

medSim 300B

Patient Simulator

Technical Data



The full-featured medSim 300B is the most versatile patient simulator on the market today. It is designed to meet the most complex inspection requirements and offers comprehensive simulation with a wide range of features for trend testing. The base model includes 12-lead ECG, 4 blood pressure channels, and respiration and temperature simulation. Preset waveform sequences, along with 15 programmable sequences, simulate a broad range of physiological events.

Two expansion options are available to give the device even greater versatility. Expansion Option 1 features cardiac catheterization, intra-aortic balloon assist pump (IABP), and direct fetal/maternal ECG/intrauterine pressure (IUP) simulation. The cardiac output simulation option features fixed waveforms, 3 trending sequences, and normal and defective curves to verify performance of cardiac output computers.

The medSim 300B is portable, and an optional handheld controller makes testing easy and convenient. For automated testing and documentation capability, the medSim 300B is compatible with medTester 5000C, Fluke Biomedical's automation hub for biomedical equipment testing.

Key Features

- 12-lead ECG simulation
- Four invasive blood pressure channels, including Swan-Ganz simulation
- Respiration and temperature selections
- Interactive defibrillator training capability
- Preset waveform sequences and 15 programmable sequences that simulate a wide range of physiological events for trend testing
- 32 arrhythmia selections
- Battery operated
- RS232 serial port for computer control
- Compatible with medTester 5000C for automated testing and documentation

Optional Features

- Option 1 expansion (cardiac catheterization; intra-aortic balloon assist pump [IABP] simulation; direct fetal/maternal ECG/intrauterine pressure [IUP] simulation)
- Cardiac output simulation (23A Controller)

Technical Specifications

Sync: Input accepted during defib training and intra-aortic balloon assist pump (IABP) augmentation (option 1)
RS232 Interface: With the exception of those functions controlled by slide switches, most functions may be controlled remotely. Non-programmable functions include all utilities. Optional RS232 cable required for remote control via PC
Baud Rate: 300, 600, 1200, and 2400

ECG General

Lead Configuration: 12-lead ECG with 9 independent outputs for each signal lead referenced to RL
Output Impedances: 500, 1000, 1500, and 2000 Ω to RL
High-Level Output: 0.2 V per mV of low-level selection
Amplitude Accuracy: $\pm 5\%$ 2 Hz square wave at 1 mV p-p (lead II)

PVC Parameter Selection

Premature Beat Insertion: Push-button insertion of PVC, PAC, and PNC during 30 BPM to 160 BPM normal sinus rhythm
Types: 1, 2, 3, and 4 (ventricular sites)
Timing: R on T, early, and standard; 0/min to 25/min with manual-stepping and autostepping modes; autostep interval: 60 s
Count: Number of PVCs generated (65535 max)

Pacemaker

Rhythms: Async 75 BPM, demand 1, demand 2, AV sequential, non-capture, non-function; independent settings for atrial- and ventricular-pacer pulses
Pulse: -700 mV to + 700 mV (29 levels), accuracy 10% of setting ± 0.2 mV
Width: 0.1, 0.2, 0.5, 1.0, and 2 ms, accuracy 5%
Manual and autostepping modes for both amplitude and width (autostep time interval of 6 s)
Pulse Polarity: Positive or negative
Min. Pulse Amplitude: ± 0.1 mA or ± 1.5 V
Input Impedance: 15 k Ω

Arrhythmia Selections

Baseline Rate: 80 BPM

Supraventricular

Atrial fibrillation 1, atrial fibrillation 2, atrial flutter, sinus arrhythmia, missed beat 80 BPM, missed beat 120 BPM, paroxysmal atrial tachycardia (PAT), nodal (PNC), supraventricular tachycardia

Premature Beats

Atrial (PAC), nodal (PNC), PVC, multifocal PVCs

Conduction Defects

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

Ventricular Rhythms

Frequent multifocal PVCs 24/min, bigeminy, trigeminy, pair PVCs, run of 5 PVCs, run of 11 PVCs, ventricular tachycardia, V-Fibrillation (fine), V-Fibrillation (coarse), dying heart complex (EMD), asystole
Pacemaker: (See "Pacemaker" section.)

