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BP Pump 2
Non-Invasive Blood Pressure Simulator and Tester

Technical Data

The BP Pump 2 provides dynamic blood-pressure simulations for testing adult and neonatal non-invasive blood pressure monitors, including both arm- and wrist-cuff types.

The analyzer features a preset mode for simulation of most patient conditions and the capability to program user-defined simulations. BP Pump 2 tests for leaks, measures static pressure, generates pressure, and tests overpressure valves. For improved testing versatility, the analyzer's recently upgraded waveform test suite includes additional physiological selections.

BP Pump 2 comes in two models: the standard BP Pump 2_L and the BP Pump 2_M. The BP Pump 2_M features a high-accuracy pressure transducer to meet the EN1060-3 standard used widely in Europe for testing non-invasive blood pressure monitors. It also includes five-lead synchronized ECG simulations to test monitors that use ECG for motion rejection.

Key features

BP Pump 2_L and BP Pump 2_M

- Dynamic simulations for arm- and wrist-cuff monitors
- Recently upgraded waveform test suite with more physiological selections
- Internal pump for use in high- and low-pressure release verification, leak testing and pressure sourcing
- Preset mode for simulation of most patient conditions
- User-defined autosequences
- Internal cuff volume for basic device testing
- RS-232 for computer control
- Compact, lightweight, and user friendly
- Respiratory artifacts, including spontaneous breathing and controlled ventilation
- Arrhythmia simulations, including premature atrial contractions #1 and #2, atrial fibrillation, and PVCs

BP Pump 2_M also includes:

- High-accuracy pressure transducer
- Five-lead synchronized ECG and arrhythmia simulation with blood pressure for both

Technical specifications

Pressure generation/measurement

Static-pressure range
0 mmHg to 400 mmHg (53 kPa)

Difference between target pressure and actual pressure
– 5 mmHg

Internal leak rate
< 2 mmHg per minute with minimum volume of 300 cc

Four respiratory artifacts
3 spontaneous breathing; controlled ventilation

3 adult wrist-cuff simulations
Normal, Hyper, Hypo

Pressure source
Specified pressure generated from 50 mmHg to 400 mmHg in selectable increments of 1 mmHg

Pressure gauge
Static pressure measured from 0 mmHg to 400 mmHg at the pressure port

Pressure relief rest
Test for the NIBPM pressure relief valve (0 mmHg to 400 mmHg) with display of peak pressure

Neonate internal cuff simulations
Internal neonate cuff; four standard neonate pressures

Neonate simulations

Cuff #1
Blood pressure: 35/15
Heart rate: 120 BPM
Pulse volume: 0.3

Cuff #2
Blood pressure: 60/30
Heart rate: 120 BPM
Pulse volume: 0.3

Cuff #3
Blood pressure: 80/50
Heart rate: 120 BPM
Pulse volume: 0.3

Cuff #4
Blood pressure: 100/70
Heart rate: 120 BPM
Pulse volume: 0.3

Normal sinus rhythm

BP and ECG
Healthy heart, weak pulse, mild exercise strenuous exercise, obese subject, geriatric subject, tachycardia, bradycardia irregular pulse

BP and ECG
Premature atrial contractions # 1, premature atrial contractions # 2, premature ventricular contractions, atrial fibrillation and PVCs

User-definable simulations
User-definable systolic and diastolic values, along with heart rate and pulse volume

Ranges

Systolic pressure range
20 mmHG to 250 mmHG

Diastolic pressure range
10 mmHG to 200 mmHG

Heart rate
30 BPM to 250 BPM

Pulse volume
0.1 cc to 2.4 cc in increments of 0.1 cc

Simulation parameters performance

Max pulse volume
2.4 cc

Max heart rate
200 BPM at 2.4 cc pulse volume; 250 BPM at 1.2 cc pulse volume

Internal neonatal cuff volume
20 cc

Internal adult cuff volume (including NN volume)
310 cc

Heart rate setting accuracy
± 1 BPM

Simulation units
kPa and mmHg (user selectable)

Pressure leak test
The pressure port is pressurized from 0 mmHg to 400 mmHg and keeps track of the pressure loss over time. Peak pressure and present pressure are displayed at all times; leak rate is displayed when it is available.

