradeable
- ◆ Battery Eliminator

### Optional

- ◆ SpO<sub>2</sub> Simulation
- ◆ Cardiac Output
- ◆ Fetal/Maternal Output
- ◆ Remote PSR-2200

1-888-223-6763 - [bcgroupintl.com](http://bcgroupintl.com)



### PS-2240

The PS-2200 Multi-Parameter Patient Simulator Series are the most comprehensive, easy-to-use simulators on the market. These new portable simulators are intuitive to use since there are NO MORE CODES to enter.

Each model provides ECG, Blood Pressure, Respiration and Temperature Simulation. Models are available with one, two or four independent blood pressure outputs. All models will support the Fetal/Maternal, SpO<sub>2</sub>, Cardiac Output and PSR-2200 Remote options.

The PS-2200 Series makes viewing and selecting the desired waveforms and parameters quick and intuitive. All operational information is available at the same time on two cursor-based graphic displays, allowing for easy maneuvering through parameters and scrolling through available options.

# SPECIFICATIONS

ECG NSR	
Rate	30, 40, 45, 60, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300 BPM
Accuracy	± 1%
Amplitude	.05, .10, .15, .20, .25, .30, .35, .40, .45, .50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV
Accuracy	± 2% @ Lead II
High Level	200 times Amplitude
Accuracy	± 5%
QRS Interval	Adult (80ms), Pediatric (40ms)
ST Segment (Elevation)	± 0, .05, .1, .2, .3, .4, .5, .6, .7, .8 mV
ECG Performance	
Sine Wave	0.1, 0.5, 5, 10, 40, 50, 60, 100 Hz
Square Wave	0.125, 2.000 Hz
Triangle Wave	2.000, 2.500 Hz
Pulse Wave	30, 60, 120 BPM; 60 ms
Amplitude	.05, .10, .15, .20, .25, .30, .35, .40, .45, .50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV
R-Wave (Havertriangle)	
Rate	30, 60, 80, 120, 200, 250 BPM
Width	8, 10, 12, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 130, 140, 150, 160, 170, 180, 190, 200 ms
Amplitude	.05, .10, .15, .20, .25, .30, .35, .40, .45, .50, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 mV
Rate Accuracy	± 1%
Amplitude Accuracy	± 2% @ Lead II
R-Wave <= 20 ms	± 5% @ Lead II
Blood Pressure	
Channels	1 – PS-2210 2 – PS-2220 4 – PS-2240
Static Pressure	-10, -5, 0, 20, 40, 50, 60, 80, 100, 150, 160, 200, 240, 250, 300, 320, 400 mmHg
Accuracy	± (2% of Reading + 2 mmHg)
Impedance	300 Ohms
Accuracy	± 10%
Excitation Range	2 to 16 V RMS
Excitation Frequency	DC to 5 KHz
Sensitivity	5 or 40 µV/V/mmHg
Respiration Artifact	0 to 16 mmHg
Remote(Option)	
Fully compatible with PSR-2200	

Pacemaker Waveforms	
Amplitude	1, 2, 3, 4, 5, 6, 7, 8, 9, 10 mV
Accuracy	± 10%
Width	0.1, 0.5, 1.0, 1.5, 2.0 ms
Accuracy	± 5%
Rate	75 BPM
Accuracy	± 1%
Respiration	
Rate	Apnea, 15, 20, 30, 40, 60, 80, 100, 120 BrPM
Accuracy	± 1%
Impedance delta	0.1, 0.2, 0.5, 1.0, 2.0, 3.0 Ω
Accuracy	± 10%
Baseline	500, 1000, 1500, 2000 Ω
Accuracy	± 5%
Lead	LA or LL
Temperature	
Temperature	0, 24, 30, 37, 40 °C (32.0, 75.2, 86.0, 98.6, 104.0 °F)
Accuracy	± 0.1 °C
Type	YSI Series 400 and 700
Fetal / Maternal	
Fetal Heart Rate	60, 90, 120, 140, 150, 210, 240 BPM
Inter Uterine Pressure Response Types	Uniform Deceleration Early Deceleration Late Deceleration Uniform Acceleration
IUP Wave	Bell Curve with 90 mmHg Peak and 90 Sec Width
IUP Trigger	Manual Auto: 2,3,5 Minute
Cardiac Output	
Injectate Volume	10 cc
Injectate Temperature	0 °C or 24 °C , ± 2%
Calibration Coefficient	0.542 (0 °C Inj), 0.595 (24 °C Inj)
Blood Temperature	37 °C (98.6 °F), ± 2%
Cardiac Output	2.5, 5.0, 10.0 l/min, ± 5%
Simulations	Normal Flow Faulty Injectate Left-to-Right Shunt Temperature Calibration Pulse
Temperature Calibration Pulse	1.5 °C Down for 1 sec, ± 1%
Catheter Type	Baxter Edwards, 93a-131-7f
SpO <sub>2</sub> Simulation (MSP-2100 & Finger SIM™ Req'd.)	
Rate	30 to 300 BPM
SpO <sub>2</sub> Output	80, 90 & 97%