Premature Ventricular Contraction (PVC) Parameter Selections

PVC Type: 1, 2, 3, and 4
PVC Timing: R on T, early, and standard
PVC Per Minute: 0 to 25, manual and auto-stepping modes; auto-step time interval is 60 s
PVC Total: Counts number of PVCs generated; maximum count is 65535

Defibrillator

Emergency 1: ECG starts normally and changes to ventricular fibrillation after 2 PVCs (R on T); defibrillation converts back to normal
Emergency 2: ECG starts normally, changes to ventricular tachycardia, then to ventricular fibrillation; defibrillation converts back to normal
Elective Cardioversion: ECG shows atrial fibrillation; properly timed defibrillation pulse converts back to normal; late defibrillation pulse causes ventricular fibrillation; cardioversion time window is ± 100 ms from the R-wave peak
"Sync/A Pace" Input Level: Triggered by positive voltage transition through ± 0.4 V; maximum voltage is ± 35 V and input impedance is 15 k Ω

Respiration

Output Configuration: Lead I or II/RL-LL
Baseline Impedance: 500, 1000, 1500 and 2000 Ω
Accuracy: 5%
Delta Impedance: 0, 0.1, 0.2, 0.5, 1 and 3 Ω
Accuracy: 10%
Normal Physiological Rate: 15, 20, 30, 40, 60 and 120 BPM
Accuracy: 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: Delta impedance reduced to 1/6 and shifted to positive or negative; rate shifted to 120 BPM for 12 s each min
Ventilator Simulation: 40 BPM at fixed ratio, other parameters variable as in normal

Blood Pressure

Input/Output Impedance: 300 Ω
Exciter Input Voltage Range: 2 V to 16 V
Exciter Input Frequency Range: DC to 4 kHz
Output Sensitivity: 5 μ V/V/mmHg or 40 μ V/V/mmHg
Output Range: -10 mmHg to + 300 mmHg on BP1, BP2 and BP4; -10 mmHg to + 30 mmHg on BP3
Accuracy: $\pm 1\%$ 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-s 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-s 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-s 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-s intervals)

Temperature

Variable: 93.2 $^{\circ}$ F (34 $^{\circ}$ C), 98.6 $^{\circ}$ F (37 $^{\circ}$ C), 104 $^{\circ}$ F (40 $^{\circ}$ C), hyperthermia, hypothermia, and spike; accuracy, 0.7 $^{\circ}$ F (0.4 $^{\circ}$ C)
Fixed: 98.6 $^{\circ}$ F (37 $^{\circ}$ C); channel 2 accuracy, 0.2 $^{\circ}$ F (0.1 $^{\circ}$ C)

Probe Compatibility: 400 and 700 series YSI types
Isolation: Variable temperature electrically isolated from rest of instrument except cardiac output; fixed temperature isolated from all other outputs

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 V-leads, or to all leads
Size: 0.25, 0.5, and 1 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 selected respiration rate at 5% to 10%. All others have respiration added to them at 5 mmHg or 10 mmHg

Sequences

Three preprogrammed step-sequences; four user-programmable step-sequences

Normal Sinus Rhythm

Rates: 30, 60, 80, 120, 160, 200, 240, and 300 BPM, accuracy $\pm 1\%$
Amplitudes (Lead II): 0.05 mV to 0.5 mV in 0.05-mV steps; 0.5 mV to 5.5 mV in 0.25-mV steps (manual and auto-step interval of 6 s)
Accuracy: 5% on lead II into a 100 Hz low-pass filter
Impedance to the RL Lead: Limb leads selectable at 500, 1000, 1500 and 2000 Ω ; V-leads at 1000 Ω ; accuracy: 5%
ST Segments: 18 total - normal (iso-electric), elevated and depressed
ST Segment Levels (Lead II): + 0.8 mV to -0.8 mV in 0.1-mV steps on lead II, including two ± 0.05 -mV steps. Includes manual-stepping and auto-stepping modes at 12 s intervals. Operates at ECG rates from 30 BPM to 160 BPM (baseline ECG modified during arrhythmias)
Axis Deviation: Normal (intermediate), horizontal, and vertical (baseline ECG modified during arrhythmias)
Neonatal Mode: ECG R-wave width reduced to 40 ms and dynamic BP selections reduced by 25%

ECG Performance Testing

Amplitudes set by baseline ECG amplitude. Lead I is 0.7 x lead II; lead III is 0.3 x lead II; V leads are same as lead II

Waveforms (Lead II and V Leads)

Square Wave: 2 Hz at 1 mV p-p
Pulse: 4 s at + 1 mV
Sine Waves: 0.05, 0.5, 1, 10, 25, 30, 40, 50, 60 and 100 Hz at 1 mV
Triangle Wave: 2 Hz at 1 mV
R-Wave Detector Test: 60 BPM Haver-triangle wave with selectable amplitude and width that can be automatically or manually operated
Width: 20 ms increments from 20 ms to 200 ms, and two smaller widths of 8 ms and 12 ms; auto-step time interval is 6 s
Amplitude (Lead II and V): 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 s

Environmental Requirements

Operating Temperature: 59 $^{\circ}$ F to 95 $^{\circ}$ F (15 $^{\circ}$ C to 35 $^{\circ}$ C)
Storage Temperature: 32 $^{\circ}$ F to 131 $^{\circ}$ F (0 $^{\circ}$ C to 55 $^{\circ}$ C)

