GE Healthcare

CARESCAPE™ V100 Vital Signs Monitor

Operator's Manual

Software Version R1.5

CARESCAPE V100 Vital Signs Monitor
English
2037107-003 (CD)
2048724-001A (paper)

NOTE: The information in this manual applies to CARESCAPE V100 Vital Signs Monitor software version R1.5. Due to continuing product innovation, specifications in this manual are subject to change without notice.

NOTE: For technical documentation purposes, the abbreviation GE is used for the legal entity name, GE Medical Systems *Information Technologies*, Inc.

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1 Introduction

About this device

The CARESCAPE V100 vital signs monitor provides a small, portable, easy-to-use monitoring alternative for sub-acute hospital and non-hospital settings. The monitor is for use on adult, pediatric, or neonatal patients—one at a time. The battery-operated monitor offers noninvasive determination of systolic blood pressure, diastolic blood pressure, mean arterial pressure, pulse rate, oxygen saturation, and temperature. Monitors are available with or without integrated printers as well as the following parameters and technologies.

- NIBP, Pulse: SuperSTAT, Auscultatory, or Classic
- SpO_2: Ohmeda TruSignal, Nellcor OxiMax, or Masimo SET
- Temperature: Alaris Turbo Temp, Alaris Tri-Site, or Exergen

The model of the CARESCAPE V100 vital signs monitor determines which parameters are in your monitor. Please refer to applicable sections.

Using the CARESCAPE V100 vital signs monitor, a clinician can measure, display, and record patient vital sign data that is derived from each parameter. The monitor is also capable of alerting the clinician to changes in the patient's condition or when it is unable to effectively monitor the patient's condition. The monitor also detects alarm limit conditions and gives audible and visual notification of these conditions. All of the main operations of the monitor are easy-to-use and only a button-touch away. Please review the factory default settings and, where applicable, enter settings appropriate for your use.

Indications for use

The CARESCAPE V100 vital signs monitor is for use as prescribed by physicians, physician assistants, registered nurses, certified registered nurse anesthetists, or other qualified medical personnel trained in the use of the equipment. The CARESCAPE V100 vital signs monitor is intended to monitor and measure oscillometric noninvasive blood pressure (systolic, diastolic, and mean blood pressure), heart rate/pulse, oxygen saturation (SpO_2) by noninvasive pulse oximetry, and temperature using fast predictive mode or continuous monitor mode. An interface to the Exergen TAT-5000 temporal scanner is also provided. Using this monitor, a clinician can view, record, and recall clinical data derived from each parameter.

CARESCAPE V100 vital signs monitors are intended for use in various markets, from the physician's office to sub-acute triage and medical/surgical units. The CARESCAPE V100 vital signs monitor is intended to monitor one patient at a time in a clinical setting.

Safety message signal words

Safety message signal words designate the severity of a potential hazard.

Danger: Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

Warning: Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

Caution: Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

Contraindications

This device is not designed, sold, or intended for use except as indicated.

WARNINGS

To avoid personal injury, do not perform any servicing unless qualified to do so.

If powering the monitor from an external power adapter or converter, use only GE-approved power adapters and converters.

Carefully route the external AC/DC power converter, air hoses, and all cables to reduce the possibility of entanglement or strangulation.

Do not immerse monitor in water. If monitor is splashed with water or becomes wet, wipe it immediately with a dry cloth.

Do not immerse sensors in water, solvents, or cleaning solutions (the sensors and connectors are not waterproof).

Examine the power cord periodically. Discontinue use and replace if damaged. Replace the power cord, as necessary, with a regulatory-approved cord for the country of use.

Avoid swinging the monitor, or entangling the monitor and its accessories with a mount or roll-stand, as this could cause the monitor to drop, leading to patient or user injury, and equipment damage.

If any of the seven-segment indicator lights fails to illuminate during the display test, the accuracy of vital sign values could be misread. This indicates problems with the display. Contact GE Technical Support.

Do not perform any testing or maintenance on a sensor while it is being used to monitor a patient.

WARNINGS

Verify calibration of NIBP parameter (temperature and pulse oximeter do not require calibration; refer to the service manual for instructions).

The monitor should only be used by people who have familiarized themselves with its operation.

Keep the monitor and its accessories out of the patient's reach when not in use.

Place the monitor on a rigid, secure surface or use the monitor with mounting hardware, poles, and stands recommended by GE.

Only use the monitor in areas where adequate ventilation exists.

Do not use any battery other than a GE recommended battery. Other batteries may not provide the same operating time and may cause unexpected monitor shut-down. Other batteries may be incompatible with the internal charger and may cause battery acid leakage, fire, or explosion.

Caution should be taken to not set alarm limits to extreme values, as this can render the alarm system useless.

CAUTIONS

Federal law (U.S.A.) restricts this device to sale by or on the order of a physician.

The performance of the monitor may be degraded if it is operated or stored outside of the environmental conditions specified in this manual.

The monitor meets standards IEC 60601-1 and ISO 9919 for shock and vibration. If the monitor is subjected to conditions exceeding these standards, performance may be degraded.

Do not use the monitor in the presence of magnetic resonance imaging (MRI) devices. There have been reports of sensors causing patient burns when operating in an MRI environment.

Do not use the monitor in the presence of flammable anesthetics.

Do not use in the presence of an oxygen-enriched atmosphere (oxygen tent).

CAUTIONS

Operating the monitor near equipment which radiates high-energy electromagnetic and radio frequencies (electrosurgical/ cauterizing equipment, portable radios, cellular telephones, etc.) may cause false alarm conditions. If this happens, reposition the monitor and temperature probe away from the source of interference and perform a new measurement.

Do not gas sterilize or autoclave the monitor.

The monitor should not be used on patients who are connected to cardiopulmonary bypass machines.

The monitor does not include any user-replaceable fuses. Refer servicing to qualified service personnel.

To reduce the risk of electric shock, do not remove the cover or the back. Refer servicing to a qualified service person.

If the accuracy of any determination reading is questionable, first check the patient's vital signs by alternate means and then check the monitor for proper functioning.

To help prevent unintended current return paths with the use of high frequency (HF) surgical equipment, ensure that the HF surgical neutral electrode is properly connected.

Do not exceed a load weighing 5 lb. (2.7 kg) in the accessory basket.

To prevent cross-contamination, clean exterior surfaces of the monitor, monitor accessories, and reusable sensors on a regular basis in compliance with your institution's infection control unit and/or biomedical department's local policy.

Do not disassemble the monitor as personal injury may result.

NOTES

- This equipment is suitable for use in the presence of electrosurgery.
- The use of approved accessories will provide protection from burns during high frequency surgery.

Product compliance

CARESCAPE V100 vital signs monitor

Compliance classifications

The monitor is classified in the following categories for compliance with IEC 60601-1:

- Internally powered or Class II when powered from external supply.
- Transportable.
- For continuous operation.
- Not suitable for use in the presence of flammable anesthetics.
- Not for use in the presence of an oxygen-enriched atmosphere (oxygen tent).
- Type BF defibrillator-proof applied parts.
- IPX1, degree of protection against ingress of water.
- Sterilization/Disinfection, refer to *Appendix C, "Maintenance"* .
- Software is developed in accordance with IEC 60601-1-4.
- The monitor complies to IEC 60601-2-49.
- The alarm system is developed in accordance with IEC 60601-1-8.
- This equipment is suitable for connection to public mains via power. adapters as defined in CISPR 11.
- The SpO_2 parameter complies to ISO 9919.
- The NIBP parameter complies to IEC 60601-2-30, EN 1060-1, EN 1060-3, and ANSI/AAMI SP10.
- The Temperature parameter complies to ASTM E-1112-00.
- Defibrillation protected. When used with the recommended accessories, the monitor is protected against the effects of defibrillator discharge. If monitoring is disrupted by the defibrillation, the monitor will recover.
- This product conforms with the essential requirements of the Medical Device Directive 93/42/EEC. Accessories without the CE mark are not guaranteed to meet the Essential Requirements of the Medical Device Directive.

Electromagnetic compatibility (EMC)

WARNINGS

Use of known RF sources, such as cell/portable phones, or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation of this device/system. Consult qualified personnel regarding device/system configuration.

Use only approved accessories, including mounts and defibrillator-proof cables. For a list of approved accessories, see the supplies and accessories list delivered with the manual. Other cables and accessories may cause a safety hazard, damage the equipment or system, result in increased emissions or decreased immunity of the equipment or system or interfere with the measurement.

CAUTIONS

The equipment or system should not be used adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, the equipment or system should be tested to verify normal operation in the configuration in which it is being used.

EMC — Magnetic and electrical fields are capable of interfering with the proper performance of the device. For this reason make sure that all external devices operated in the vicinity of the monitor comply with the relevant EMC requirements. X-ray equipment or MRI devices are a possible source of interference as they may emit higher levels of electromagnetic radiation. Changes or modifications to this device/system not expressly approved by GE Healthcare may cause EMC issues with this or other equipment. This device/system is designed and tested to comply with applicable standards and regulations regarding EMC and needs to be installed and put into service according to the EMC information stated as follows: This device/system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. Mains power should be that of a typical commercial or hospital environment.

NOTE

Medical electrical equipment require special electromagnetic compatibility (EMC) precautions which must be considered when installing and putting this equipment into operation. Refer to the service manual for information.

Exergen temporal scanner

The Exergen temporal scanner has these additional classifications:

- Type BF applied part
- Internally powered (battery operated)
- IPX0, degree of protection against ingress of water

Symbols

The following symbols are associated with the monitor and Exergen temporal scanner.

CARESCAPE V100 vital signs monitor

NOTE
The model of the monitor determines which symbols appear on it.


Attention, consult accompanying documents


Silence


Alarms Silence


+ / - Increase / decrease adjustable settings


Inflate/Stop


On/Off


Battery Power


External communications port connector


Charging

External DC power input

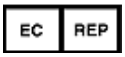

Class II equipment

Defibrillator-proof type BF equipment

WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE): This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

Manufacturer: This symbol is accompanied by the name and the address of the manufacturer.