PS-2220

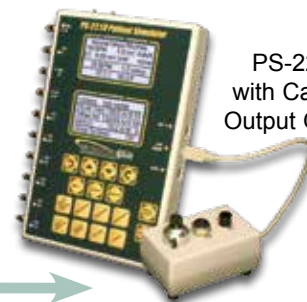


## COMPARE

**To Compare Patient Simulators, see chart on Page 14.**

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PS-2210 with Cardiac Output Option



## Features - PSR-2200 Remote

- ◆ Large easy-to-read 128 x 64 pixel Graphical LCD Display
- ◆ Small & Lightweight
- ◆ 10 Default Output Keys (adjustable)
- ◆ 18 Programmable Keys
- ◆ 25-foot Coiled Cord
- ◆ Easily Access Each and Every Output Waveform, Rate and Level of Your Patient Simulator
- ◆ Over 20 hours of Operation from a Single 9V Battery
- ◆ Up to 30 hours of Trended Data Output
- ◆ Endless Looping Capability on Trended Data
- ◆ 180 User-Programmable Steps for Waveform Output
- ◆ Virtually Unlimited User-Configured Waveform One-Touch Key Output Configurations through Use of the PSR-2200 PC Software Utility
- ◆ “Clone” a Specific Remote Control Setup to Other Remotes
- ◆ Flash Programmable, Field Upgradeable
- ◆ Powerful yet Remarkably Easy to Use Companion PC Software Setup Utility
- ◆ Can be Configured to Work With Competitive (Non BC Biomedical Brand) Patient Simulators

## Optional

- ◆ USB to Serial Port Adapter



## PSR-2200

The PSR-2200 Programmable Patient Simulator Remote Control with Trending Capability brings an unprecedented level of functionality and ease-of-use to patient simulator remote control. How would you like to have all of your patient simulators' outputs available to you on a handheld, easy to use remote control, up to 25-feet away from your simulator? There's nothing else on the market that even comes close to the PSR-2200.

You can easily access every output waveform of your patient simulator without ever touching it! Control outputs from NSR, Arrhythmias, Resp, Temp, CO, ECG and Resp artifact, ST Elevation Levels, to Performance Waves, etc. Use the included PC Software utility to assign any outputs you like to any of the 18 programmable keys. Configure sequences (trends) to any of these keys that will run from 1 to 600 seconds per step. “Daisy-chain” the 18 programmable keys to provide up to 30 hours worth of unique trended patient data. Save a virtually unlimited number of configurations. Set up one remote and then “clone” the setup to as many remotes as you want. You can also e-mail PSR-2200 configuration files. The PSR-2200 is Flash upgradeable in the field, ensuring that your device will never become outdated.

## SCREEN VIEWS

Easy to read display shows current simulator outputs. Run programmed sequences & know where you are in the sequence.

Normal Sinus Rhythm	
80 BPM	1.0 mV Adult
ST: 0.0 mV	Artf: none
30 BrPM	3.0 ohms
37.0 C	98.6
SEQS:01:008	

Key Number	Sequence Step	Time until next step
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Even BP outputs can be displayed with a push of one key.

1)Static	0 mmHg
2)Static	0 mmHg
3)Static	0 mmHg
4)Static	0 mmHg
Group Settings:	N/A

Assign names to each of the 18 programmable keys.

Key List	
12)NSR	30Bpm Apnea
13)Pace	Atrial 10mV
14)Perf	Sine 50Hz
15)Fetal	Auto 5min
16)Cardiac	Faulty Inj

Select outputs from any simulator waveform or output group.