Autosequences
Nine autosequences are provided for four tests and up to five simulations.

Electrical ECG (optional)

Signals
RA, LA, RL, LL, V

Waveform
Lead II

Amplitude
1 mV peak (± 10 %) NIBP peripheral pulse synchronized with ECG signal

Connections
Optional external ECG adapter physiological synchronization with NIBP

Heart rate for NIBP simulations

Heart rate accuracy
+ 1 BPM

Except for the following
Patient condition weak pulse, tachycardia, obese, geriatric:
+ 1 % + 1 BPM
Patient condition mild exercise:
+ 1.5 % + 1 BPM
Patient condition strenuous exercise: + 3 % + 1 BPM

Serial port
Bidirectional RS-232 port; baud rate of 9600 with no parity, one stop bit, and eight data bits

Pressure measurement

Pressure-measurement units
kPa, mmHg, cmH_20, cmH_2O and psi (user selectable)

Range
0 mmHg to 400 mmHg

Resolution, BP Pump 2_L (basic model)
0 mmHg to 300 mmHg: ± 0.5 % of reading ± 1 mmHg
301 mmHg to 400 mmHg: ± 2 % of reading

Resolution, BP Pump 2_M (high-accuracy version)
< 0.8 mmHg (0.1 kPa)

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Accuracy

Basic model (BP Pump 2_L)
0 mmHg to 300 mmHg: + 0.5 % of reading + 1 mmHg;
301 mmHg to 400 mmHg: + 2 % of reading

High-accuracy version (BP Pump 2_M)
< 0.8 mmHg (0.1 kPa) throughout range

Parallel port

25-pin female connector, with D-subminiature style and pinouts conforming to IBM PC printer port (unidirectional), HP and ASCII printers

Sample adult arm-cuff simulation (standard parameters)

Standard set of blood pressures

BP #1
Blood pressure: 120/80 (93)
Heart rate: 80
Pulse volume: 0.68 cc

BP #2
Blood pressure: 150/100 (116)
Heart rate: 80
Pulse volume: 0.65 cc

BP #3
Blood pressure: 200/150 (166)
Heart rate: 80
Pulse volume: 0.6 cc

BP #4
Blood pressure: 255/195 (215)
Heart rate: 80
Pulse volume: 0.55 cc

BP #5
Blood pressure: 60/30 (40)
Heart rate: 80
Pulse volume: 0.75 cc

BP #6
Blood pressure: 80/50 (60)
Heart rate: 80
Pulse volume: 0.7 cc

BP #7
Blood Pressure: 100/65 (76)
Heart rate: 80
Pulse volume: 0.69 cc

Patient condition simulations

Healthy heart
Blood pressure: 120/80 mmHg (93 MAP)
Heart rate: 75 BPM
Pulse volume: 0.7 cc

Weak pulse
Blood pressure: 110/80 (90)
Heart rate: 95 BPM
Pulse volume: 0.3 cc

Mild exercise #1
Blood pressure: 140/90 (106)
Heart rate: 120 BPM
Pulse volume: 1.1 cc

Strenuous exercise #2
Blood pressure: 140/90 (106)
Heart rate: 162 BPM
Pulse volume: 1.4 cc

Obese subject
Blood pressure: 120/80 (93)
Heart rate: 90 BPM
Pulse volume: 0.4 cc

Geriatric subject
Blood pressure: 150/110 (12)
Heart rate: 95 BPM
Pulse volume: 0.4 cc

Tachycardia
Blood pressure: 120/105 (110)
Heart rate: 130 BPM
Pulse volume: 0.3 cc

Bradycardia
Blood pressure: 120/60
Heart rate: 45 BPM
Pulse volume: 1.1 cc

Arrhythmia simulations

Premature atrial cont. #1
Blood pressure: 138/53 mmHg (81 MAP)
Heart rate: 80 BPM
Pulse volume: varies