Manufacturing Date: This symbol is accompanied by the date of the manufacturing.



European authorized representative.

Classified with respect to electric shock, fire, and mechanical and other specified hazards only in accordance with CAN/CSA C22.2 No. 601.1 and UL 2601-1 (UL 60601-1). Also evaluated to IEC 60601-2-30.

This product conforms with the essential requirements of the Medical Device Directive 93/42/EEC. Accessories without the CE mark are not guaranteed to meet the Essential Requirements of the Medical Device Directive.

This product is protected against vertically falling drops of water and conforms with the IEC 60529 Standard at level of IPX1. No harmful effects will come of vertically falling drops of water making contact with the monitor.

FDA Prescriptive Device symbol for: “Caution: Federal law restricts this device to sale by or on the order of a physician.”.

Catalog or orderable part number.

Device serial number.

Russia only. GOST-R mark.

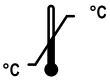
Consult instructions for use.

The PSE mark (Product Safety Electric Appliance and Materials) is a mandatory mark required on Electrical Appliances in Japan as authorized by the Electrical Appliance and Material Safety Law (DENAN).This mark signifies that a product complies with the law according to a set of standards for electric devices.

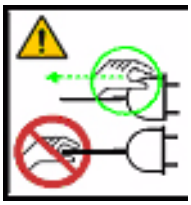
Atmospheric pressure limitations.

Fragile. Handle with care.

Humidity limitations.



Temperature limitations.



CAUTION — Safety ground precaution. Remove power cord from the mains source by grasping the plug. *Do not* pull on the cable.

Exergen temporal scanner

Attention, consult accompanying documents.

Type BF Applied Part.

WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE): This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.

Manufacturer: This symbol is accompanied by the name and the address of the manufacturer.

2006-12

Manufacturing Date: This symbol is accompanied by the date of the manufacturing.

IPX0

Ordinary Equipment.

"On" (only for part of Equipment)

About this manual

Printed copies of this manual

A paper copy of this manual will be provided upon request. Contact your local GE representative and request the part number on the first page of the manual.

Conventions used in this manual

Within this manual, special styles and formats are used to distinguish between terms viewed on screen, a button you must press, or a list of menu commands you must select:

- For technical documentation purposes, the abbreviation GE is used for the legal entity name, GE Medical Systems *Information Technologies*, Inc.
- In this manual, the CARESCAPE V100 vital signs monitor is referred to as the monitor.
- Names of hardware keys on the equipment, keypad, remote control, and modules are written in **bold** typeface: **Go/Stop**.
- Menu items are written in ***bold italic*** typeface: ***Monitor Setup***.
- Emphasized text is in *italic* typeface.
- Menu options or control settings selected consecutively are separated by the > symbol: ***Procedures*** > ***Cardiac Output***.
- When referring to different sections in this manual, section names are enclosed in double quotes: “Cleaning and care.”
- The word “select” means choosing and confirming.
- Messages (alarm messages, informative messages) displayed on the screen are written inside single quotes: '***Learning***.'
- Note statements provide application tips or other useful information.
- Any illustrations appearing in this manual are provided as examples only. They may not necessarily reflect your monitoring setup or data displayed on your monitor.
- Any names appearing in examples and illustrations are fictitious. The use of any real person’s name is purely coincidental.

Revision history

Revision	Comments
A	Initial release of this document.

2 Getting started

Unpacking the monitor and accessories

Before attempting to use the monitor, take a few minutes to become acquainted with the monitor and its accessories. Unpack the items carefully. This is also a good time to check for any damage or accessory shortage. If there is a problem or shortage, contact GE.

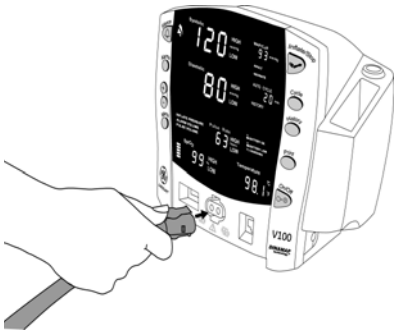
It is recommended that all the packaging be retained, in case the monitor must be returned for service in the future.

Setting up NIBP connections

1. Connect the end of the air hose that has quick-release clips to the NIBP connector on the front of the monitor. Make sure that the hose is not kinked or compressed.

   NOTE

   To disconnect the hose from the monitor, squeeze the quick-release clips together and pull the plug from the NIBP connector.



2. Select appropriate cuff size. Measure patient's limb and select appropriately sized cuff according to size marked on cuff or cuff packaging. When cuff sizes overlap for a specified circumference, choose the larger size cuff.

   WARNING

   Accuracy of NIBP measurement depends on using a cuff of the proper size. It is essential to measure the circumference of the limb and to select the proper size cuff. In addition, the air hoses are color-coded according to patient population. The gray 12- or 24-foot hose (3.66 m or 7.3 m) is required on patients who require cuff sizes from infant through thigh cuffs. The light blue 12-foot hose (3.66 m) is required for the neonatal cuff sizes #1 through #5. If it becomes necessary to move the cuff to another limb, make sure the appropriate size cuff is used.

3. Inspect cuff for damage. Replace cuff when aging, tearing, or weak closure is apparent. Do not inflate cuff when unwrapped.

   CAUTION

   Do not use cuff if structural integrity is suspect.

4. Connect the cuff to the air hose. Refer to "Chapter 7, "NIBP" " of this manual for complete cuff connection instructions.

CAUTION
Always use the appropriate hose and cuff combination for the patient. Any attempt to modify the hose may inhibit the monitor from switching between the neonate and adult/ pediatric measurement modes.

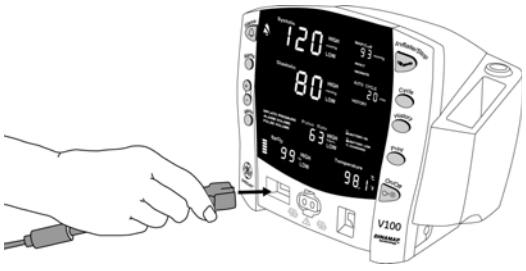
NOTE
Care should be taken in reconnecting the cuff to a hose, ensuring that threads of the cuff and hose are in alignment and no cross-threading occurs.

5. Refer to Chapter 7, "NIBP" of this manual for complete instructions on taking an accurate NIBP determination.

NOTES
- Use only GE CRITIKON BP cuffs. The size, shape, and bladder characteristics can affect the performance of the instrument. Inaccurate readings may occur unless GE CRITIKON Blood Pressure cuffs are used. Refer toAppendix B, "Accessories" for reorder codes.
- The **ADULT** indicator encompasses both adult and pediatric patients.

Setting up SpO_2 connections

1. Plug the appropriate SpO_2 sensor into the SpO_2 sensor extension cable.
2. Then plug the SpO_2 sensor extension cable into the SpO_2 sensor connector on the monitor.

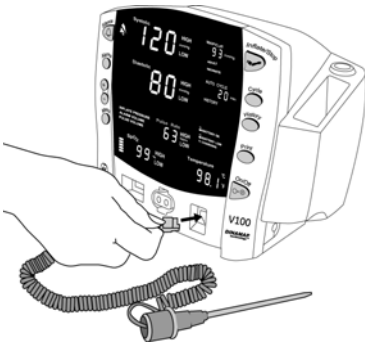


3. Refer to the applicable "SpO2" section of this manual for complete instructions on monitoring SpO_2.

Setting up temperature connections

Alaris

1. Connect the temperature probe cable to the temperature probe connector on the monitor.
2. Insert the temperature probe into the probe holster at the side of the monitor.
3. Refer to *Chapter 11, "Alaris Temperature – Turbo Temp and Tri-Site"* section of this manual for complete instructions on taking a temperature reading.



Exergen

NOTE

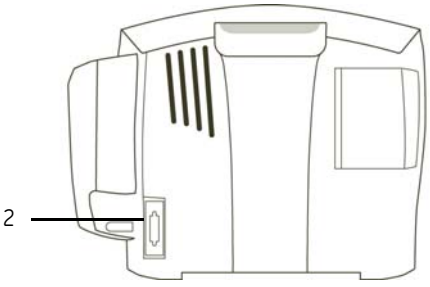
Specific error messages that display on the scanner's LED window will not display on the monitor. Instead, error conditions will be indicated on the monitor by '***E--***'.

NOTE

No more than one Exergen scanner should be connected and used with the monitor at a time.

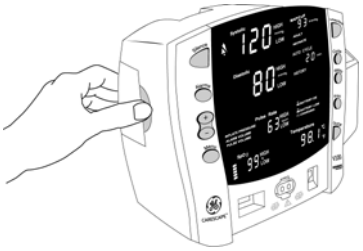
1. Connect the scanner's modular plug (1) to the Host Communication port (2) at the back of the monitor.
2. Secure the plug using the two thumbscrews on the plug.

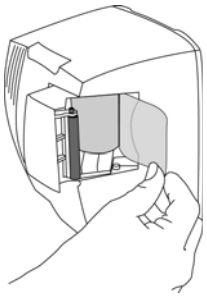
3. Refer to *Chapter 12, "Exergen Temperature"* section of this manual for complete instructions on taking a temperature reading.



Setting up the printer (installing the paper)

1. With the monitor powered on, turn it so that the side with the printer is facing you.
2. While grasping the side of the monitor, lift the printer door open by placing your thumb in the indented area and pulling. The printer door will pop open.





3.Place the roll of paper into the compartment so that the end of the paper comes off the right-side of the roll (paper is wound around the roll clockwise). Place the roll of paper in the holding bracket that is integrated in the door of the printer, making sure the paper extends out of the printer cavity at least two inches.

4.Firmly press the door to close it.

Power sources

The monitor is designed to operate either from an external power source (mains) or from an internal battery. Refer to "Specifications" on page 3-13 for details.

With external DC power connected, the green ⎓ ***CHARGING*** indicator will light to indicate that the battery is charging.