General Information

Display: 2-line by 24-character LCD
Power: Two 9 V batteries; battery eliminator
Dimensions: 7 in L x 10 in W x 3 in H (17.8 cm L x 25.4 cm W x 7.6 cm H)
Weight: 3.5 lb (1.6 kg)

Ordering Information

Model

Base Models (Patient Simulation)

2247184: MS300B-US120V
2395133: MS300B-AUS250V
2395140: MS300B-DEN250V
2395157: MS300B-SHK250V
2395169: MS300B-ISR250V
2395178: MS300B-ITAL250V
2395184: MS300B-IND250V
2395191: MS300B-SWZ250V
2395207: MS300B-UK250V

Standard Accessories for medSim 300B Base Model

2243039: User/service manual
2392826: Soft-sided vinyl carrying case
2392729: ECG electrode adapter for lead test

Battery Eliminator (as ordered)

2183983: 120 VAC to 9 V battery eliminator
2183990: 220 VAC to 9 V battery eliminator

Optional Accessories for medSim 300B Base Model

2244952: 23A Controller/CI-3 cardiac output box (overlay kit included, model 2217384)
2248554: Multipurpose hard-sided watertight carrying case

Blood Pressure Cables

2198969: Advanced Medical Systems (FM 660, FM 670) LT-1 (intrauterine pressure – 10M)
2198969: Airshields (Petascan 1400) LT-1 (intrauterine pressure – 10M)
2198879: BCI International TK-1 (6M)
2198879: Criticare Systems Inc. (1100) TK-1 (6M)
2198879: Critikon (Dinamap Plus) TK-1 (6M)
2198887: Datascope DS-1 (6F)
2200955: Datex (AS/3, CS/3, Compact, Cardio Cap II, Critical Care, Light) DX-1 (10F)
2199387: Fakuda Denshi (DS3300 series) FD-2 (12M)
2199682: GE Marquette Medical Corametrics (115, 116, 142, 145, 556) CM-3 (Nicolet round – 12M)
2198893: GE Marquette Medical (PPG/E for M DR) EM-1 (6F)
2198978: GE Marquette Medical (7000 and TRAM –AR series only) MQ-2 (8M round)
2199627: GE Marquette Medical (Dash, Eagle, Solar, Tram, and MacLab) MQ-3 (rectangular – 11M)
2198902: Hewlett Packard/Philips (78-300, 78-500, 78-800, Merlin/Viridia/ Omnicare) (HP/Philips M1006B iBP module has a sensitivity of 5 uV/V/mmHg only. The HP-3 cable should be selected for this application.) HP-3 (12M 5 µV)
2198916: Hewlett Packard/Philips (78-300, 78-500, 78-800, Merlin/Viridia/ Omnicare) HP-4 (12M 40 µV)
2199694: Hewlett Packard/Philips (8040A, M1350A) HP-8 (intrauterine pressure only – 12M 40 µV)
2199701: HP/Philips (8040A) HP-9 (intrauterine pressure only – 12M 5 µV)
2198879: Invivo Research TK-1 (6M)
2198879: Ivy Biomedical (400 and 700 series) TK-1 (6M)
2199096: Kontron Medical (Mini-, Super-, Color-Mon series) KT-1 (6M)
2198940: Medical Data Electronics (Escort series) PC-1 (6M)

2198933: Mennen Medical (Horizon series) MM-1 (6M)
2199107: Nihon Kohden NK-1 (6M)
2198879: North American Drager (Vitalert 2000) TK-1 (6M)
2198940: Physio Control (VSM series) PC-1 (6M)
2198879: Protocol System (Propaq series) TK-1 (6M)
2200955: Puritan Bennett PB 240 DX-1 (10F)
2199176: Quinton (Q Cath series) QM-1 (6M)
2198925: Siemens (SIRECUST series) [SM-1 and Siemens Medical Transducer Adapter (3368-383-E530U) used to run a single invasive BP channel on the Siemens Medical SC6000 and SC9000 series monitors] SM-1 (10M)
2199666: Siemens (Micor/Mingo) SM-3 (15M)
2198957: SpaceLabs (ALPHA9/703R) SL-1 (5M)
2198879: SpaceLabs (1050, 1700, PCMS series) (SpaceLabs adapters 700-0028-00 and O120-0551-00 with TK-1 used when testing the new UltraView Command Module) TK-1 (6M)
2392173: Universal unterminated UU-1 (5-Pin DIN one end only)
2198893: Witt Biomedical EM-1 (6F)

