HELPING TO **PROTECT YOUR MOST VULNERABLE NEWBORNS**

Technical specifications for the U.S.

Puritan Bennett™ 980 Ventilator System

The Operator's Manual contains information relevant to your institution's use of the ventilator, including instructions, warnings, and cautions.

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Puritan Bennett™ 980 Ventilator

Technical specifications

The Puritan Bennett™ 980 neonatal ventilator is designed specifically to address the challenges of safe and effective neonatal ventilation. Every Puritan Bennett™ 980 ventilator features Leak Sync software, which automatically detects and compensates for fluctuating leak sizes.† This capability results in a decreased risk of trigger asynchronies and more reliable displayed volume, helping you keep babies at a more desirable work of breathing.[1,2]

PHYSICAL CHARACTERISTICS

Weight	113 lb (51.26 kg) including BDU, GUI, standard base, and primary battery; 69 lb (31.3 kg) for BDU only
Ventilator dimensions	12.5" width x 11.5" depth x 58" height (32 cm width x 30 cm depth x 148 cm height), including GUI screen
Graphical user interface dimensions	15" (38.1 cm) screen, rotates 170° and tilts up to 45° from vertical
A-weighted sound pressure level, ventilator	At a distance of 1 m, does not exceed 48 dBA at 5 L/min

Displayed units

Weight units	Kilograms (kg) or pounds (lb) — user selectable
Length units	Centimeters (cm) or inches (in) — user selectable
Pressure units	Hectopascal (hPa) or centimeters of water (cmH_2O) — user selectable

† Puritan Bennett Leak Sync software compensates for leaks up to 30 L/min for neonatal patients.

Puritan Bennett™ 980 Pendant Ventilator

PENDANT CHARACTERISTICS

Pendant base dimensions	14.7" width x 15.5" depth x 22.5" height (37 cm width x 39 cm depth x 57 cm height)
Pendant base weight	76 lb (34.5 kg) including BDU, GUI, and primary battery; 60 lb (27.2 kg) for BDU only
Graphical user interface dimensions	15" (38.1 cm) screen
Pendant graphical user interface weight	12.6 lb (5.7 kg)

COMPRESSOR CHARACTERISTICS

DC compressor

DC compressor base weight	89 lb (40.4 kg)
Battery	Ships with one lithium-ion one-hour battery

PNEUMATIC SPECIFICATIONS

Oxygen and air inlet supplies	Pressure: 241 to 600 kPa (35 psi to 87 psi), Flow: Maximum of 200 L/min
Gas mixing system	Leakage from one gas system to another: Meets IEC 80601-2-12 standard
Maximum limited pressure ($P_{LIM\,max}$)	Limits circuit pressure to < 125 cmH_2O (123 hPa) at the patient wye
Maximum working pressure ($P_{W\,max}$)	$P_{W\,max}$ is ensured by the high pressure limit when P_I is < 100 cmH_2O (98.07 hPa).

Measuring Devices

Pressure measurements	Type: Solid-state differential pressure transducer Sensing position: Inspiratory module, expiratory module
Flow and volume measurements	Type: Hot-film anemometer Sensing position: Inspiratory module, expiratory module Type: Proximal flow sensor option uses differential pressure Sensing position: Patient wye
Oxygen measurement	Type: Galvanic cell; Sensing position: Inspiratory module
Oxygen sensor life	Up to one year; operating life varies depending on oxygen usage and ambient temperature

Filtration Capabilities

Internal inspiratory filter bacterial/viral filtration efficiency	> 99.999%
Internal inspiratory filter particle filtration efficiency	> 99.97% retention of particles 0.3 µm nominal at 100 L/min flow
Exhalation filter bacterial/viral filtration efficiency (neonatal, disposable)	>99.999% bacterial filtration efficiency/99.99% viral filtration efficiency
Exhalation filter particle filtration efficiency (neonatal, disposable)	> 99.70% retention of particles 0.3 µm nominal at 30 L/min flow
Exhalation filter resistance (neonatal, disposable)	< 0.58 cmH_2O at 2.5 L/min when new

Circuit Compliance and Resistance

Circuit compliance	Neonatal: 0.4 mL/cmH_2O to 1.5 mL/cmH_2O
Inspiratory limb circuit resistance	Neonatal: 0.37 cmH_2O to 4.5 cmH_2O (6.0 cmH_2O for Prox) at 10 L/min
Expiratory limb circuit resistance	Neonatal: 0.37 cmH_2O to 4.5 cmH_2O (6.0 cmH_2O for Prox) at 10 L/min