DANGER
ELECTRIC SHOCK — Do not touch the patient and the DC power input connector pins simultaneously.

WARNING
Examine the power cord periodically. Discontinue use and replace if damaged. Replace the power cord, as necessary, with a regulatory-approved cord for the country of use.

NOTES

- Be sure to unplug the power supply from the AC outlet before transport.
- Even if connected to an external power source, the monitor is not designed to operate without an internal battery.

Using the power cord supplied with the monitor, connect it to the power line. Use only the original cord, a power cord recommended by GE, or a regulatory-approved cord for the country of use.

Turning the monitor on and off

To turn the monitor on, push the power **On/Off** button. As the monitor powers up, it runs a short self-test (display test) in which all seven-segment indicator lights illuminate. When the monitor is powered on, it generates a start-up sound. This start-up sound consists of 5 separate tones generated in succession.

WARNINGS
Inspect the device for damage before use.

If any of the seven-segment indicator lights fails to illuminate during the display test, the accuracy of vital sign values could be misread. This indicates problems with the display. Contact GE Technical Support.

If the monitor fails to sound the start-up tones, do not use the monitor. This indicates problems with the audible alarm circuit. Contact GE Technical Support.

To turn the monitor off, push the power **On/Off** button again. This will terminate any measurements that may be in progress and automatically deflate the cuff.

Automatic shutdown

The monitor has an automatic shutdown feature in order to conserve battery life.

When in clinical mode

In clinical mode, the monitor automatically shuts down after an inactive period of 15 minutes.

NOTE
Refer to "Clinical mode" on page 3-7 for a description of clinical mode.

Certain conditions or actions that can delay or disable auto shutdown are:

- The monitor is operating on external DC power.
- The SpO_2 parameter is monitoring vitals.
- The NIBP mode of operation is auto or Stat mode.
- An NIBP determination is in progress.
- Any alarm other than ***BATTERY LOW*** or '***E13***' ***BATTERY LOW*** is active.
- Any remote command/request is received via the host communications protocol.
- A temperature determination is in progress.
- A button is pressed.
- The monitor is in configuration or advanced configuration mode.

In configuration and advanced configuration modes, pressing any button will delay auto shutdown. The monitor automatically shuts down after an inactive period of 15 minutes even if powered by external DC power.

Procedure for testing alarms

1. With the monitor on and the NIBP hose *not* connected to the front of the monitor, press the **Inflate/Stop** button.
2. Verify that after approximately 15 seconds the alarm sounds and the monitor generates an '***E83***' alarm.
3. To clear the alarm, press the **Silence** button.

Configuration mode settings

Monitor settings such as ***HIGH***/***LOW*** alarm settings changed in the clinical mode will not be retained after the monitor is powered off. To retain alarm and parameter settings, the changes must be done in the configuration mode. Date/Time settings are also entered in the Configuration mode.

Entering configuration mode

- With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.

  NOTE

  CFG displays in the **Systolic** window. As the monitor turns on in the configuration mode, a brief display appears showing the software revision, NIBP technology, and temperature technology of the monitor. These displays appear only during the first part of the power up sequence and are not selectable and cannot be changed.

Display	Window
Major software revision	**Systolic**
Minor software revision	**Diastolic**
Type of NIBP technology	**min**
Type of temperature technology	**Temperature**

The type of NIBP technology selected in the monitor is displayed in the **min** (minutes display) window as follows:

- ***AUSC*** if the monitor is configured with auscultatory NIBP Algorithm
- ***STAT*** if the monitor is configured with DINAMAP SuperSTAT Algorithm
- ***CLAS*** if the monitor is configured with DINAMAP Classic Algorithm

The type of temperature probe selected in the monitor is displayed in the **Temperature** window as follows:

- ***trb0*** if the monitor is configured for Alaris Turbo Temp
- ***trl*** if the monitor is configured for Alaris Tri-Site
- ***tat*** if the monitor is configured for Exergen

The Menu selections appear in the following order. Refer to each manual section for settings options.

Menu selections for SpO_2 differ depending upon the technology. Refer to *Chapter 8, "Ohmeda TruSignal SpO2"* , *Chapter 9, "Nellcor OxiMax SpO2"* and *Chapter 10, "Masimo SET SpO2"* sections for options.

Setting	Setting LED window	LED display
Inflate pressure (adult/ped)	**Systolic**	XXX (numeric)
Inflate pressure (neonate)	**Systolic**	XXX (numeric)
Line frequency mode (Ohmeda TruSignal only)	**SpO2**	LF
SpO_2 mode (Nellcor & Masimo only)	**SpO2**	nOd

Setting	Setting LED window	LED display
SpO_2 sat (Nellcor & Masimo only)	**SpO2**	SAt
SpO_2 sensitivity (Masimo only)	**SpO2**	SEn
Temperature units (Alaris Turbo Temp or Tri-Site only)	Degrees **°C** or **°F** will be illuminated	Unt
Temperature display time	**Temperature**	tdt
Year	**Systolic**	Yr
Month	**MAP/Cuff**	MtH
Day	**Diastolic**	dAY
Hour	**min**	Hr
Minute	**min**	Min
Mode (when main screen is active)	**Systolic**	CFG

Configuring the default vital sign alarm limits

WARNINGS

Monitors located in the same clinical area but containing different alarm default settings can result in a potential hazard. Always check your alarm settings before using the monitor.

Caution should be taken to not set alarm limits to extreme values, as this can render the alarm system useless.

To set the default vital sign alarm limits, complete the following procedure:

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Alarms** button until the limit value you want to change is displayed in the applicable vital sign window. The ***HIGH***, ***LOW***, **ADULT**, and ***NEONATE*** screen labels identify what limit value default you are setting.
3. Use the **+/-** buttons to increase or decrease the selected value.
4. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

Reverting to the factory default vital sign alarm limits

WARNING

The Line Frequency mode (for Datex-Ohmeda oximetry) must be set according to each country's electrical power utilities implementation; and that it must be checked and reset any time the monitor is set to or reverts to factory default settings.

To revert to the factory default vital sign alarm limit settings, the monitor must be disconnected from the DC power supply and from the monitor battery. Refer to "Replacing the battery" on page C-8 for DC power supply and battery disconnection/reconnection instructions,

When reverting to factory default settings, the user settings (including alarm limits and inflation pressure), date/time, and the Ohmeda TruSignal SpO_2 Line Frequency mode (***LF***) will go back to default values. Refer to "Configuration mode settings" on page 2-7 to configure the factory default user settings.

NOTE

For monitors configured for Ohmeda TruSignal SpO_2 only, verify that the setting for Line Frequency mode (***LF***) is correct for your country. Refer to "Configuration settings associated with SpO2" on page 8-5.

Setting the date and time

To set the date and time on the monitor, you must access the configuration mode. Press **Menu** to skip the default settings that do not require changes. Refer to the above table.

NOTE

While in configuration mode, all entries stored in the clinical history are erased when the time and/or date is changed.

Procedures

1. Press the **Menu** button to move from one setting to another. Use the **+/-** buttons to increment or decrement the setting.

   NOTE

   For the date and time to be saved, you must advance the menu through the minute setting.

2. To exit the configuration mode, press the **On/Off** button.
3. To continue with other changes, press the **Menu** button. CFG appears in the **Systolic** window. To change parameter settings, press the **Menu** button and select the parameter function. To change alarm settings, press the **Alarms** button.

SpO_2 configuration settings

Procedure for units with Ohmeda TruSignal technology

NOTE
Refer to Chapter 8, "Ohmeda TruSignal SpO2" for options.

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Menu** button until ***LF*** appears in the **Pulse Rate** window.
3. Use the **+/-** buttons to select the option.
4. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

Procedure for units With Nellcor technology

NOTE
Refer to Chapter 9, "Nellcor OxiMax SpO2" for options.

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Menu** button until ***n0d*** (response mode) appears in the **Pulse Rate** window.
3. Use the **+/-** buttons to select the option.
4. Press the **Menu** button once. ***SAt*** (*SatSeconds*) appears in the **Pulse Rate** window.
5. Use the **+/-** buttons to select the option.
6. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

Procedure for units with Masimo technology

NOTE
Refer to Chapter 10, "Masimo SET SpO2" for options.

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Menu** button until ***n0d*** (averaging time) appears in the **Pulse Rate** window.
3. Use the **+/-** buttons to select the option.
4. Press the **Menu** button once. ***SAt*** (FastSAT) appears in the **Pulse Rate** window.
5. Use the **+/-** buttons to select the option.
6. Press the **Menu** button once. ***SEn*** (sensitivity mode) appears in the **Pulse Rate** window.

7. Use the **+/-** buttons to select the option.
8. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

Temperature hardware configuration settings

Changing the Alaris temperature unit of measurement

(Refer to *Chapter 11, "Alaris Temperature – Turbo Temp and Tri-Site"* for options.)

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Menu** button until ***Unt*** (unit of measurement) appears in the **Pulse Rate** window.
3. Use the **+/-** buttons to select the option.
4. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

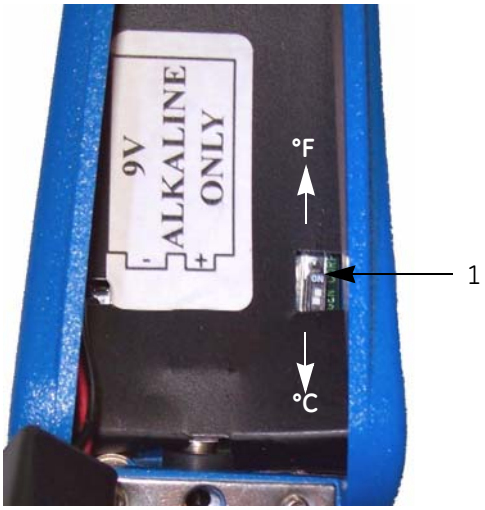
Changing the Exergen temperature unit of measurement

The Exergen scanner comes preset with the requested unit of temperature measurement, but can be changed. To change the scanner's unit of measurement (***°C*** or ***°F***):

1. Disconnect the scanner cable from the monitor.
   - Loosen the two screws from the scanner's modular plug.
   - Unplug the scanner cable from the monitor's Host Communication port.
2. Loosen the single screw (**1**) from the bottom, on the back of the scanner, and remove the battery cover (**2**).

