# medSim 300B Instrument Specifications

## **ECG Section**

The ECG configuration is 12-lead with independent outputs for each signal lead referenced to RL, and provides:

- A "High Level ECG" output.
- Selectable parameters including rate, amplitude, ST segment deviation, axis deviation, neonatal waveforms, performance waveforms, R-wave detection, PVC focus, PVC timing, PVCs per minute, arrhythmias (32), pacemaker amplitude, and pacemaker width.
- Input for interactive defibrillator training and simulation.

### Normal Sinus Rhythm ECG Waveform Selections

Rate:	30, 60, 80, 120, 160, 200, 240, and 300 BPM
	Accuracy: 1 %
Amplitude:	Lead II
	0.05 mV to 0.5 mV in 0.05 mV steps
	0.50 mV to 5.5 mV in 0.25 mV steps
	The high level output is approximately 0.2 V per mV of the low level output. Selection is either manual or automatic at stepped intervals of 6 seconds
	Accuracy: 5 % on Lead II into a 100 Hz low pass filter
Impedance to the RL Lead:	Limb leads are selectable at 500 $\Omega$ , 1000 $\Omega$ , 1500 $\Omega$ and 2000 $\Omega$ . The V-leads are 1000 $\Omega$
	Accuracy: 5%
ST Segment Deviation (Elevation and Depression):	Lead II at 1 mV
(Elevation and Depression).	
	+0.8 mV to $-0.8$ mV in 0.1 mV steps, also $+0.05$ mV and
	-0.05 mV
	Both manual and auto-stepping modes. Auto-step time interval is 12 seconds
	Operates at ECG rates from 30 to 160 BPM
Axis Deviation:	Horizontal, vertical and intermediate heart positions

# ECG Performance Waveform Selections

Amplitudes are set by "Baseline ECG Amplitude". Amplitude applies to Lead II and V-leads. Lead I is 0.7 times Lead II; Lead III is 0.3 times Lead II. The V-leads are the same as Lead II.

Performance Waveforms	Rates
Zero	Zero output
Pulse	4 seconds
Square	2 Hz
Triangle	2 Hz
Sine	0.05, 0.5, 1, 10, 25, 30, 40, 50, 60, and 100 Hz
R-Wave Detection	Width: 20 ms increments from 20 to 200 ms and two smaller widths of 8 and 12 ms. Auto-step time interval is 6 seconds.
	Amplitude: 0.05 mV to 0.5 mV in 0.05 mV steps; 0.5 mV to 5.5 mV in 0.25 mV steps. Auto-step time interval is 6 seconds.
	R-Wave Rate: 60 BPM

# Arrhythmia Selections

Supraventricular	Atrial fibrillation (1 and 2)
	Atrial flutter
	Sinus arrhythmia
	Missed beat at 80 BPM
	Missed beat at 120 BPM
	Paroxysmal atrial tachycardia (PAT)
	Nodal rhythm
	Supraventricular tachycardia (SVT)
Premature	Premature atrial contraction (PAC)
	Premature nodal contraction (PNC)
	Premature ventricular contraction (PVC)
	Multifocal 1
	Multifocal 2
	Multifocal 3
Ventricular Rhythm	Bigeminy
	Trigeminy
	Couplet (pair of PVCs)
	Run of 5 PVCs
	Run of 11 PVCs

Ventricular Rhythm 2	Ventricular
	Ventricular tachycardia
	Ventricular fibrillation
	Electromotive disassociation
	Asystole
Conduction	First degree A-V block
	Second degree A-V block, type 1
	Second degree A-V block, type 2
	Third degree A-V block
	Right bundle branch block
	Left bundle branch block

Premature Ventricular Contraction (PVC) Parameter Selections

PVC Type	1, 2, 3 and 4

Note

See the "Operation" chapter for descriptions.

PVC Timing	R on T, early and standard

Note See the "Operation" chapter for descriptions.

PVC per Minute	0 to 25. Manual and auto-stepping modes. Auto-step time interval is 60 seconds.
PVC Total	Counts number of PVCs generated. Maximum count is 65535.

#### Insertion Selections

PVCs, PACs, and PNCs can be inserted one at a time by pushing a button. Operates on normal sinus waveforms only and at ECG rates from 30 to 160 BPM.

