BeneVision N1

Patient Monitor

Operator's Manual

CE 0123

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Revision: 20.0

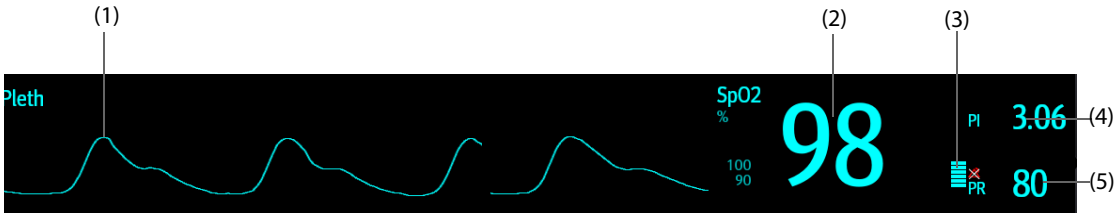
- Birthmark(s), tattoos, skin discolorations, moisture on skin, deformed or abnormal fingers. etc.

■ Interfering substances:
- Intravascular dyes (such as indocyanine green, methylene blue, indigo carmine, etc.)
- Dyes in the measure site, such as nail polish.

■ Environmental conditions:
- Excessive ambient light
- Electrosurgery equipment
- Defibrillation (may cause inaccurate reading for a short amount of time)
- Excessive patient/sensor motion
- Electromagnetic field
- Arterial catheters and intra-aortic balloon

■ Others
- Inappropriate positioning of the SpO_2 sensor, or use of incorrect SpO_2 sensor
- Cuff or arterial blood pressure measurement device on the same limb as the SpO_2 sensor.

12.4 SpO_2 Display



(1) Pleth waveform (Pleth): indicates the blood pulsation at the measurement site. The waveform is not normalized.

(2) Arterial oxygen saturation (SpO_2): indicates the percentage of oxygenated hemoglobin relative to total hemoglobin.

(3) Perfusion indicator: the pulsatile portion of the measured signal caused by arterial pulsation. The higher the bar, the better the perfusion quality.

(4) Perfusion index (PI): indicates the percentage of pulsatile signal to non pulsatile signal. PI is an indicator of the pulsatile strength. You can also use it to assess the SpO_2 signal strength.

For Mindray SpO_2 module,
- Above 1 is optimal.
- Between 0.3 and 1 is acceptable.
- Below 0.3 indicates low perfusion. Reposition the SpO_2 sensor or find a better site. If low perfusion persists, choose another method to measure oxygen saturation if possible.

(5) Pulse rate: indicates the number of pulsations per minute.

NOTE

- **PI is only available for Mindray SpO_2 and Masimo SpO_2.**

12.5 Preparing for SpO_2 Monitoring

To prepare to monitor SpO_2, follow this procedure:

1. Select an appropriate sensor according to the module type, application site, patient category and weight.
2. Clean the contact surface of the reusable sensor.
3. Apply the sensor to the patient according to the instruction for use of the sensor.
4. Select an appropriate extension cable according to the connector type and plug the cable into the SpO_2 connector.

- **Do not touch or apply external pressure against the cuff and air tubing during NIBP measurement. This may cause inaccurate blood pressure values.**
- **Use care when placing the cuff on an extremity used for monitoring other patient parameters.**

14.7 Starting and Stopping NIBP Measurements

Start and stop NIBP measurement by selecting the NIBP quick keys or from the NIBP menu.

Task	By Quick Key	From NIBP menu
Start a manual measurement	**NIBP Start/Stop** quick key	**Start NIBP** button
Start auto NIBP series	**NIBP Start/Stop** quick key Make sure to set **Interval** before starting auto NIBP.	**Setup** tab → set **Interval** → **Start NIBP** button
	NIBP Measure quick key → select **Interval**	
Start NIBP sequence measurement	**NIBP Measure** quick key → **Sequence**	**Sequence** tab → set NIBP sequence →**Start NIBP** button
Start STAT measurement	**NIBP Measure** quick key **STAT**	**STAT** button
Stop the current NIBP measurements	**NIBP Start/Stop** quick key	**Stop NIBP** button
End auto NIBP series or NIBP Sequence	/	**NIBP Stop All** button
Stop STAT measurement and end series	**NIBP Start/Stop** quick key	**Stop NIBP** or **NIBP Stop All** button

14.8 Changing NIBP Settings

14.8.1 Setting the NIBP Alarm Properties

To set the NIBP alarm properties, follow this procedure:

1. Select the NIBP numeric area to enter the **NIBP** menu.
2. Select the **Alarm** tab.
3. Enter the password if required.
4. Set alarm properties as desired.