3. Disconnect and remove the battery (**3**).

4. To set the unit of measurement to:
   - ***°F*** — move the F/C switch (**1**) up *toward* the probe cone.
   - ***°C*** — move the F/C switch (**1**) *away* from the probe cone.



5. Replace the battery and cover, then tighten the screw.
6. Reconnect the scanner cable to the Host Communication port and tighten the two screws.

Changing temperature display time

(Refer to *Chapter 11, "Alaris Temperature – Turbo Temp and Tri-Site"* or *Chapter 12, "Exergen Temperature"* for options.)

1. With the monitor off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Press the **Menu** button until ***tdt*** (temperature display time) appears in the **Pulse Rate** window.
3. Use the **+/-** buttons to select the option.
4. To exit the configuration mode, turn the unit off. To continue with additional configuration settings, press the **Menu** button.

Advanced configuration mode

Advanced configuration is used for viewing and printing the failure alarm history. In addition, qualified service personnel use advanced configuration for configuring the monitor's serial port communication settings,

Entering advanced configuration mode

- With the monitor off, press the **On/Off** button at the same time as pressing and holding the **Menu** and **-** (minus) buttons.

  NOTE

  ACF displays in the **Systolic** window. As the monitor turns on in the advanced configuration mode, a brief display appears showing the software version of the monitor.

Display	Window
Major software revision	**Systolic**
Minor software revision	**Diastolic**

Printing the failure alarm history

NOTE

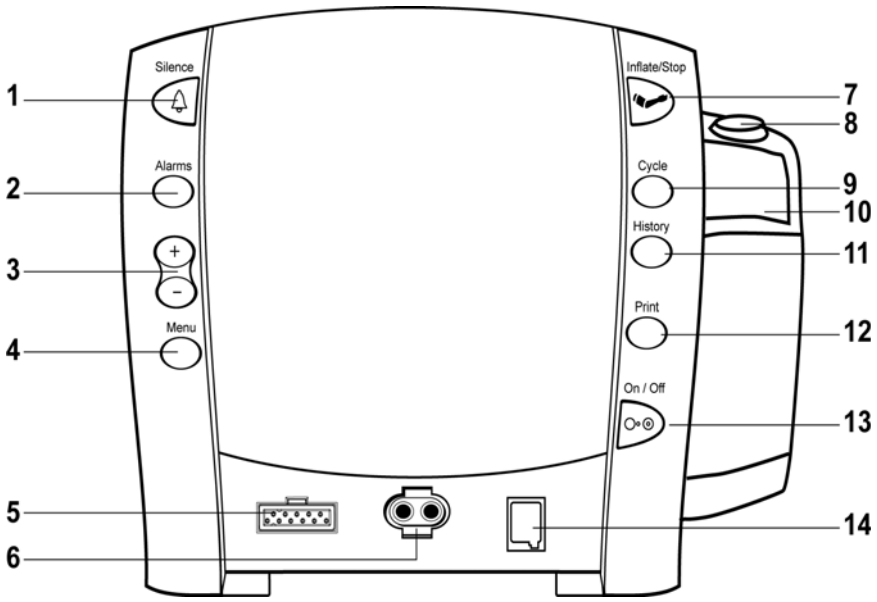
Refer to chapter Chapter 4, "Printer" for printout details.

1. With the monitor off, press the **On/Off** button at the same time as pressing and holding the **Menu** and **-** (minus) buttons.
2. Press the **Print** button once. All failure alarm entries in the failure alarm history are printed n the order of the most recent to the oldest. Each entry is printed on one line.
3. To exit the advanced configuration mode, press the **On/Off** button for less than 5 seconds.

For your notes

3 Product overview

Buttons



1. **Silence** button: mutes audible alarms. Any other active alarm that can be acknowledged is also cleared and the alarm condition is reset whenever this key is pressed. When pressed, the alarm silence indicator (bell) lights solid red to indicate that audible alarms have been silenced for 2 minutes. Alarm silence can be cancelled by pressing the **Silence** button again.
2. **Alarms** button: used to view or adjust parameter alarm limit settings.
3. **+/-** buttons (Plus/Minus): used when you are in the following modes: limit, menu, cycle, and history.
   - When you are in limit or menu setting, pressing the **+/-** button increases and decreases an adjustable setting.
   - When you are in cycle or history mode, pressing the **+/-** buttons displays the next or previous cycle selection or entry in the history list, respectively.
   - When you reach the beginning or ending of a list, a negative key-click sounds.
4. **Menu** button: accesses menu settings that can be adjusted: ***INFLATE PRESSURE*** (***ADULT*** and ***NEONATE***), ***ALARM VOLUME***, and ***PULSE VOLUME***.

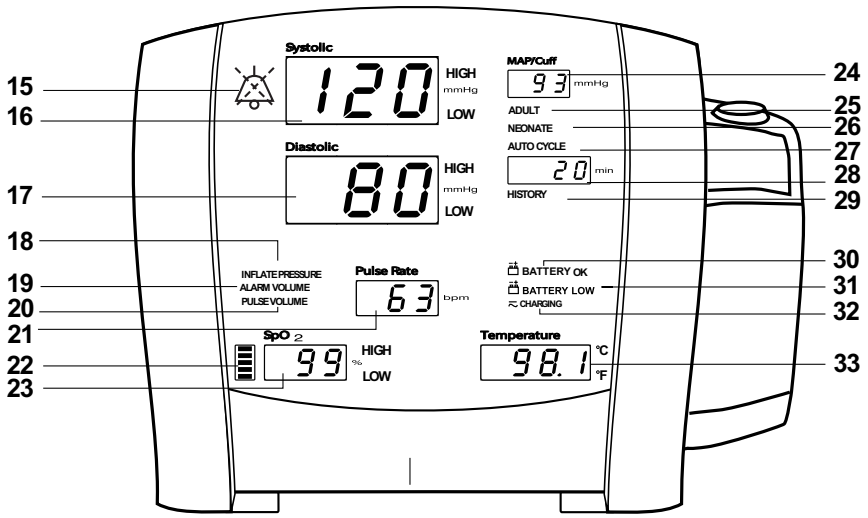
   NOTE
   Refer to "Clinical mode" on page 3-7 for a description of clinical mode.

   NOTE
   (Refer to"Operating (system) modes" on page 3-7 for a description of operating mode.)

   NOTE
   ADULT indicator encompasses both adult and pediatric patients.
5. SpO_2 sensor connector: attach SpO_2 cables here.
6. NIBP connector: attach NIBP cuff hoses here.

7. **Inflate/Stop** button: starts a manual NIBP determination or stop any NIBP determination.
8. Temperature probe holster: stores Alaris temperature probe.
9. **Cycle** button: used to select NIBP mode of manual, auto cycle, or Stat mode.
10. Temperature probe cover storage: stores Alaris probe covers.
11. **History** button: activates the history mode to view stored patient data. The most recent entries are displayed first. Press and hold the button for 2 seconds to clear all entries stored; the adaptive inflate pressure setting returns to the configured setting. Refer to Chapter 6, "History" for more information.
12. **Print** button: prints currently displayed values or all stored entries when in history mode.
13. **On/Off** button: controls on/off state of monitor; push for power on and push again for power off.
14. Alaris temperature probe connector: attach temperature probe cable here. (The Exergen scanner connects to the Host Communications port at the back of the system. Refer to the "Rear panel" on page 3-5.

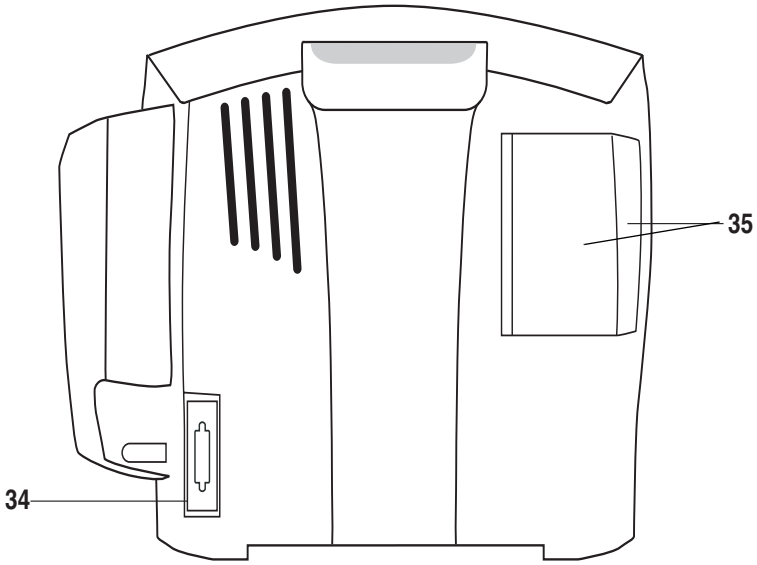
Front panel



15. **Alarm** silence indicator:
    - Solid red: Indicates that an alarm silence is active and the audible alarm tones are silenced for 2 minutes.
    - Blinking red (Legacy alarm mode only): Indicates that an alarm silence is not active and at least one alarm condition is present.
16. **Systolic** window: indicates measured systolic NIBP in mmHg.
17. **Diastolic** window: indicates measured diastolic NIBP in mmHg.