ELECTRICAL SPECIFICATIONS

Electrical ratings without compressor	100 V ~, 50–60, Hz, 2.25 A 120 V ~, 50–60, Hz, 1.5 A 220–240 V ~, 50–60 Hz, 0.75 A
Mains overcurrent release	CB1: 4 A, CB2: 6 A
Earth leakage current	Meets requirements of IEC 60601-1, type BF applied part
Touch current	Meets requirements of IEC 60601-1, type BF applied part
Patient leakage current	Meets requirements of IEC 60601-1, type BF applied part
Electrical ratings with DC compressor	100 V ~, 50–60 Hz, 8.25 A 120 V ~, 50–60 Hz, 6.0 A 220–240 V ~, 50–60 Hz, 3.0 A

ENVIRONMENTAL SPECIFICATIONS

Temperature	Operation: 10°C to 40°C (50°F to 104°F) Storage: -20°C to 70°C (-4°F to 158°F)
Atmospheric pressure	Operation: 70 kPa to 106 kPa (10.15 psi to 15.37 psi) Storage: 50 kPa to 106 kPa (7.25 psi to 15.37 psi)
Altitude	Operation: -411.5 m to 3,048 m (-1,350 ft to 10,000 ft) Storage: 6,096 m max (20,000 ft max)
Relative humidity	Operation: 10% to 95% non-condensing Storage: 10% to 95% non-condensing

TECHNICAL SPECIFICATIONS

Setting	Range	Overview
Predicted body weight (PBW)	0.3 kg (0.66 lb) to 7 kg (15 lb)	
Modes	Assist Control (A/C), Synchronized Intermittent Mandatory Ventilation (SIMV), Spontaneous (SPONT), BiLevel, Continuous Positive Airway Pressure (CPAP)	
Trigger type	Flow-triggering ($\dot{V}_{TRIG}$)	
Mandatory breath types	Volume Control (VC), Pressure Control (PC) and Volume Control Plus (VC+)	
Spontaneous breath types	Pressure Support (PS), Volume Support (VS)	
Ventilation type	Invasive, Noninvasive (NIV), and HFO_2T (optional)	
Tidal volume (V_T)	2 mL to 315 mL	
Respiratory rate (f)	1.0 1/min to 150 1/min	
Positive end expiratory pressure (PEEP)	0 cmH_2O to 45 cmH_2O	The measured circuit pressure (referenced to the patient wye) at the end of the expiratory phase of a breath
Constant flow ($\dot{V}_{CONST}$)	1 L/min to 50 L/min	Flow delivered continuously and maintained at the operator-set rate ($\dot{V}_{CONST}$) through a single-limb circuit connected to an oxygen therapy interface (setting available with the HFO2T software option)
O_2%	21% to 100%	Percentage of delivered oxygen in the gas mixture
Pressure support (P_{SUPP})	0 cmH_2O to 70 cmH_2O	The positive pressure above PEEP during a spontaneous breath
Peak inspiratory flow ($\dot{V}_{MAX}$)	1 L/min to 30 L/min	Maximum rate of tidal volume delivery during mandatory volume-based breaths
Flow pattern	Square or descending ramp	
Rise time %	1% to 100%	The speed at which inspiratory gas delivered to the patient reaches the pressure target
Expiratory sensitivity (E_{SENS})	1% to 80%	Percentage of $\dot{V}_{MAX}$ that causes the ventilator to cycle from inspiration to exhalation when reached during pressure-based spontaneous breaths
Plateau time (T_{PL})	0.0 to 2.0 seconds	Amount of time inspiration is held in the patient's lungs after inspiratory flow ceases
Inspiratory pressure (P_I)	5 cmH_2O to 90 cmH_2O	Pressure above PEEP at which gas is delivered to the patient during mandatory PC breaths
Inspiratory time (T_I)	0.2 to 8.0 seconds	Time during which an inspiration is delivered to the patient
I:E ratio	1:299 to 4:1	Specifies the ratio of inspiratory time to expiratory time
Expiratory time (T_E)	≥ 0.20 seconds	Time interval between the end of inspiration and beginning of the next inspiration
Flow sensitivity ($\dot{V}_{SENS}$)	0.1 L/min to 10 L/min	Determines volume of flow required to begin a mandatory or spontaneous patient-initiated breath
Apnea ventilation mandatory type	PC, VC	A safety mode of ventilation that starts if the patient does not receive a breath for an elapsed time exceeding the apnea interval
Apnea flow pattern	Square or descending ramp	The flow shape of the delivered mandatory volume-based (VC) apnea breath
Apnea peak inspiratory flow ($\dot{V}_{MAX}$)	1.0 L/min to 30 L/min	The maximum rate of tidal volume delivery during mandatory volume-based apnea breaths