### Pacemaker Selections

Pacemaker Waveforms	Asynchronous at 75 BPM, continuously paced
	Demand 1
	Demand 2
	Atrial-ventricular sequential
	Non-capture
	Non-function
	Atrial and ventricular pacemaker pulses are set up independently

Pacemaker Amplitude	2 mV steps from -20 mV to +20 mV and settings of ±50, ±100, ±200, ±500, and ±700 mV
	Accuracy is 10 % of setting ±0.2 mV
Pacemaker Width	0.1, 0.2, 0.5, 1.0, and 2.0 ms
	Accuracy is 5 %
	Both "amplitude" and "width" have manual and auto- stepping modes. Auto-step time interval is 6 seconds.
Pacemaker Input	The minimum pulse amplitude is $\pm 0.1$ mA or $\pm 1.5$ V
	The input impedance is 15 k $\Omega$

### **Defibrillator Section**

The simulator has three training scenarios each with a preprogrammed series of ECG waveforms that require clinical intervention with a cardiac defibrillator. The operator interacts with these scenarios by either manually selecting functions on the simulator keyboard, or inputting an attenuated defibrillator discharge signal through the "SYNC" input. This stimulus can be generated by discharging a defibrillator into a Fluke Biomedical defibrillator analyzer. Just connect the analyzer's 1000:1 oscilloscope output to the simulator's "SYNC" input to automatically sequence the ECG waveforms.

Emergency 1:	ECG starts normally, then after 2 PVCs (R on T) it changes to ventricular fibrillation. Defibrillation converts back to normal.
Emergency 2:	ECG starts normally, then changes to ventricular tachycardia, and then to ventricular fibrillation. Defibrillation converts back to normal.
Elective Cardioversion:	ECG shows atrial fibrillation. A properly timed defibrillation pulse converts back to normal. A late defibrillation pulse causes ventricular fibrillation. The cardioversion time window is $\pm 100$ ms from the R-wave peak.
"SYNC/A PACE" Input Level:	A positive voltage transition through $\pm 0.4$ V triggers this input. Maximum voltage is $\pm 35$ V and input impedance is approximately 15 k $\Omega$ .

#### **Respiration Section**

Output Configuration:	The output configuration is Lead I or II/RL-LL
Baseline Impedance:	500, 1000, 1500, and 2000 $\mathbf{\Omega}$
	Accuracy is 5 %
Delta Impedance:	0, 0.1, 0.2, 0.5, 1.0, and 3.0 <b>Ω</b> .
	Accuracy is 10 %
Normal Physiological Rate:	15, 20, 30, 40, 60, and 120 BrPM
	Accuracy is 5 %
Apnea:	Off, momentary, continuous, 12 s and 32 s
Ratio:	5/1, 4/1, 3/1, 2/1 and 1/1 (inspiration/expiration)
Baseline Shift:	The delta impedance is reduced to 1/6 and shifted to

	either "positive" or "negative". The rate is shifted to 120 BrPM for 12 seconds each minute.
Ventilator Simulation:	40 BrPM at fixed ratio, other parameters variable as in "normal"

# **Blood Pressure Section**

Input/Output Impedance:	300 Ω
Exciter Input Voltage Range:	2 to 16 V
Exciter Input Frequency Range:	DC to 4 kHz
Output Sensitivity:	5 or 40 µV/V/mmHg
Output Range:	-10 to +300 mmHg on BP1, BP2 and BP4
	-10 to +30 mmHg on BP3
Accuracy:	±(1 % of full range + 1 mmHg) at 80 BPM, normal sinus rhythm ECG only
Rate:	All dynamic pressures track all normal sinus rhythm rates and track all arrhythmias
Isolation:	Blood pressure circuitry is electrically isolated from all other medSim 300B outputs
Channel 1 (mmHg):	Atmosphere (0)
	Arterial = 120/80
	Left ventricle = $120/0$
	Central venous pressure = $15/10$
	Right ventricle = $25/0$
	Pulmonary artery = $25/10$
	Pulmonary artery wedge = $10/2$
	Static: -10, -5, 0, 20, 40, 80, 100, 200, 250, and 300 Manual or auto-stepping at 12 second intervals
Channel 2 (mmHg):	Atmosphere (0)
	Arterial = 120/80
	Left ventricle = $120/0$
	Central venous pressure = $15/10$
	Right ventricle = $25/0$
	Pulmonary artery = $25/10$
	Pulmonary artery wedge = $10/2$
	Static: -10, -5, 0, 20, 40, 80, 100, 200, 250 and 300 Manual or auto-stepping at 12 second intervals

Channel 3 (mmHg):	Atmosphere (0)
	Central venous pressure = $15/10$
	Right ventricle = $25/0$
	Pulmonary artery = $25/10$
	Pulmonary artery wedge = $10/2$
	Static: -10, -5, 0, 5, 10, 20 and 30
	Manual or auto-stepping at 12 second intervals
	Swan-Ganz: start, insert, inflate, deflate and remove
Channel 4 (mmHg):	Atmosphere (0)
	Arterial = 120/80
	Left ventricle = $120/0$
	Right ventricle = $25/0$
	Pulmonary artery = $25/10$
	Pulmonary artery wedge = $10/2$
	Triangle = 30, 2 Hz
	Triangle = 300, 2 Hz
	Static: -10, -5, 0, 20, 40, 80, 100, 200, 250 and 300
	Manual or auto-stepping at 12 second intervals

# **Temperature Section**

Variable Temperature:	34 °C, 37 °C, 40 °C, hyperthermia, hypothermia, and spike

Note

See the "Operation" chapter for descriptions of waveforms.