18. ***INFLATE PRESSURE*** indicator: flashes to indicate you are making a change to the inflation pressure. Adjustable for adult/ped and neonate patients.
19. ***ALARM VOLUME*** indicator: flashes to indicate you are making a change to the alarm volume.
20. ***PULSE VOLUME*** indicator: flashes to indicate you are making a change to the pulse volume.
21. **Pulse Rate** window: shows pulse rate in beats per minute.
22. SpO_2 pulse indicator: flashing red LED bar indicates that pulses are being derived from SpO_2 signals.
23. **SpO2** window: indicates oxygen saturation in %.
24. **MAP/Cuff** window: indicates measured mean arterial pressure (MAP) in mmHg and shows cuff pressure during NIBP determination.
25. ***ADULT*** indicator: lights to indicate you are making a change to adult/ped NIBP limits or inflation pressure settings.
26. ***NEONATE*** indicator: lights to indicate you are making a change to neonate NIBP limits or inflation pressure settings.
27. ***AUTO CYCLE*** indicator: lights green to indicate auto mode is the chosen NIBP mode; flashes to indicate you are making a change to the auto mode.
28. **Min** window: displays the NIBP mode if manual or Stat as well as the cycle time when taking auto NIBP determinations.
29. ***HISTORY*** indicator: flashes to indicate you are in history mode.
30. ***BATTERY OK*** indicator: lights green to indicate the monitor is operating on battery power and that the battery is sufficiently charged.
31. ***BATTERY LOW*** indicator: lights amber to indicate low charge for the battery (less than 45 minutes when solid; 5 min or less when flashing).
32. ***CHARGING*** indicator: lights green to indicate presence of external power source and battery charging.
33. **Temperature** window: indicates measured temperature.

Rear panel



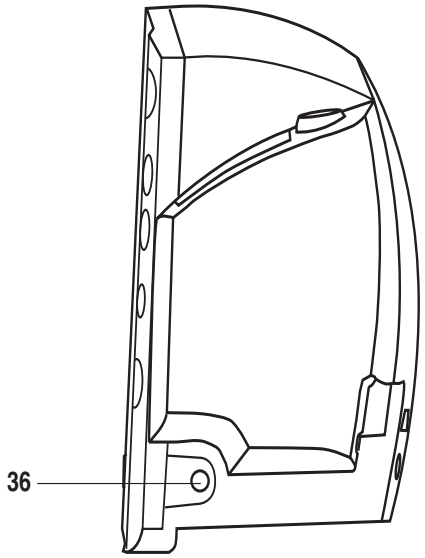
34. Host communications port (15 pin D-type RS-232 serial port) for use only with equipment conforming to IEC 60601-1 or configured to comply with IEC 60601-1-1. The Exergen scanner connects to this port.

    NOTES

    - Refer to Appendix A, "Connections" for connection details.
    - Attach one accessory to this port.

35. Printer door.

Right-side panel



36. External DC power socket: used with GE-approved AC-DC power converter only. Refer to Appendix B, "Accessories" for the part number of the approved power supply.

Windows

Each derived vital sign has an associated window for displaying the value. For each window, the vital sign's name and unit of measure are labeled above and to the right of it, respectively. An additional window--the **min** window--is available for displaying the NIBP mode or chosen ***AUTO CYCLE*** selection.

Indicators

Indicators are text messages and icons that are positioned on the front of the monitor. Each indicator can be backlit one color, either red, green or amber. Indicators are described in the appropriate sections throughout this manual.

Operating (system) modes

The monitor can operate in one of six modes:

- Clinical
- Configuration
- Advanced configuration
- Service
- Battery low shutdown
- System failure

Clinical mode

Clinical mode is the mode used to monitor patients.

How to enter and exit clinical mode

To enter clinical mode:

- With the monitor off, press the **On/Off** button.

To exit clinical mode:

- With the monitor on, press the **On/Off** button for less than 5 seconds.

While in clinical mode:

- All parameters are available for monitoring.
- Alarm limits and all user settings are adjustable.

Configuration mode

Configuration mode is used for configuring or customizing how the monitor operates in clinical mode. Configuration mode briefly displays the software revision in the **Systolic** and **Diastolic** windows, the configured NIBP technology in the **min** window, and the configured temperature technology in the **Pulse Rate** window.

How to enter and exit configuration mode

To enter configuration mode:

- With the monitor off, press the **On/Off** button at the same time as pressing and holding the **Menu** button.

To exit configuration mode:

- With the monitor on, press the **On/Off** button for less than 5 seconds.

While in configuration mode:

- All parameters are inoperable.
- The **Systolic** window displays CFG indicating the monitor is in configuration mode.
- Applicable default settings are configurable to their user-preferred default settings.

Advanced configuration mode

Advanced configuration is used for configuring the monitor's serial port communication settings as well as viewing and printing the failure alarm history. Advanced configuration mode displays the software revision in the **Systolic** and **Diastolic** windows.

How to enter and exit advanced configuration mode

To enter advanced configuration mode:

- With the monitor off, press the **On/Off** button at the same time as pressing and holding the **Menu** and **-** (minus) buttons.

To exit advanced configuration mode:

- With the monitor on, press the **On/Off** button for less than 5 seconds.

While in advanced configuration mode:

- All parameters are inoperable.
- The **Systolic** window displays ***ACF*** indicating the monitor is in Advanced configuration mode.
- A failure alarm history can be viewed and printed.

NOTE

Refer to the service manual for instructions for use concerning advanced configuration mode.

Service mode

Service mode is used to configure and calibrate various components of the monitor's hardware.

NOTE

The service mode is intended for use by qualified service personnel only. For instructions concerning service mode, refer to the service manual.

Battery low shutdown

Battery low shutdown is entered when the high-priority ***BATTERY LOW*** alarm has been active for 5 minutes. Refer to Chapter 5, "Alarms" for details and error codes. Refer to the service manual for detailed battery instructions.

System failure

System failure mode is entered when the monitor has a depleted battery, or a hardware or software failure. A distinctive alarm tone is generated for up to 5 minutes, after which if the monitor isn't turned off, it shuts down completely. Refer to Chapter 5, "Alarms" for details and error codes. Refer to the service manual for detailed instructions.

User modes

The monitor has four user modes that are available during clinical operating mode: menu, cycle, limit adjustment, and history.

Menu mode

The menu mode allows you to access and change the three settings associated with the following indicators: ***INFLATE PRESSURE*** (***ADULT*** and ***NEONATE***)**,** ***ALARM VOLUME***, and ***PULSE VOLUME***.

To enter this mode, press the **Menu** button. Each press of the **Menu** button steps you through each of the these settings.

After 7 seconds of not pressing the **Menu** button, the menu mode is automatically exited. Otherwise, you can exit the menu mode by cycling through all menu options. Upon exiting menu mode, the main monitoring screen is displayed. Alarm and pulse volume settings are retained after power-off. ***INFLATE PRESSURE*** (***ADULT***, ***NEONATE***) is reset to its configured default after power-off.

Inflate pressure

Procedure

NOTE

This setting is available for two patient types: adult and neonate. The adult setting is applicable to both adult and pediatric determinations.

1. Press the **Menu** button. The ***INFLATE PRESSURE*** indicator flashes, and—at the same time—the ***ADULT*** indicator and the value in the **Systolic** window light showing you that the ***INFLATE PRESSURE*** for ***ADULT*** setting is ready to be changed.
2. To change the associated value, simply use the **+/-** button to increment or decrement, respectively.
3. Press the **Menu** button again. The ***INFLATE PRESSURE*** indicator flashes, and—at the same time—the ***NEONATE*** indicator and the value in the **Systolic** window light showing you that the ***INFLATE PRESSURE*** for ***NEONATE*** setting is ready to be changed.
4. To change the associated value, simply use the **+/-** button to increment or decrement, respectively.

Alarm volume

Procedure

1. Press the **Menu** button. The ***ALARM VOLUME*** indicator flashes.
2. To change the associated value, simply use the **+/-** button to increment or decrement, respectively.

Pulse volume

Procedure

1. Press the ***Menu*** button. The ***PULSE VOLUME*** indicator flashes.
2. To change the associated value, simply use the **+/-** button to increment or decrement, respectively.

Cycle mode

The cycle mode allows you to start auto cycle and Stat modes.

1. Press the **Cycle** button. The ***AUTO CYCLE*** indicator flashes.
2. To change the time increment while the ***AUTO CYCLE*** indicator flashes, simply use the **+/-** button to increment or decrement, respectively. When you reach the beginning or ending of the list, the negative key-click sounds.

OR

3. While the ***AUTO CYCLE*** indicator flashes, you can also press the **Cycle** button until you reach the desired time increment.

Refer to Chapter 7, "NIBP" for more information.

Limit adjustment mode

The limit adjustment mode allows you to change alarm limit settings that are used while monitoring a patient. To enter this mode, press the **Alarms** button. All alarm limit settings return to their default settings after power-off. To change the associated limit, simply use the **+/-** button to increment or decrement, respectively. The range and increment/decrement steps for each derived vital sign that has adjustable limits are described in each parameter section. The step size specified (which cannot be adjusted) tells how much the limit value will change per increment/decrement key press and also dictates how close together a pair of limits can be.

Limit-adjustable vital signs are displayed in the following order:

- ***ADULT***:
  - **Systolic *HIGH*, *LOW***
  - **Diastolic *HIGH*, *LOW***

- ***NEONATE*:**
  - **Systolic *HIGH*, *LOW***
  - **Diastolic *HIGH*, *LOW***
- **Pulse Rate:**
  - ***HIGH*, *LOW***
- **SpO_2:**
  - ***HIGH*, *LOW***

NOTES

- The temperature and MAP (mean arterial pressure) vital signs are not checked against alarm limits.
- Only NIBP limits (Systolic and Diastolic) are adjustable based on the patient type.

History mode

The history mode allows you to access the stored patient data. When the history mode is active, pressing the **+/-** buttons displays the next or previous entry in the history list. When you reach the beginning or end of the list, a negative key-click sounds. Pressing the ***History*** button also allows you to view the previous entry.

NOTE

Refer to Chapter 6, "History" for more information.

Sounds

The monitor generates sounds based upon user interaction, parameter events, and physiological, technical, or system failure alarms.

Start-up sound

When the monitor is powered on a start-up sound is generated. This start-up sound consists of 5 separate tones generated in succession. Refer to "Turning the monitor on and off" on page 2-6 for more details.