14.8.2 Setting the Initial Cuff Inflation Pressure

To set initial cuff inflation pressure, follow this procedure:

1. Select the NIBP numeric area to enter the **NIBP** menu.
2. Select **Initial Pressure**, and then select the appropriate setting.

NOTE

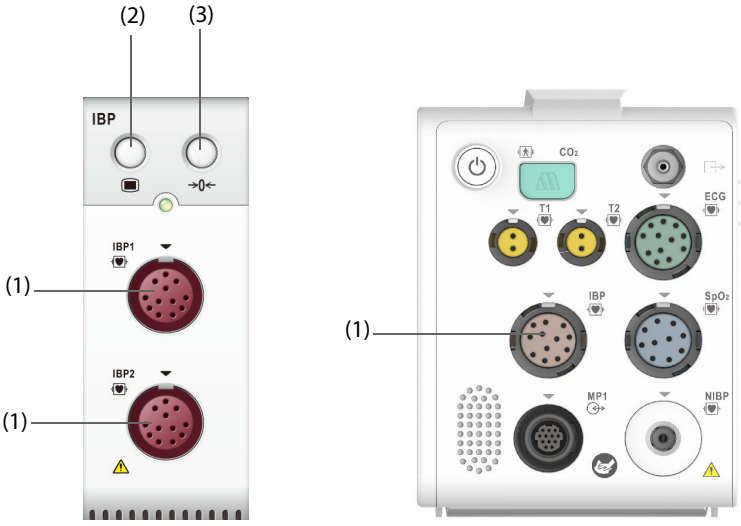
- **For known hypertensive patients, you need to set initial cuff pressure to a higher value to reduce the measurement time.**

15 Monitoring Invasive Blood Pressure (IBP)

15.1 IBP Introduction

This patient monitor can monitor four invasive blood pressures.

IBP monitoring is intended for adult, pediatric, and neonatal patients. PAWP monitoring is only intended for adult and pediatric patients. PAWP monitoring is available only for the external display.



(1) IBP cable connector (2) IBP menu hard key (3) Zero IBP hard key

NOTE

- **In order for the N1 to connect to the external IBP module and perform IBP monitoring, the N1system software V02.25 and above is required.**
- **If your monitor configures the PiCCO module, you can also measure IBP with the PiCCO module. For more information, see *17 Monitoring Continuous Cardiac Output (CCO)*.**

15.2 IBP Safety Information

WARNING

- **Use only pressure transducers specified in this manual. Never reuse disposable pressure transducers.**
- **Make sure that the applied parts never contact other conductive parts.**
- **To reduce the hazard of burns during high-frequency surgical procedure, ensure that the monitor's cables and transducers never come into contact with the high-frequency surgical units.**

CAUTION

- **Using IABP may cause IBP, including PR, measurements inaccurate or failed.**
- **Mechanical shock to the invasive blood pressure transducer may cause severe shifts in zero balance and calibration, and cause erroneous readings.**

CAUTION

- **During the cleaning procedure, disable the touch operation by switching off the monitor or locking the touchscreen.**
- **Any contact of cleaners or disinfectants with connectors or metal parts may cause corrosion.**

24.4 Disinfecting the Equipment and Mounting Kits

Disinfect the monitor, parameter modules, Modular Rack, Dock, folding hook, monitor handle, and bedrail hook as required in your hospital's servicing schedule. Cleaning the equipment and mounting kits before disinfecting is recommended. Always dilute and use disinfectants according to the manufacturer's instructions. The following table lists approved disinfectants:

Product Name	Product Type	Manufacturer
Alpet® D2 Surface Sanitizing Wipes	Wipes	BEST SANITIZERS INC™.
CIDEX® OPA	Liquid	Gilag GmbH International Advanced Sterilization products
Clorox Dispatch® Hospital Cleaner Disinfectant Towels with Bleach	Wipes	Clorox professional products company
Clorox Healthcare® Bleach Germicidal Wipes	Wipes	Clorox professional products company
Clorox Healthcare® Hydrogen Peroxide Cleaner Disinfectant Wipes	Wipes	Clorox professional products company
Diversey Oxivir® TB Wipes	Wipes	Diversey Inc
Metrex CaviCide1™	Liquid, spray	METERX® RESEARCH
Metrex CaviWipes™	Wipes	METERX® RESEARCH
PDI Sani-Cloth® AF3 Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® Bleach Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® HB Germicidal Disposable Wipe	Wipes	PDI Inc.
PDI Sani-Cloth® Plus Germicidal Disposable Cloth	Wipes	PDI Inc.
PDI Super Sani-Cloth® Germicidal Disposable Wipe	Wipes	PDI Inc.
VIRAGUARD® Hospital Surface Disinfectant Towelettle	Wipes	VERIDIEN corporation
Virex® II 256 (1:256)	Liquid	Diversey Inc
Virex® TB	Liquid, spray	Diversey Inc
JIAN ZHI SU Disinfectant Tablets	Tablet	Beijing ChangJiangMai Medical Science Technology Co. Ltd
JIAN ZHI SU Surface Disinfectant Spray	Liquid, spray	Beijing ChangJiangMai Medical Science Technology Co. Ltd

Product Name	Product Type	Manufacturer
JIAN ZHI SU Disinfectant, Double-chain Quaternary Ammonium	Liquid	Beijing ChangJiangMai Medical Science Technology Co. Ltd
DIAN'ERKANG Surface Wipes	Wipes	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
DIAN'ERKANG Surface Disinfectant	Liquid	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
DIAN'ERKANG Disinfectant Spray	Liquid, spray	Shanghai Likang Disinfectant Hi-Tech Co., Ltd
Clinell® Universal Wipes	Wipes	GAMA Healthcare Ltd
Clinell ® Sporicidal Wipes	Wipes	GAMA Healthcare Ltd
Tristel Duo™	Liquid, foam	Tristel solutions Limited
Tristel Jet	Liquid, spray	Tristel solutions Limited
Tristel Fuse For Surfaces, 196ppm	Liquid	Tristel solutions Limited
Surfanios Premium, 0.25%	Liquid	ANIOS LABORATORIES
Surfa 'safe	Liquid, spray	ANIOS LABORATORIES
Wip' Anios premium	Wipes	ANIOS LABORATORIES
Aniosurf ND premium, 0.25%	Liquid	ANIOS LABORATORIES
Mikrobac® Tissues	Wipes	BODE Chemie GmbH
Cleanisept® Wipes	Wipes	Dr. Schumacher GmbH
mikrozid® PAA Wipes	Wipes	Schülke & Mayr GmbH
mikrozid® Sensentive Wipes	Wipes	Schülke & Mayr GmbH
Ecolab Incidin® OxyWipe S	Wipes	Ecolab Deutschland GmbH
Glutaraldehyde, 2%	Liquid	/
*Ethanol, 70%	Liquid	/
*Isopropanol, 70%	Liquid	/
*Sodium hypochlorite bleach, 0.5%	Liquid	/
*Hydrogen peroxide, 3%	Liquid	/
*Rely+On™ Virkon® High Level surface Disinfectant, 1%	Powder	Antec International Ltd
*1-Propanol, 50%	Liquid	/
*Descosept® forte	Liquid	Dr. Schumacher GmbH
*Descosept® AF	Liquid	Dr. Schumacher GmbH
*Dismozon® plus, 0.4%	Powder	BODE Chemie GmbH
*mikrozid® AF Wipes	Wipes	Schülke & Mayr GmbH