Note

"VAR TEMP" is inoperative during the Cardiac Output simulation.

Fixed Temperature:	Fixed at 37 °C
	Channel 2's accuracy is 0.1 °C
Probe Compatibility:	400 and 700 series YSI types
Isolation:	Variable temperature is electrically isolated from the rest of the instrument except Cardiac Output. Fixed temperature is isolated from all other outputs.

# **Cardiac Output Section**

See the "Cardiac Output" option chapter in this manual.

# Artifact Section

#### ECG Artifact

Wave Type:	50 Hz, 60 Hz, muscle, or baseline-wander
Leads:	Any wave type can be added to any limb lead, or to the V-leads, or to all leads
Size:	0.25, 0.5, and 1.0 times the Lead II ECG amplitude setting

## Blood Pressure/Respiration Artifact

Respiration artifact can be injected into any blood pressure waveform. Arterial and left ventricle waveforms are modulated by the selected respiration rate at 5 % or 10 %. All others have respiration added to them at 5 mmHg or 10 mmHg.

### **Sequences Section**

Sequences step through a series of preprogrammed selections.

There are two types of sequences—autosequences and step-sequences. Autosequences run automatically with no display interaction; step-sequences can be started and stopped by the operator. There are three preprogrammed step-sequences and four user-programmable step sequences.

*Note See the "Operation" chapter for more information and a list of the sequences.* 

View Angle:	Down, up and save; saved permanently
Auto Power Off Time:	0.5, 1.0, 2.0, 4.0 and 8.0 hours; and off.
	This is reset each time a key is pressed; saved permanently
Key Beep:	On and off; not saved
RS-232 Baud Rate:	300, 600, 1200, and 2400 baud; saved permanently
Save:	Saves all current settings as power-on conditions

### **Utility Functions Section**

### **RS-232 Serial Port Interface**

The medSim 300B can be interfaced to a personal computer or to the Fluke Biomedical medTester 5000B. Most functions can be controlled remotely except for slide switch controlled functions.

Note

A special cable is required and is available from Fluke Biomedical. Refer to the current Fluke Biomedical Price List for availability, part number information and price.

Baud rates are 300, 600, 1200, and 2400.

Parameter	Specification
Power Requirements	Two 9-volt batteries for 20-hour life or the 9-volt battery eliminator
Temperature Range	Operating: 59 °F to 95 °F; 15 °C to 35 °C
	Storage: 32 °F to 131 °F; 0 °C to 55 °C
Display	2 line x 24 character LCD display
	Weight 3.5 lb; 1.6 kg
Dimensions	7" L x 10" W x 3" H;
	17.78 cm Lx 25.40 cm W x 7.62 cm H

# General Specifications for medSim 300B

# medSim 300B, Options, and Accessories

	Part No.
300B Base Model	
ECG waveforms, blood pressure, respiration and temperature simulations.	2247184
Optional Features	
Option 1 <sup>*</sup>	2399546
Cardiac Catheterization; Fetal/Maternal ECG with Intrauterine Pressure; Intra-aortic Balloon Pump	
Cardiac Output Option <sup>*</sup>	2399638
Provides cardiac output simulations	
medSim Controller Option (HHC3 Handheld Controller)	2645641
Provides direct push-button access to the medSim 300B	
Combined Cardiac Output and Option 1*	2399728
medSim 300B Accessories	
Standard	
9-volt Battery Eliminator 115-230 VAC	2183983
Soft Vinyl Carrying Case	2392826
Operating and Service Manual	2243039
Two 9-volt alkaline batteries	

Optional <sup>**</sup>	
Blood Pressure Cables	
Temperature Cables	
RS-232 Interface Cables	
Option 1 Cables	

Note

See the "Option 1" chapter also.

Cardiac Output Option Cables

Note

See the "Cardiac Output" chapter also.

Note

See the HHC3 Handheld Controller (PN2645641) Users Manual for all information regarding the controller's operation.

Note

\* These part numbers to be used at original time of order only. Contact Fluke Biomedical for field upgrade kits covering these options.

\*\**Refer to the current Fluke Biomedical Price List for availability, part number information and price.*