User interaction sounds

Positive key tone

When pressing a button results in its intended function being performed, one audible tone sounds.

Negative key tone

When pressing a button results in its intended function not being performed, three audible tones sound.

Alarm sounds

The monitor generates high priority and low priority alarm sounds, each with a different sound. These sounds repeat with the rate dependent on the priority of the alarm and for as long as the alarm is active and not silenced. When alarms of multiple priorities are active, only the highest-priority alarm sound is audible.

High priority

The high-priority alarm sounds three high-pitched tones followed by two high-pitched tones.

Low priority

The low-priority alarm sounds a single low-pitched tone followed by a single higher-pitched tone.

Battery low shutdown and system failure sounds

When the monitor enters either of these modes, it generates a sound that remains on until the monitor either automatically shuts down or is turned off. This sound consists of a high-pitched tone that repeats at a very high rate.

Battery charger sounds

The battery charger sounds are generated—whether the monitor is on or off—whenever the external DC charger is connected and disconnected.

When connected to the monitor, the battery charger sounds a single low-pitched tone followed by a single higher-pitched tone. Upon disconnection from the monitor, the battery charger sounds a single high-pitched tone followed by a single lower-pitched tone.

Power sources

The monitor is designed to operate from an internal lead-acid battery. For replacement rechargeable batteries, please refer to "Replacing the battery" in Appendix C, "Maintenance" of this manual.

Specifications

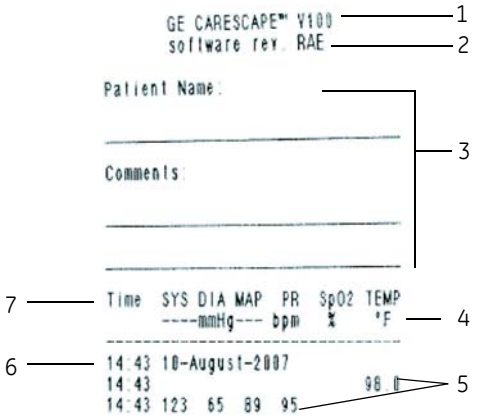
Specifications	
Mechanical	
Dimensions	
Height	7.7 in (19.5 cm)
Width	8.6 in (21.9 cm) without Alaris temperature 10.0 in (25.4 cm) with Alaris temperature
Depth	5.3 in (13.5 cm)
Weight (Including battery)	5.4 lb (2.4 kg)
Mountings	Self-supporting on rubber feet, pole mounted, or wall mount bracket
Portability	Carried by recessed handle
Power requirements	
Power converter universal	P/N: 2018859-001
Protection against electrical shock	Class II
AC input	100 to 240VAC, 0.5A
DC output voltage	12VDC at 1A The AC mains power adapter contains a nonresettable and nonreplaceable fuse.
Monitor	
Protection against electrical shock	Internally powered or Class II when powered from specified external power supply.
DC input voltage	12 VDC, supplied from a source conforming to IEC 60601-1.
Fuses	The monitor contains three fuses. The fuses are mounted within the monitor. The fuses protect the low voltage DC input, the main battery, and the remote alarm output. The +5 V output on the host port connector is regulated by internal supply.
Main Battery	Refer to Chapter 14, "Battery"
Environmental	
Operating temperature	+ 5°C to + 40°C (+ 41°F to + 104°F)

Specifications	
Operating atmospheric pressure	500 hPa to 1060 hPa
Storage/transportation	
Storage temperature	– 20°C to + 50°C (– 4°F to + 122°F)
Atmospheric pressure	500 hPa to 1060 hPa
Humidity range	5% to 95% noncondensing
Radio frequency	Complies with IEC Publication 60601-1-2 Medical Electrical Equipment, Electromagnetic Compatibility Requirements and Tests and CISPR 11 (Group 1, Class B) for radiated and conducted emissions

4 Printer

Description

The printer is an optional feature to the monitor. If your monitor contains a printer, each time a printout is started the following information is printed.



Item	Name
1	Monitor name and model number
2	Current software revision. The software revision letters map to a numeric software revision. (e.g., RAE is the equivalent of R1.5. Where A=1, B=2...Z=26).
3	Area for patient name and hand-written comments
4	Unit of measure
5	Vital signs data, if available
6	Date and time
7	Column and parameter labels

Installing the paper

Refer to "Setting up the printer (installing the paper)" on page 2-5 for instructions.

Print button

You can print in both clinical and advanced configuration modes. In clinical mode, you can print both currently displayed values and history. In advanced configuration mode you can print a failure alarm history. Refer to the service manual for more information on the use of the **Print** button while in advanced configuration mode.

In clinical mode, pressing the **Print** button prints everything on the screen. Since measurements may have been taken at different times, a time stamp is printed with each parameter. Values are printed in order of the most recent (newest) to the oldest.

By pressing the **Print** button when in history mode, all entries currently stored in the history are printed in order of the most recent to the oldest.

To tear off the printout, use a slight sideways action to pull the paper sharply up across the edge of the door.

NOTE

If the **Print** button was pressed during the first 10 seconds of SpO_2 monitoring, dashes will appear for SpO_2 and pulse rate readings.

The availability of the printer is determined at the time the printout is started. When the printer is unavailable, the **Print** button makes a negative key sound when you press it. The printer is unavailable when:

- The printer is out of paper, too hot, or if the monitor is in any of the following modes: cycle, alarm limit adjustment, menu, configuration, or service.
- The battery is nearly depleted. In this case, a high-priority '**E13**' ***BATTERY LOW*** alarm sounds and the ***BATTERY LOW*** indicator flashes. No printouts of any type will print.

Printouts

Current (real time)

For this printout, the following information may be printed:

- SpO_2 info line:
  - The time the **Print** button was pressed.
  - The displayed SpO_2 and pulse rate values are printed under the SpO_2 and pulse rate columns along with the time stamp.
  - If values are not displayed, '**---**' is printed.
- PIr info line:
  - The time the **Print** button was pressed—*only* if the monitor is configured for Ohmeda TruSignal SpO_2.
  - The perfusion index measurement is printed when it is valid. Dashes are printed when it is invalid (the sensor is not applied to the patient).
- NIBP info line:
  - The displayed NIBP values and the time that these values were completed.
  - The displayed pulse rate values if they were completed at the same time as the displayed NIBP values.

- Temperature info line:
  - The values of a previous temperature measurement if they are still displayed in the **Temperature** window.
  - The time that the measurement completed.

- The above lines are printed in the order of most recent to oldest with the exception of the PIr info line, which always follows the SpO_2 info line. If the date changes between entries, a single line containing the date is printed.

Clinical history

All entries currently stored in the clinical history list when the **Print** button is pressed are printed in the order of the most recent (newest) to the oldest. For a value that was violating its high limit when it was stored, an up arrow is printed after the value. For a value that was violating its low limit when it was stored, a down arrow is printed after that value. If the date changes between entries, a single line containing the date is printed.

Failure alarm history

The monitor must be in advanced configuration mode to print the failure alarm history. Press the ***History*** button to enter the history mode. Then, when the **Print** button is pressed, all entries in the failure alarm history are printed. They are printed in the order of the most recent to the oldest. Each entry is printed on one line and that line contains, from left to right, the following:

- Time of day as **HH:MM**, in military time, the failure was detected
- Date the failure was detected as **DD-Month-YYYY**, where **DD** is the day, Month is the month spelled out and **YYYY** is the year
- System error code for the detected failure

Paper storage

Store thermal paper in a cool, dry place. The printed strip (thermal paper recording) should not be

- Exposed to direct sunlight
- Exposed to temperatures over 38°C/100°F or relative humidity over 80%
- Placed in contact with adhesives, adhesive tapes, or plasticizers such as those found in all PVC page protectors

NOTES

- When in doubt about long-term storage conditions, store a photocopy of the thermal paper recording.
- The paper is thermally activated; therefore, do not store it in a hot place as discoloration may result.
- Use only replacement paper rolls (P/N 089100 for box of 10) from GE.

Alarms

Refer to Chapter 5, "Alarms" for detailed information regarding printer alarms.

Specifications

Specifications	
Printer type	Thermal dot array
Resolution	384 dots/inch horizontal
Paper type	The paper roll used by the printer must be compatible with GE PN 770137.
Languages printed	English, German, French, Italian, Spanish, Portuguese, Hungarian, Polish, Czech, Finnish, Swedish, Danish, Dutch, Norwegian, and Slovak
Languages not printed (text printed in English only)	Russian, Greek, Korean, Japanese, Turkish and Lithuanian

For your notes

5 Alarms

Description

During an alarm condition, the monitor may generate an audible alarm signal, visual alarm signal, alarm message code, and electronic record in the history.

Alarm conditions

Physiological alarm conditions

Physiological alarm conditions are triggered by a patient's vital sign exceeding the parameter limits. Refer to "Alarms and priorities" on page 5-9 for a listing of related alarm messages and alarm priorities.

The monitor checks each derived vital sign (except MAP and temperature) against user-set limits. A high-limit alarm is generated when that value is greater than its high limit. A low-limit alarm is generated when that value is less than its low limit.

Parameter	Range	Factory default*
Systolic high (adult)	35 to 290	200
Systolic low (adult)	30 to 285	80
Diastolic high (adult)	15 to 220	120
Diastolic low (adult)	10 to 215	30
Systolic high (neonate)	35 to 140	100
Systolic low (neonate)	30 to 135	40
Diastolic high (neonate)	15 to 110	60
Diastolic low (neonate)	10 to 105	20
Pulse rate high (adult and neonate)	35 to 235	150
Pulse rate low (adult and neonate)	30 to 230	50
SpO_2 high (adult and neonate)	71 to 100	100
SpO_2 low (adult and neonate)	70 to 99	90
*To change alarm default settings, refer to Chapter 2, "Getting started" .		

Technical alarm conditions

Technical alarm conditions are triggered by an electrical, mechanical, or other failure of the equipment, or by a sensor or component failure. Technical alarm conditions may also be caused when an algorithm cannot classify or interpret the available data.