Operating Mode
Normal Sinus Rhythm
Arrhythmias
Pacemaker
Performance
Fetal/Maternal

### Compatibility

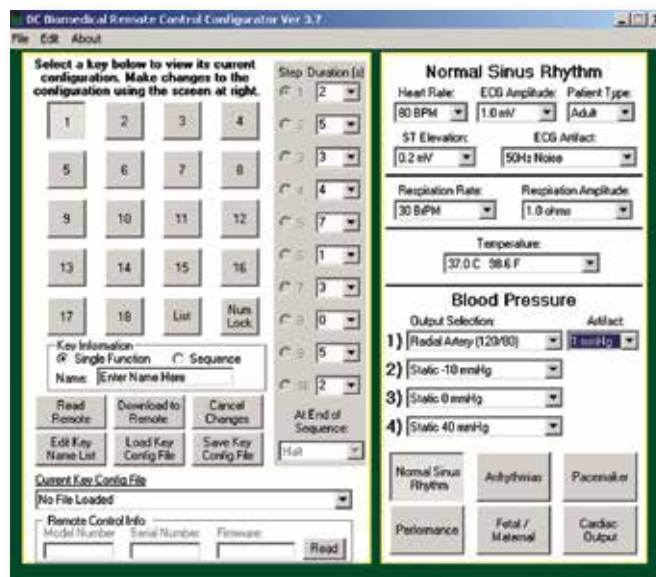
For Microsoft® Windows Operating systems

100% compatible with the BC Biomedical PS-2200 Family of Patient Simulators (older simulators may require a Flash firmware upgrade, which can be accomplished in the field with a special software update utility). The PSR-2200 can be configured by special request to work with competitive brand patient simulators from leading manufacturers.

## Specifications

Display	LCD Graphical 128 x 64 Pixels
Enclosure	5.98 x 3.27 x 1.28 Inches, ABS Plastic
Weight	< 1 Lbs
Faceplate	Lexan, Back printed
Operating Range	15 to 40 °C
Storage Range	-20 to 65 °C
Interface Cable	25' Coiled Cord
Power	One alkaline battery, 9V (NEDA 1604 - battery life > 20 hours)

## PROGRAMMING SOFTWARE



The PSR-2200 comes with a Microsoft® Windows-Based Application Program that allows the user to quickly and easily develop and upload almost any configuration. Complex testing and trending routines can easily be generated and saved.

The software is self-installing and designed to mimic the simulator screens, so there is almost no learning curve, just point and click. The software works with both RS-232 and USB ports and will automatically find the PSR-2200 and identify it. Single click uploading (writing to) and downloading (reading from) the PSR-2200 allow for full cloning and file transfers.

# Patient Simulator Series

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Patient Simulator Series



## Features - PS-2100 Series

- ◆ Simple to Operate
- ◆ Independent Lead Outputs Produce a True 12 Lead ECG Signal
- ◆ One Invasive BP Channel (PS-2110)
- ◆ Arrhythmia Selections
- ◆ Resp & Temp Simulation (PS-2110)
- ◆ ECG Performance Waveforms
- ◆ Graphical Display with Backlighting
- ◆ Drop Down Choice Screen List All Options for Parameters
- ◆ Special Power Up Feature Allows the User to Choose to use Default, Last or Custom Settings
- ◆ Auto Sequences for BPM, Static-Pressure Levels & Performance
- ◆ 10 AHA & European Color Coded Universal Patient Lead Connectors (with Enough Space Between Posts for the Large Diameter Connectors)
- ◆ Mini DIN Connectors Compatible with Standard BP Cables (Optional Mini DIN-M to DIN-F Cable Adapter)
- ◆ % Battery Life Display & Low Battery Indicator
- ◆ Powered by Two 9V Batteries or Included Universal Battery Eliminator
- ◆ Full Remote Operation via RS-232
- ◆ Flash Programmable, Field Upgradeable
- ◆ Battery Eliminator

## Optional

- ◆ SpO<sub>2</sub> Simulation



## PS-2110

The PS-2100 Patient Simulator Series offers cost effective simulation with many features. If you only need ECG simulation, the PS-2105 offers all of the features you need. If you want basic Multi-Parameter simulation, the PS-2110 is the right choice. It provides ECG, Blood Pressure, Respiration and Temperature Simulation, plus limited Fetal/Maternal Simulation.