Product Name	Product Type	Manufacturer
*Terralin® Liquid	Liquid	Schülke & Mayr GmbH
*Perform® Classic Concentrate OXY, 0.5%	Powder	Schülke & Mayr GmbH

NOTE

- **For equipment with the symbol , all the listed cleaners and disinfectants are available for use. For equipment without this symbol, only the cleaners and disinfectants marked with "*" are available for use.**

24.5 Cleaning and Disinfecting the Accessories

To clean and disinfect the following accessories, using cleansers, disinfectants, and methods described in this manual:

- NIBP air hose
- Mindray SpO_2 cable
- Masimo SpO_2 cable
- Nellcor SpO_2 cable

For other accessories, consult instructions for use delivered with the accessories.

CAUTION

- **Fluids entering the NIBP air hose can damage the equipment. When cleaning or disinfecting the NIBP air hose, prevent liquid from entering the hose.**
- **Periodically inspect the NIBP air hose and connector for signs of wear or deterioration after cleaning or disinfecting the NIBP air hose. Replace the NIBP air hose if you detect a leak. Dispose of damaged NIBP air hose according to local laws for disposal of hospital waste.**
- **Never immerse or soak the accessories in any liquid.**
- **Never clean or disinfect the connectors and metal parts.**
- **Use only Mindray approved cleaners and disinfectants and methods listed in this section to clean or disinfect the accessories. Warranty does not cover damage caused by unapproved substances or methods.**
- **To avoid long term damage, the accessories should be disinfected only when necessary as determined by your hospital's policy.**

24.5.1 Cleaning the Accessories

You should clean the accessories on a regular basis. Before cleaning the accessories, consult your hospital's regulations for cleaning the accessories.

To clean the accessories, follow this procedure:

1. Clean the accessories with a soft cloth moistened with water or ethanol (70%).
2. Wipe off all the cleaner residue with a dry cloth.
3. Allow the accessories to air dry.

24.5.2 Disinfecting the Accessories

We recommend that the accessories should be disinfected only when necessary as determined by your hospital's policy. Cleaning the accessories before disinfecting is recommended.

B.5 Temp Specifications

Standard	Meet the standard of ISO 80601-2-56
Technique	Thermal resistance
Operating mode	Direct mode
Measurement range	0 to 50 °C (32 to 122 °F)
Resolution	0.1°C
Accuracy	±0.1 °C or ±0.2 °F (excluding probe error)
Refreshing rate	≤1 s
Minimum time for accurate measurement	Body surface: <100 s Body cavity: <80 s

Alarm limit	**Range**	**Step**
Txx High (xx refers to temperature site)	(low limit +1.0) to 50.0 °C (low limit +2.0) to 122.0 °F	0.1 °C 0.1 °F
Txx Low (xx refers to temperature site)	0.1 to (high limit - 1.0) °C 32.2 to (high limit - 2.0) °F	
ΔT High	0.1 to 50.0 °C 0.2 to 90.0 °F	

B.6 NIBP Specifications

Standard	Meet standard of IEC 80601-2-30: 2018			
Technique	Oscillometry			
Mode of operation	Manual, Auto, STAT, Sequence			
Auto mode repetition intervals	1, 2, 2.5, 3, 5, 10, 15, 20, 30, 60, 90, 120, 180, 240 or 480 min			
STAT mode cycle time	5 min			
Max measurement time	Adult, pediatric: 180 s Neonate: 90 s			
Heart rate range	30 to 300 bpm			
Measurement ranges (mmHg)		Adult	Pediatric	Neonate
	Systolic:	25 to 290	25 to 240	25 to 140
	Diastolic:	10 to 250	10 to 200	10 to 115
	Mean:	15 to 260	15 to 215	15 to 125
Accuracy	Max mean error: ±5 mmHg Max standard deviation: 8 mmHg			
Resolution	1mmHg			
Initial cuff inflation pressure range (mmHg)	Adult: 80 to 280 Pediatric: 80 to 210 Neonate: 60 to 140			
Default initial cuff inflation pressure (mmHg)	Adult: 160 Pediatric: 140 Neonate: 90			