Refer to "Alarms and priorities" on page 5-9 for a listing of related alarm messages and alarm priorities.

Battery alarm conditions

Refer to Chapter 14, "Battery" for detailed information regarding battery alarms.

Printer alarm conditions

When any of the printer alarm conditions occur, the alarm code flashes in the **min** window. When a printer alarm condition is active, you can acknowledge and clear the alarm by pressing the **Silence** button. If an '***E13***' ***BATTERY LOW*** alarm is active, it takes precedence over active printer alarms and '***E13***' appears in the **min** window.

Memory alarm conditions

The '***E00***' memory lost alarm is generated on power-up when battery backed RAM has been corrupted. When it occurs, all settings are reset to their factory defaults and all entries in clinical history are erased.

When detected while powering-up in clinical, configuration, or advanced configuration mode, the status code related to this condition flashes in the **Systolic** window and the appropriate alarm sound becomes audible. While the '***E00***' memory lost alarm is active, all parameters remain in their offline state and only the **Silence** button is available.

NOTE
If an '***E00***' memory alarm occurs, all settings revert to the factory default. The clinician should check the monitor configuration settings to verify that they are set as desired. For monitors configured for Ohmeda TruSignal SpO_2 only, verify that the setting for line frequency mode (***LF***) is correct for your country. Refer to "Configuration settings associated with SpO2" on page 8-5

System failure alarm conditions

The system failure mode is activated when there is a hardware or software failure. To view and print a system failure entry, the monitor must be in advanced configuration mode.

During a system failure alarm condition, the following occurs:

- The **Systolic** window displays a failure error code.
- The failure sound is generated for up to 5 minutes.
- To turn the monitor off, press the **On/Off** button for less than 5 seconds.
- After alarming for up to 5 minutes the monitor shuts down completely.

NOTES

- Refer to "Alarms and priorities" on page 5-9 for a listing of related alarm messages and alarm priorities.
- Refer to the service manual for instructions concerning system failure mode.

Alarm modes

The monitor may be configured to operate in one of two different alarm modes: IEC or Legacy. The IEC mode is 60601-1-8 compliant. The Legacy mode matches the alarm signal behavior used by previous versions of this monitor. The factory configuration is IEC. Refer to the "CARESCAPE V100 Vital Signs Service Manual" to configure the alarm mode setting.

IEC alarm mode

In IEC alarm mode, the monitor's alarm silence indicator has two states:

- Solid red: alarm silence is active.
- Off: alarm silence is not active.

Legacy alarm mode

In Legacy alarm mode, the monitor's alarm indicator has three states:

- Solid red: alarm silence is active.
- Blinking red: alarm silence is not active and audible alarm tones sound when at least one alarm condition is present.
- Off: alarm silence is not active and no alarm condition is present.

Alarm signals

The monitor provides visual and audible alarm signals when an alarm condition is present. All alarm conditions are accompanied by an audible signal unless an alarm silence is active.

When multiple alarm conditions occur, the following conditions apply:

- If more than one alarm occurs at the same time, the monitor will sound an alarm tone for the highest priority alarm. Any lower priority audible alarm tones are suppressed by the higher priority alarm tone.
- If more than one alarm of the same priority occurs, the monitor sounds the appropriate priority audible alarm tone and flashes the associated alarm message codes.

Audible alarm signals

The monitor produces three different alarm tones depending on the alarm condition that is present:

- High-priority alarm tone repeats a pattern of three high-pitched tones followed by two high-pitched tones.
- Low-priority alarm tone repeats a pattern of two tones.
- System failure or battery low shutdown alarm tone is a single, continuous high-pitched tone.

Visual alarm signals

NOTE
Refer to the “CARESCAPE V100 Vital Signs Service Manual” to configure the IEC or Legacy alarm mode setting.

IEC alarm silence indicator

When the monitor is in the IEC alarm mode, the alarm silence indicator has two states:

- Solid red: Alarm silence is active and the audible alarm tones are silenced for 2 minutes.
- Off: Alarm silence is not active.

Legacy alarm silence indicator

When the monitor is in the Legacy alarm mode, the alarm silence indicator has three states:

- Solid red: Alarm silence is active and the audible alarm tones are silenced for 2 minutes.
- Blinking red: Alarm silence is not active and at least one alarm condition is present.
- Off: Alarm silence is not active and no alarm condition is present.

Flashing screen text

High priority alarm conditions will flash:

- Vital sign values that exceed the alarm limit settings will flash in the associated monitor window. The associated **HIGH** or **LOW** limit indicator will also flash.
- Alarm message codes will flash in the monitor windows when technical-level problems with a parameter measurement, sensor, or equipment are present.

In Legacy alarm mode, low priority SpO_2 alarm conditions will flash if the SpO_2 "spot mode" time period is active:

- '**---**' alarm code will flash in the SpO_2 window when a SpO_2 sensor off finger alarm condition is present.
- '***E25***' alarm code will flash in the SpO_2 window when a SpO_2 lost pulse alarm is present.
- If either of these low-priority alarm conditions are not acknowledged within one minute, they automatically escalate to a high-priority alarm condition.

NOTE

Refer to the "CARESCAPE V100 Vital Signs Service Manual" to configure the alarm mode setting

Remote alarms

A remote alarm activates when any high priority alarm or system failure alarm is active, or if the monitor is powered off. Low priority alarms do not latch remote alarms. Remote alarms are an output of the host communication port. Refer to "Host port connector" on page A-2 for additional information on the host port connector and the remote alarm signal.

NOTE

When using remote alarms, the monitor should be considered the primary alarm source. The remote alarm is considered a secondary alarm source and should be used for remote purposes only.

Silencing an alarm

To silence a patient-related alarm (physiological or technical alarms) at anytime, press the **Silence** button. The alarm silence indicator (bell) lights solid red to indicate that audible alarms have been silenced for 2 minutes.

NOTE

The high-pitched, continuous system failure or battery low shutdown audible alarm tone sounds regardless of an alarm silence being active.

Acknowledging an alarm

Some parameter limit and technical alarms are acknowledgeable when the **Silence** button is pressed. Acknowledging an alarm clears the audible and visible alarm signals and resets the alarm condition. For a list of acknowledgeable alarms, refer to "Alarms and priorities" on page 5-9.

Adjusting vital sign alarm limits

WARNINGS

Monitors located in the same clinical area but containing different alarm default settings can result in a potential hazard. Always check your alarm settings before using the monitor.

Caution should be taken to not set alarm limits to extreme values, as this can render the alarm system useless.

NOTES

- The temperature and MAP vital signs are not checked against alarm limits.
- Only NIBP limits (diastolic and systolic) are adjustable based on the patient type.
- All changes are temporary and return to the default configuration settings when the monitor is turned off. To permanently change the alarm settings refer to "Configuration mode settings" on page 2-7.

To adjust the alarm limit settings, complete the following procedure:

1. Press the **Alarms** button until the limit value you want to change is displayed in the applicable vital sign window. The ***HIGH***, ***LOW***, **ADULT**, and ***NEONATE*** screen labels identify what limit value default you are setting.
2. Press the **+/-** buttons to increase or decrease the selected value.
3. To exit this function, choose one of the following:
   - Press the **Alarms** button until the main monitoring screen appears.
   - Let the monitor time-out by not touching any of the monitor buttons. After a few seconds, the main monitoring screen appears.

Reverting to the factory default vital sign alarm limits

WARNING
The Line Frequency mode (for Datex-Ohmeda oximetry) must be set according to each country's electrical power utilities implementation; and that it must be checked and reset any time the monitor is set to or reverts to factory default settings.

To revert to the factory default vital sign alarm limit settings, the monitor must be disconnected from the DC power supply and from the monitor battery. Refer to "Replacing the battery" on page C-8 for DC power supply and battery disconnection/reconnection instructions,

When reverting to factory default settings, the user settings (including alarm limits and inflation pressure), date/time, and the Ohmeda TruSignal SpO_2 Line Frequency mode (***LF***) will go back to default values. Refer to "Entering configuration mode" on page 2-8 to configure the factory default user settings.

NOTE
For monitors configured for Ohmeda TruSignal SpO2 only, verify that the setting for Line Frequency mode (***LF***) is correct for your country. Refer to "Configuration settings associated with SpO2" on page 8-5.

Adjusting the alarm volume

NOTE
Adjustment to the alarm volume setting is retained after the monitor is powered off.

To adjust the volume for all alarm tones on the monitor, complete the following procedure:

1. Press the **Menu** button until ***ALARM VOLUME*** flashes in green.

   The current alarm volume setting is displayed in the **Diastolic** window.

2. Press the **+/-** buttons to increase or decrease the selected value.

   The selectable alarm volume range is from ***1*** to ***10*** (10 being the loudest). The positive key tone that sounds when you press the **+/-** buttons relates directly to the alarm volume setting selected.

3. To exit this function, choose one of the following:

   - Press the **Alarms** button until the main monitoring screen appears.
   - Let the monitor time-out by not touching any of the monitor buttons. After a few seconds, the main monitoring screen appears.

Alarms and priorities

In this table, the alarm condition is indicated with the following: physio. = physiological, technical = technical, and system = system failure.