TECHNICAL SPECIFICATIONS (CONT'D)

Setting	Range	Overview
Apnea tidal volume (V_T)	3 mL to 315 mL	Sets the volume of gas delivered to the patient's lungs during a mandatory, volume-controlled apnea breath
Apnea inspiratory pressure (P_I)	5 cmH_2O to 90–PEEP cmH_2O	The pressure above PEEP at which gas is delivered to the patient during mandatory PC apnea breaths
Apnea interval (T_A)	10 to 60 seconds or Off in CPAP	Duration of time that can lapse without a patient- or ventilator-triggered breath before the ventilator will initiate mandatory apnea ventilation breaths
Apnea respiratory rate (f_A)	2.0 1/min to 40 1/min	Sets the number of volume- or pressure-based breaths per minute for ventilator initiated mandatory (VIM) apnea breaths
Apnea O_2%	21% to 100% O_2	Determines the oxygen concentration in a standard mixture of air and oxygen
Apnea I:E ratio	≤ 4.00:1	In PC breath types, specifies the ratio of apnea inspiratory time to apnea expiratory time
Apnea expiratory time (T_E)	0.20 to 59.8 seconds	For mandatory PC apnea breaths, the time interval between the end of inspiration and the beginning of the next inspiration
Disconnect sensitivity (D_{SENS}) when Leak Sync software is enabled	1 L/min to 15 L/min for INV and 1 L/min to 30 L/min for NIV	Maximum allowable leak flow rate that can be lost before a circuit disconnect alarm sounds
Humidification type	Heat-moisture exchanged (HME), non-heated expiratory tube, heated expiratory tube	The type of humidification system used on the ventilator
Humidifier volume	100 mL to 1,000 mL	Empty fluid volume of the currently installed humidifier

ALARMS

Setting	Range
Exhaled tidal volume	Low/high
Exhaled minute volume	Low/high
Inspired tidal volume	High
Respiratory rate	High
Circuit pressure	Low/high
Apnea interval	10 to 60 seconds or Off in CPAP

ADVANCED DISPLAYED PATIENT DATA

Data Value	Range	Overview
End expiratory pressure at the patient interface ($PEEP_{IF}$)	-10 cmH_2O to 45 cmH_2O	Pressure measured at the end of the expiratory phase of the previous breath referenced to the patient side of an NIV interface (available with the NIV+ software option)
End inspiratory pressure at the patient interface ($PI_{END\,IF}$)	-10 cmH_2O to 90 cmH_2O	Pressure measured at the end of the inspiratory phase of the current breath referenced to the patient side of an NIV interface (available with the NIV+ software option)

ADVANCED DISPLAYED PATIENT DATA **(CONT'D)**

Data Value	Range	Overview
Proximal exhaled tidal volume (V_{TE-Y})	0 mL to 500 mL	Exhaled volume of the previous breath, measured by the proximal flow sensor for neonatal patients
Proximal inspired tidal volume (V_{TI-Y})	0 mL to 500 mL	Inspired volume of the previous breath, measured by the proximal flow sensor for neonatal patients
%Leak	0% to 100%	Percentage of total delivered volume during inspiration attributed to the leak. Calculated as (leak volume during inspiration/total delivered inspiratory volume) x 100
Inspiratory leak volume (V_{LEAK})	0 mL to 9,000 mL	The total volume delivered during inspiration to compensate for the leak
Leak	0 L/min to 200 L/min	Leak rate during exhalation at PEEP
Dynamic resistance (R_{DYN})	0 cmH_2O/L/s to 100 cmH_2O/L/s	Change in pressure per unit change in flow
Dynamic compliance (C_{DYN})	0 mL/cmH_2O to 200 mL/cmH_2O	Result of dividing the delivered tidal volume by the peak airway pressure
Inspiratory compliance (C_{20}/C)	0 to 1.00	Ratio of compliance of the last 20% of inspiration to the compliance of the entire inspiration