Premature atrial cont. #2
Blood pressure: 144/64 (90)
Heart rate: 83 BPM
Pulse volume: varies

Premature ventricular cont.
Blood pressure: 118/61 (80)
Heart rate: 83 BPM
Pulse volume: varies

Atrial Fib and PVCs
Blood pressure: 139/72 (94)
Heart rate: 91 BPM
Pulse volume: varies

Respiratory artifacts

Spontaneous breathing #1
Blood pressure: 138/65 mmHg (89 MAP)
Heart rate: 104 BPM
Pulse volume: varies

Spontaneous breathing #2
Blood pressure 149/65 (93)
Heart rate: 105 BPM
Pulse volume: varies

Spontaneous breathing #3:
Blood pressure: 112/47 (68)
Heart rate: 86 BPM
Pulse volume: varies

Controlled ventilation

Blood pressure
132/44 (73)

Heart rate
98 BPM

Pulse volume
varies

Wristsimulations

Simulation #1
Blood pressure 120/80 (93)
Heart rate: 80 BPM
Pulse volume: 0.5 cc

Simulation #2
Blood pressure 160/100 (120)
Heart rate: 80 BPM
Pulse volume: 0.5 cc

Simulation #3
Blood pressure: 80/55 (63)
Heart rate: 80 BPM
Pulse volume: 0.5 cc

Temperature

Operating
15 °C to 40 °C (59 °F to 104 °F)

Storage
-20 °C to 65 °C (-4 °F to 149 °F)

Relative humidity

90 ° max

Display

Bright, large 4-line x 40-character alphanumeric display with back lighting

Dimensions (WxDxH)

25.4 cm x 25.4 cm x 12.7 cm (10 in x 10 in x 5 in)

Weight

3.4 kg (7.5 lb)

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Ordering information

Model

BP Pump 2_L (standard pressure transducer)

2249036 BPPUMP2_L-US 120 V
2394895 BPPUMP2_L-AUS 250 V
2394901 BPPUMP2_L-DEN 250 V
2394912 BPPUMP2_L-SHK 250 v
2394920 BPPUMP2_L-ISR 250 V
2394935 BPPUMP2_L-ITAL 250 V
2394947 BPPUMP2_L-IND 250 V
2394958 BPPUMP2_L-SWZ 250 V
2394964 BPPUMP2_L-UK 250 V

BP Pump 2_M (high-accuracy pressure transducer)

2249049 BPPUMP2_M-US 120 V
2394973 BPPUMP2_M-AUS 250 V
2394986 BPPUMP2_M-DEN 250 V
2394999 BPPUMP2_M-SHKO 250 V
2395003 BPPUMP2_M-ISR 250 V
2395015 BPPUMP2_M-ITAL 250V
2395026 BPPUMP2_M-IND 250 V
2395032 BPPUMP2_M-SWZ 250 V
2395044 BPPUMP2_M-UK 250 V

Standard accessories

2391882 Accessory Kit (tubings and fittings)
N/A User Manual
N/A Power Cord (country specific)

Optional accessories

2755836 Ansur BP Pump 2 Plug-in
2222822 Soft-Sided Vinyl Carrying Case
2391894 ECG Adapter Block (allows simulation of 5-lead ECG waveforms)
2238072 Parallel Printer Cable, D25M-C36M
2248899 Printer, Seiko DPU-414-30B, 120 V Power Supply
2399531 Printer, Seiko DPU-414-30B, 200 V Power Supply
2235375 Printer, 120 V Power Supply
2235382 Printer, 220 V Power Supply
2248737 Printer Paper (7 rolls min)
2238659 Serial Cable, D9M-D9F
2392381 Adult Cuff Mandrel Spacer Block (three required)
2392370 Adult Cuff Mandrel End Block (two required)
2392328 Neonatal/External Cuff Mandrel (truncated plastic cylinder diameters: 7.6 cm, 10 cm, and 14 cm)
2391875 Wrist Cuff Mandrel (adult)

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
- NRC Compliant, where required

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Better products.
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