Temperature Cables

2392199: CI-3 cable assembly
2199004: UT-1 standard 1/4 in phone plug (compatible with YSI 400 series-2 conductor; used to test SpaceLabs UltraView Command Module, with adapters 700-0031-00, available from SpaceLabs)
2199019: UT-2 standard 1/4 in phone plug (compatible with YSI 700 series – 3 conductor)
2199291: UT-3 unterminated cable (DIN plug on one end only)
2199257: HPT-2 temperature adapter (Hewlett Packard) (2 pin, used with UT-1 for HP monitors)

Interface Cables

2199070: PC remote control interface cable (right-angle DIN to female DB25)
2199225: Patient simulator to medTester interface cable (right-angle DIN to female DB25)

Models for medSim 300B with Option 1

[cardiac catheterization; intra-aortic balloon assist pump (IABP) simulation; direct fetal/maternal ECG/intrauterine pressure (IUP) simulation]:
2399546: MS300B-US120V-01
2399554: MS300B-AUS250V-01
2399568: MS300B-DEN250V-01
2399579: MS300B-SHK250V-01
2399587: MS300B-ISR250V-01
2399593: MS300B-ITAL250V-01
2399606: MS300B-IND250V-01
2399614: MS300B-SWZ250V-01
2399623: MS300B-UK250V-01

Optional Accessories for medSim 300B with Option 1

2248554: Multipurpose hard-sided watertight carrying case

Intra-Aortic Balloon Assist Pump Sync Cables

2199747: DS-A Datascope System 9 (DS-1 BP cable required)
2199786: KT-A Kontron K200, KAAT (KT-1 BP cable required)

Models for medSim 300B with Cardiac Output Option

2399638: MS300B-US120V-CO
2399645: MS300B-AUS250V-CO
2399650: MS300B-DEN250V-CO
2399661: MS300B-SHK250V-CO
2399677: MS300B-ISR250V-CO
2399689: MS300B-ITAL250V-CO
2399692: MS300B-IND250V-CO
2399704: MS300B-SWZ250V-CO
2399719: MS300B-UK250V-CO

Optional Accessories for medSim 300B with Cardiac Output Option

2248554: Multipurpose hard-sided watertight carrying case

Cardiac Output Bath/Injectate Adapters

Note: Modified Switchcraft 4-pin (SL-40-F) compatible panel-mounted connector included with the 23A Controller. For systems requiring a different injectate connector, an existing cardiac output cable can be modified using Fluke Biomedical's general-purpose connector, or additional adapters can be used. See following list:
2392158: General purpose connector
2199240: COA-1 cardiac output adapter (Hewlett Packard) (HPT-2 also required for cardiac output simulation on HP patient-monitoring systems)
2199257: HPT-2 temperature adapter (Hewlett Packard) (2 pin; COA-1 also required for cardiac output simulation on HP patient monitoring systems)
2199379: COA-2 adapter (Gould/Spectramed Model 1445)

Models for medSim 300B with Option 1 and Cardiac Output Option

2399728: MS300B-US120V-1C
2399737: MS300B-AUS250V-1C
2399743: MS300B-DEN250V-1C
2399755: MS300B-SHK250V-1C
2399762: MS300B-ISR250V-1C
2399770: MS300B-ITAL250V-1C
2399781: MS300B-IND250V-1C
2399801: MS300B-SWZ250V-1C
2399812: MS300B-UK250V-1C

Optional Accessories for medSim 300B with Option 1 and Cardiac Output Option

2248554: Multipurpose hard-sided watertight carrying case

Cardiac Output Bath/Injectate Adapters

Note: Modified Switchcraft 4-pin (SL-40-F) compatible panel-mounted connector included with the 23A Controller. For systems requiring a different injectate connector, an existing cardiac output cable can be modified using Fluke Biomedical's general-purpose connector, or additional adapters can be used. See following list:
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2199240: COA-1 cardiac output adapter (Hewlett Packard) (HPT-2 also required for cardiac output simulation on HP patient-monitoring systems)
2199257: HPT-2 temperature adapter (Hewlett Packard) (2 pin; COA-1 also required for cardiac output simulation on HP patient monitoring systems)
2199379: COA-2 adapter (Gould/Spectramed Model 1445)

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Intra-Aortic Balloon Assit Pump (IABP) Sync Cables

2199747: DS-A Datascope System 9 (DS-1 BP cable required)

2199786: KT-A Kontron K200, KAAT (KT-1 BP cable required)

About Fluke Biomedical

Fluke Biomedical is the world's leading manufacturer of quality biomedical test and simulation products. In addition, Fluke Biomedical provides the latest medical imaging and oncology quality-assurance solutions for regulatory compliance.

Today, biomedical personnel must meet the increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

Fluke Biomedical Regulatory Commitment

As a medical device manufacturer, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 certified and our products are:

- FDA Compliant
- CE Certified, where required
- NIST Traceable and Calibrated
- UL, CSA, ETL Certified, where required

Fluke Biomedical.

Better products. More choices. One company.

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