FLUKE®
Biomedical

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, which features a high-accuracy pressure transducer. BP Pump 2 also includes an optional five-lead synchronized ECG simulations to test monitors that monitors patients ECG.

Key features

- Dynamic simulations for arm- and wrist-cuff monitors
- Physiological waveform
- 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-definable systolic and diastolic values, along with heart rate and pulse volume and user-defined autosequences
- Five-leads synchronized ECG simulation
- Internal cuff volume for basic device testing
- Respiratory artifacts, including spontaneous breathing and controlled ventilation
- Arrhythmia simulations, including premature atrial contractions #1 and #2, atrial fibrillation, and PVCs
- PC based ansur test automation system to standardize testing protocol and documentation
- High-accuracy pressure transducer (Bp $Pump2_M$ version only)
- Dynamic pressure simulation repeatability within 2 mmHg at maximal pulse size independent of device under test

FLUKE®
Biomedical

Specifications

Pressure generation/measurement	
Static-pressure range	50 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: 0.1 cc
Cuff #2	Blood pressure: 60/30 Heart rate: 120 BPM Pulse volume: 0.1 cc
Cuff #3	Blood pressure: 80/50 Heart rate: 120 BPM Pulse volume: 0.1 cc
Cuff #4	Blood pressure: 100/70 Heart rate: 120 BPM Pulse volume: 0.1 cc
Normal sinus rhythm and arrhythmias	
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
Dynamic NIBP simulation repeatability	Within 2 mmHg (at maximal pulse size independent of device under test)
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_20 and psi (user selectable)
Range	0 mmHg to 400 mmHg
Accuracy, 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
Accuracy, BP Pump 2_M (high-accuracy version)	± 0.7 mmHg (0.09 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)

Ordering information

Model

BP Pump 2_L Non-Invasive Blood Pressure Analyzer (standard pressure transducer)
BPPUMP2L-US120V United States, 120 V
BPPUMP2L-AUS250V Australia, 250 V
BPPUMP2L-DEN250V Denmark, 250 V
BPPUMP2L-SHK250V Shuko, 250 v
BPPUMP2L-ISR250V Israel, 250 V
BPPUMP2L-ITAL250V Italy, 250 V
BPPUMP2L-IND250V India, 250 V
BPPUMP2L-SWZ250V Switzerland, 250 V
BPPUMP2L-UK250V United Kingdom, 250 V
BPPUMP2L-BRAZ250V Brazil, 250 V

BP Pump 2_M Non-Invasive Blood Pressure Analyzer (high-accuracy pressure transducer)
BPPUMP2M-US120V United States, 120 V
BPPUMP2M-AUS250V Australia, 250 V
BPPUMP2M-DEN250V Denmark, 250 V
BPPUMP2M-SHK250V Shuko, 250 V
BPPUMP2M-ISR250V Israel, 250 V
BPPUMP2M-ITAL250V Italy, 250V
BPPUMP2M-IND250V India, 250 V
BPPUMP2M-SWZ250V Switzerland, 250 V
BPPUMP2M-UK250V United Kingdom, 250 V
BPPUMP2M-BRAZ250V Brazil, 250 V
BPPM2M/ECG-NIM (Includes a BPPUMP2_M-AUS250V, a ECG Adapter Block, 100 ml and 500 ml rigid aluminum chambers and a manual pressure pump (700PMP))
BPPM2M-NIM (Includes a BPPUMP2_M-AUS250V, 100 ml and 500 ml rigid aluminum chambers and a manual pressure pump (700PMP))

BP Pump 2_L Non-Invasive Blood Pressure Analyzer with Test Automation (standard pressure transducer)
TA-BPPMP2L-US United States, 120 V
TA-BPPMP2L-AUS Australia, 250 V
TA-BPPMP2L-DEN Denmark, 250 V
TA-BPPMP2L-SHK Shuko, 250 v
TA-BPPMP2L-ISR Israel, 250 V
TA-BPPMP2L-ITAL Italy, 250 V
TA-BPPMP2L-IND India, 250 V
TA-BPPMP2L-SWZ Switzerland, 250 V
TA-BPPMP2L-UK United Kingdom, 250 V
TA-BPPMP2L-BRAZ Brazil, 250 V

BP Pump 2_M Non-Invasive Blood Pressure Analyzer with Test Automation (high-accuracy pressure transducer)
TA-BPPMP2M-US United States, 120 V
TA-BPPMP2M-AUS Australia, 250 V
TA-BPPMP2M-DEN Denmark, 250 V
TA-BPPMP2M-SHK Shuko, 250 v
TA-BPPMP2M-ISR Israel, 250 V
TA-BPPMP2M-ITAL Italy, 250 V
TA-BPPMP2M-IND India, 250 V
TA-BPPMP2M-SWZ Switzerland, 250 V
TA-BPPMP2M-UK United Kingdom, 250 V
TA-BPPMP2M-BRAZ Brazil, 250 V

BP Pump 2_L Non-Invasive Blood Pressure Testing Bundles (with 5 leads ECG Block)
BPPM2L/ECG-US United States, 120 V
BPPM2L/ECG-AUS Australia, 250 V
BPPM2L/ECG-DEN Denmark, 250 V
BPPM2L/ECG-SHK Shuko, 250 v
BPPM2L/ECG-ISR Israel, 250 V
BPPM2L/ECG-ITAL Italy, 250 V
BPPM2L/ECG-IND India, 250 V
BPPM2L/ECG-SWZ Switzerland, 250 V
BPPM2L/ECG-UK United Kingdom, 250 V

Quick NIBP monitor testing bundles

PS420/DPM1B Bundle PS420/DPM1B Bundle Kit (includes PS420, DPM1B, all accessories, and a custom carrying case)

PS410/DPM1B Bundle PS410/DPM1B Bundle Kit (includes PS410, DPM1B, all accessories, and a custom carrying case)

Standard accessories

2780003FG Accessory Kit (tubings and fittings)

Operators Manual

Power Cord (country specific)

Optional accessories

ANSUR BP PUMP 2 Ansur BP Pump 2 Plug-in

5022010 Soft-Sided Vinyl Carrying Case

2780512FG ECG Adapter Block (allows simulation of 5-lead ECG waveforms)

71072 Parallel Printer Cable, D25M-C36M

PRINTR/414-US120V Printer, Seiko DPU-414-30B, 120 V power supply

PRINTR414-SHK220V Printer, Seiko DPU-414-30B, 220 V power supply

61096 Printer, 120 V power supply

61097 Printer, 220 V power supply

97116 Printer Paper (7 rolls min)

75034 Serial Cable, D9M-D9F

5215-0269FG Adult Cuff Mandrel Spacer Block (three required)

5215-0268FG Adult Cuff Mandrel End Block (two required)

5027-0203FG Neonatal/External Cuff Mandrel (truncated plastic cylinder diameters: 7.6 cm, 10 cm, and 14 cm)

98175FG Wrist Cuff Mandrel (adult)

BPPM2M-2001 500 ML Rigid Aluminum Chamber for NIBP Testing

BPPM2M-2002 100 ML Rigid Aluminum Chamber for NIBP Testing

700PMP External Pressure Pump