The PS-2100 Series makes viewing and selecting the desired waveforms and parameters quick and intuitive, with all operational information being available at the same time on the cursor-based graphic display, allowing for easy maneuvering through parameters and scrolling through available options.

# PS-2105 SPECIFICATIONS

ECG Functions	
Rate	30 to 300 BPM
Amplitude	0.05 to 5mV
S-T Segment Elevation	± 0.05 to 0.8 mV
Artifacts	50 Hz, 60 Hz, Muscle, Baseline Wander, Respiration
QRS Interval	Adult (80 ms) or Pediatric (40 ms)
Arrhythmia Functions	
Arrhythmias	49 different
General Groups	Supraventricular, Premature, Ventricular, Conduction
Triggering	Manual & Automatic
Pacemaker Functions	
Waveforms	Atrial, Pacer, Asynchronous, Non-Capture, Non-Function, Demand - Occasional, Demand - Frequent, AV - Sequential
Pulse Height	1 to 10 mV
Pulse Width	0.1 to 2 ms
ECG-Performance Functions	
Sine Waves	0.1 to 100 Hz
Square Waves	0.125, 2 Hz
Triangle Waves	5, 2.5 Hz
Pulse Waves	30, 60, 120 BPM; 60 ms Width
Amplitude	0.05 to 5 mV (Lead II)
Automatic Mode	Yes
R Wave Rate	30, 60, 80, 120, 200, 250 BPM
R Wave Width	8 to 200 ms
R Wave Amplitude	0.05 to 5 mV (Lead II)
Training	
Timer	Manual, 10, 15, 20, 25, 30 s
Randomizer	Off, On
Arrhythmias	All, Subset
SpO <sub>2</sub> Simulation (MSP-2100 & FingerSim™ Req'd.)	
Rate	30 to 300 BPM
SpO <sub>2</sub> Output	80, 90 & 97%

# PS-2110 SPECIFICATIONS

ECG Functions	
Rate	30,60,80,120,180,240,300 BPM
Accuracy	± 1%
Amplitude	0.5, 1.0, 1.5, 2.0 mV
Accuracy	± 2% @ Lead II
High Level	200 times Amplitude
ECG Performance	
Sine Wave	0.1,0.5,5,10,40,50,60,100 Hz
Square Wave	0.125, 2.000 Hz
Triangle Wave	2.000 Hz
Rate Accuracy	± 1%
Amplitude Accuracy	± 2% @ Lead II
Blood Pressure	
Static Pressure	0,20,40,80,100,200,250,300 mmHg
Accuracy	± (2% of Reading + 2 mmHg)
Impedance	300 Ω
Accuracy	± 10%
Excitation Range	2 to 16 V RMS
Excitation Frequency	DC to 5 kHz
Sensitivity	5 or 40 μV/V/mmHg
Respiration	
Rate	Apnea,15,20,30,40,60,80,100,120 BrPM
Accuracy	± 1%
Impedance delta	0.1,0.2,0.5,1.0,2.0,3.0 Ω
Accuracy	± 10%
Baseline	500,1000 Ω
Accuracy	± 5%
Lead	LA or LL
Temperature	
Temperature	30,37,40 °C (86.0,98.6,104.0 °F)
Accuracy	± 0.1 °C (± 0.1 °F)
Type	YSI Series 400 and 700
SpO <sub>2</sub> Simulation (MSP-2100 & FingerSim™ Req'd.)	
Rate	30 to 300 BPM
SpO <sub>2</sub> Output	80, 90 & 97%



PS-2105

## COMPARE



PS-2110 with (optional) MSP-2100 & FingerSim™

To Compare Patient Simulators, see chart on Page 14

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## Overview - PS-2010

The PS-2010 is the perfect tool for providing a 10 lead wire hook up for those diagnostic 12 lead ECG machines. This small, lightweight, feature packed simulator is a must for your test equipment tool box.

- ◆ 10 AHA & European Color Coded Leads
- ◆ Normal Sinus Rhythm & Performance Waveforms
- ◆ Universal Connectors
- ◆ Lead Test

PS-2010



## Overview - PS-2006

The PS-2006 is unique in the market place. Many of the new monitors now being released have a six lead configuration. By popular demand, the PS-2006, six lead ECG/PVC simulator was developed. Press a button and insert PVCs into the ECG trace.