ORDERING INFORMATION

Standard Base Configuration	Software Options	Part Number
Puritan Bennett™ 980 series ventilator kit neonatal configuration, standard	Neonatal software	980N1ENDIUUS
Puritan Bennett™ 980 series ventilator kit universal configuration, standard	Universal software	980U1ENDIUUS
Pendant Base Configuration	**Software Options**	**Part Number**
Puritan Bennett™ 980 series ventilator kit neonatal configuration, pendant	Neonatal software	980N2ENDIUUS
Puritan Bennett™ 980 series ventilator kit universal configuration, pendant	Universal software	980U2ENDIUUS
DC Compressor Configuration	**Software Options**	**Part Number**
Puritan Bennett™ 980 series ventilator kit neonatal configuration, DC compressor	Neonatal software	980N3ENDIUUS
Puritan Bennett™ 980 series ventilator kit universal configuration, DC compressor	Universal software	980U3ENDIUUS

Standard Accessories	Part Number
Gold standard test circuit (tube assembly silic. 21")	4-018506-00
Flex arm	4-032006-00
Oxygen hose assembly (United States, Latin America)	4-001474-00
Air hose assembly (United States, Latin America)	4-006541-00
Condensate vial	10063031
Power cord (North America)	10081056
Inspiratory bacterial filter	
DAR™ pediatric/neonatal filter	350U5679
Puritan Bennett™ inspiratory bacterial filter, disposable (D/Flex filter, 22 mm ISO, box of 12)	4-074601-00
Expiratory bacterial filter and collector vial	
Puritan Bennett™ neonatal expiratory filtration system, disposable	4-076900-00
Puritan Bennett™ neonatal expiratory filter kit: bracket/door and disposable filtration system	10095100
Puritan Bennett™ exhalation valve flow sensor assembly, reprocessing kit (EVQ) (carton of 6)	10086048
Oxygen sensor	
Oxygen sensor	10097559

Optional Accessories	Part Number
Rechargeable lithium-ion battery	10086042
Test lung	10005490
Humidifier bracket	10086049
Cylinder mount	10086050
Puritan Bennett™ exhalation valve flow sensor (EVQ)	10097468
Puritan Bennett™ wall air water trap	10086051
Humidifiers, Filters and Breathing Circuits	**Part Number**
Humidifier base	MR850JHU
DAR™ pediatric-neonatal electrostatic filter HME, small (Hygrobaby 50/box)	355U5427
Disposable DAR™ PVC neonatal breathing circuit with water trap and single heated wire	307/8682
Drain Bag and Drain Bag Accessories	**Part Number**
Drain bag, disposable (package of 25)	4-048491-00
Drain bag tubing, disposable (package of 10)	4-048493-00
Clamp, reusable (package of 5)	4-048492-00
Drain cap	4-074613-00
Proximal Flow Options	**Part Number**
Puritan Bennett™ host board (required for proximal flow option)	10084334
Proximal flow module hardware install kit	10084331
Proximal flow monitoring sensor, neonatal, with IFU and clips	10047078
Combo sensor, neonatal, with IFU and clips (box of 10)	10005002
End-Tidal CO_2 Monitoring Options	**Part Number**
End-tidal CO_2 monitoring option	10084332
Neo/ped CO_2 airway adapter, disposable	10078386
Neonatal CO_2 airway adapter, reusable	10083943
Neo Flow and CO_2 combo sensor, disposable	10005002
Capnostat™* CO_2 sensor	10087409
Software Options	**Part Number**
High flow oxygen therapy (HFO_2T) software option	980HFO2T-US
NIV+ software option	980NIVPLUS-US

This guide is provided as a convenience companion document to the Operator's Manual. It is not intended to replace the Operator's Manual, which should always be available while using the ventilator. It is important to familiarize yourself with all information in the Operator's Manual relevant to your institution's use of the ventilator, including on-screen help instructions, warnings, and cautions.

1. Bernstein G, Knodel E, Heldt GP. Airway leak size in neonates and autocycling of three flow-triggered ventilators. *Crit Care Med*. 1995;23(10):1739-1744.

2. Wilkins RL, Stoller JK, Scanlan CL. *Egan's Fundamentals of Respiratory Care*. 8th ed. Louis, MO: Mosby; 2003.

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