- ◆ 6 AHA & European Color Coded Leads
- ◆ Normal Sinus Rhythm & Performance Waveforms
- ◆ Snap Connectors
- ◆ PVC Insertion

PS-2006



## Overview - PS-2005

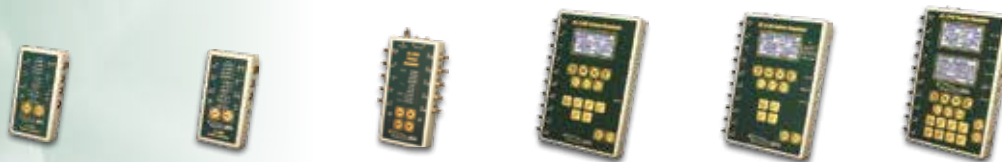
The PS-2005 is a small unit for those who need five lead ECG simulation only and are looking for a cost effective simulator. Need to check your lead wires? There is a built-in lead wire tester for your convenience.

- ◆ 5 AHA & European Color Coded Leads
- ◆ Normal Sinus Rhythm & Performance Waveforms
- ◆ Snap Connectors
- ◆ Lead Test

PS-2005



# Comparison Chart



Models	PS-2005	PS-2006	PS-2010	PS-2105	PS-2110	PS-2200
<b>General</b>						
Display	11 LED	11 LED	11 LED	1 LCD Graphical 128x64 pixels	1 LCD Graphical 128x64 pixels	2 LCD Graphical 128x64 pixels
Backlight	No	No	No	Yes	Yes	Yes
Lead Test Terminals	Yes	No	Yes	No	Yes	Yes
RS-232	No	No	No	Yes	Yes	Yes
Power	1-9 Volt Battery	1-9 Volt Battery	1-9 Volt Battery	2-9 Volt Batteries	2-9 Volt Batteries	2-9 Volt Batteries
Battery Eliminator	No	No	Yes	Yes	Yes	Yes

<b>ECG-NSR</b>	Yes	Yes	Yes	Yes	Yes	Yes
Leads	5	6	10	10	10	10
Rates	4	4	4	17	7	17
Amplitudes	1	1	1	4	4	19
QRS Interval	Adult	Adult	Adult	Adult & Pediatric	Adult	Adult & Pediatric
ST Segment Elevation	No	No	No	19	No	19

<b>ECG-Performance</b>	Yes	Yes	Yes	Yes	Yes	Yes
Sine Waves	3	3	3	8	8	8
Square Waves	2	2	2	2	2	2
Triangle Waves	1	1	1	2	1	2
Pulse Waves	--	--	--	3	--	3

<b>Respiration</b>	No	No	No	No	Yes	Yes
Rate	--	--	--	--	8	8
Baseline	--	--	--	--	2	4
Delta Impedance	--	--	--	--	6	6

<b>Pacemaker</b>	No	No	No	Yes	No	No
<b>Arrhythmias</b>	No	PVC on Demand	No	49	12	49
<b>Blood Pressure</b>	No	No	No	No	1 Channel	1, 2, or 4 Channel
<b>Temperature</b>	No	No	No	No	YSI 400/700	YSI 400/700

<b>Special Modes</b>						
SpO <sub>2</sub> Simulation	No	No	No	w/MSP-2100	w/MSP-2100	w/MSP-2100
Fetal/Maternal	No	No	No	No	Yes	Optional
Cardiac Output	No	No	No	No	No	Optional
Training Mode	No	No	No	Yes	No	Yes
Lead Test	Yes	No	Yes	No	Yes	Yes

<b>Physical</b>	ABS Plastic Case	ABS Plastic Case	ABS Plastic Case	ABS Plastic Case	ABS Plastic Case	ABS Plastic Case
Size	5.12" x 2.56" x .97"	5.15" x 2.89" x 1.06"	7.26" x 4.46" x 1.51"	8.63" x 5.5" x 1.63"	8.63" x 5.5" x 1.63"	8.63" x 5.5" x 1.63"
Weight	< 1 Lbs	≤ 0.5 Lbs (0.23 kg)	< 1 Lbs	< 2 Lbs	< 2 Lbs	< 2 Lbs