Alarm message code (if any)	Alarm detected	Cause	Alarm condition	Acknowledgeable by pressing Silence?[1]	Alarm priority
NIBP alarms					
	NIBP Systolic high	Value is greater than the HIGH alarm limit	physio.	yes	high
	NIBP Systolic low	Value is less than the LOW alarm limit	physio.	yes	high
	NIBP Diastolic high	Value is greater than the HIGH alarm limit	physio.	yes	high
	NIBP Diastolic low	Value is less than the LOW alarm limit	physio.	yes	high
E89	NIBP no determination	NIBP failed. Reapply cuff	technical	yes	high
E85	BP level timeout	Remained at one cuff pressure level for more than 1 minute.	technical	yes	high
E84	BP total timeout	Length of time has exceeded 2 minutes for an adult/pediatric determination or 85 seconds for a neonate determination.	technical	yes	high
E83	NIBP pump timeout	Pressure leak. Check or replace hose or cuff	technical	yes	high
E82	NIBP excess air in cuff	Determination cannot be made due to an excess amount of air in the cuff.	technical	yes	high
E80	NIBP overpressure	Excess cuff pressure. Check for hose blockage	technical	yes	high

Alarm message code (if any)	Alarm detected	Cause	Alarm condition	Acknowledgeable by pressing Silence?[1]	Alarm priority
SpO_2 alarms					
	SpO_2 high	Value is greater than the HIGH alarm limit	physio.	no	high
	SpO_2 low	Value is less than the LOW alarm limit	physio.	no	high
E20	SpO_2 sensor disconnected	Sensor disconnected	technical	yes	high
E21	SpO_2 replace sensor	Sensor broken or wrong type. Replace	technical	yes	high
---	SpO_2 sensor off finger	Sensor off finger	technical	yes	IEC: high Legacy: low, escalating to high in "spot-mode." Otherwise, high.[3,4]
E25	SpO_2 lost pulse	Lost pulse	technical	yes	IEC: high Legacy: low, escalating to high in "spot-mode." Otherwise, high.[3, 4]
Temperature alarms					
E61	Temp probe broken (Alaris only)	Probe broken. Replace	technical	no	high
E63	Temp probe disconnected (Alaris only)	Disconnected or wrong probe	technical	yes	high
E66	Temp probe too hot (Alaris only)	Probe too hot	technical	yes	high
E--	Temp scanner error (Exergen only)	Exergen battery low, or invalid temperature value. Also, check the scanner's display. Refer to *Chapter 12, "Exergen Temperature"* for more information.	technical	yes	high

Alarm message code (if any)	Alarm detected	Cause	Alarm condition	Acknowledgeable by pressing Silence?[1]	Alarm priority
Pulse rate alarms					
	Pulse rate high	Value is greater than the HIGH alarm limit	physio.	no-SpO_2, yes-NIBP	high
	Pulse rate low	Value is less than the LOW alarm limit	physio.	no-SpO_2, yes-NIBP	high
Printer alarms					
E10	Printer no paper	Printer no paper	technical	yes	high
E11	Printer too hot	Printer too hot	technical	yes	high
Battery alarms					
E13	Battery low	Battery too low	technical	yes	high
	Battery low	Battery is running low and should be plugged in	technical	yes[2]	low, escalating to high when approx. 5 minutes of battery charge remains.
E00	Memory lost	Memory loss ■ Usually noted after changing batteries. ■ User settings and date/ time revert to default settings. ■ For units with Ohmeda TruSignal technology, verify the Line Frequency (LF) mode setting. Refer to "Configuration settings associated with SpO2" on page 8-5.	technical	yes	high

Alarm message code (if any)	Alarm detected	Cause	Alarm condition	Acknowledgeable by pressing Silence?[1]	Alarm priority
System failure alarms					
900-999	System failure	Internal system failure. Refer to the service manual or call Technical Support for definitions and instructions	system	no	-

[1]Acknowledging an alarm by pressing the **Silence** button, clears and resets the audible and visible alarm signals and resets the alarm condition.

[2] A ***BATTERY LOW*** alarm will re-alarm every 10 minutes after it's been acknowledged.

[3] Legacy alarm mode only: The '**---**' sensor off finger and "***E25***' lost pulse alarms are generated as low priority alarms when the SpO_2 sensor is on a patient less than 2 minutes. This is referred to as "spot mode." If a manual NIBP measurement is taken while "spot mode" is active, the time to generate a low priority alarm is increased until the NIBP measurement is completed. If the low priority SpO_2 alarms are not acknowledged within 1 minute, these low-priority alarms will escalate to high-priority alarms.

[4] Legacy alarm mode only: The '**---**' sensor off finger and "***E25***' lost pulse alarms are generated as high priority alarms when "spot mode" is not active.

Specifications

Specifications	
Alarm volume	60 dB to 75 dB
Remote alarm	The remote alarm signals an alarm in 0.5 seconds of the monitor's display of the alarm.

Factory default

- The factory default for alarm volume is ***5***.

6 History

Description

NOTE

Age in this section refers to when and how long ago the vital signs were taken.

The history mode allows you to access stored patient data in clinical mode and a failure alarm history in advanced configuration mode. The history mode is especially useful when doing hospital rounds: if the patient's temperature and SpO_2 measurements are taken while an NIBP determination is in progress, then upon completion of the determination, pressing the **History** button once shows all vital signs on the same screen for that patient.

The following information refers to operation in clinical mode. The monitor can hold up to 40 stored entries in history. It displays the most recent entries first. When full, the oldest entry is removed so the most recent entry can be stored. Additionally, entries are automatically removed when they become older than 24 hours.

The age of each entry is maintained and displayed in the **min** window with a minus sign (-) in front of it when other data stored for that entry is displayed. For entries that are greater than 59 minutes old, the age is displayed as HH:MM (hour:min). For entries that are less than or equal to 59 minutes old, the age is displayed in total minutes.

When viewing entries in history that are out of limits, the corresponding ***HIGH*** or ***LOW*** indicator appears in red.

An entry is stored in history at the completion of an NIBP determination and at the completion of a successful predictive temperature measurement. At the end of an NIBP determination, systolic, diastolic, MAP, pulse rate, SpO_2, and temperature (if measurement is completed while the NIBP determination was in progress) values are stored. However, when continuously monitoring SpO_2, values are not stored periodically but only when an NIBP determination completes. At the end of a temperature determination that completes while an NIBP determination is not in progress, only the temperature value is stored.

To obtain a full set of vitals stored in the same history entry:

1. Place the SpO_2 sensor on patient's finger and place the cuff on the other limb.
2. Start the NIBP determination.
3. Take the temperature measurement while the NIBP determination is in progress.
4. Upon completion of the NIBP determination, remove the cuff and sensor.
5. Press the **History** button to view all vitals.

Buttons associated with history

To activate the history mode, press the **History** button. The ***HISTORY*** indicator flashes green while this mode is active. With each press of the **History** button, the patient data stored with the next oldest entry is displayed. Entries are displayed from the most recent to the oldest. For example, the most recent entry could have an age of -0 minutes and the oldest entry could have an age of -23:59.

You can also activate the history mode by pushing the **History** button and then using the **+/-** buttons to scroll through the stored entries. Pressing the **History** button again exits history mode. Upon exiting history mode, the main monitoring screen is displayed.

After 15 seconds of not pressing the **History** or the **+/-** button, the history mode is automatically exited. Otherwise, you can exit the history mode by pressing the **History** button one more time after viewing the oldest entry. Upon exiting history mode, the main monitoring screen is displayed.

Erasing stored history

To erase stored patient data when a static printout in not in progress, press and hold the **History** button for a minimum of 2 seconds. All entries that were stored in history as well as any patient data displayed on the monitor that relates to the previous determination or the previous temperature measurement are erased. Pressing and holding the **History** button for 2 seconds also causes the target pressure to return to the current value in the ***INFLATE PRESSURE*** setting.

Windows associated with history

Each window on the monitor can be active during history mode. When the **History** button is pressed the patient data stored for each entry is displayed in the applicable windows. Patient data is displayed from most recent to oldest, indicated by the age in the **min** window.

Indicators associated with history

The ***HISTORY*** indicator is used to show the state of the history mode. When history mode is active, the ***HISTORY*** indicator flashes green.

For your notes

7 NIBP

Description

NOTE

Age in this section refers to how long ago the vital signs were taken.

The NIBP parameter in the monitor is available with two types of NIBP technologies: one calibrated to intra-arterial pressure (DINAMAP SuperSTAT or Classic) and one calibrated to the auscultatory method (specific technologies are available in select markets).

The type of NIBP technology used by the monitor is indicated while the monitor is in the configuration mode. Refer to "Checking the monitor's NIBP technology configuration setting" on page 7-11.

Refer to Appendix D, "Principles of Noninvasive Blood Pressure Determination" for specific information regarding these technologies. Most user interface options, instructions for use, and alarms will be the same for all technologies. The NIBP parameter is included in all models. Blood pressure is monitored noninvasively in the monitor by oscillometric method.

NOTE

For neonatal populations, the reference is always the intra-arterial pressure monitoring method.

The monitor has three NIBP modes: ***1***. manual, ***2***. auto cycle, and ***3***. Stat. The mode is selected by the user. The actual NIBP determination is automated and, once it is complete, the values for systolic pressure, diastolic pressure, mean arterial pressure, and pulse rate (if SpO_2 is not active) are shown in their respective windows.

Before each NIBP determination, the monitor performs a test to ensure that the cuff pressure is below a specified level. The determination is delayed until this condition is met. The monitor senses the type of hose being used and automatically uses adult/pediatric monitoring parameters or neonate monitoring parameters, as appropriate.

Audible and visible alarms occur when any of the values for systolic pressure, diastolic pressure, or pulse rate (if sourced by NIBP) are outside their selected high or low limits.

NOTE

When the ***BATTERY LOW*** alarm is active as a high-priority alarm, any attempts to start an NIBP determination results in an '***E13***' ***BATTERY LOW*** alarm. At anytime during monitoring, if an NIBP determination is started and cannot be completed due to a low or bad battery, the monitor issues an '***E13***' ***BATTERY LOW*** alarm. Because this particular event can be indicative of a bad battery, this alarm event is logged into the failure alarm history.

Instructions for cleaning and disinfecting NIBP cuffs are in Appendix C *"Maintenance."*

What is the difference between intra-arterial and auscultatory methods?

Oscillometric method

The oscillometric method of determining NIBP is accomplished by a sensitive transducer which measures cuff pressure and pressure oscillations within the cuff. These signals are analyzed by the algorithm that uses one of the references (intra-arterial or auscultatory) to display the NIBP values.

Intra-arterial reference

The intra-arterial reference algorithm was developed based on blood pressure values obtained with an intra-arterial catheter (e.g. central aortic).

Auscultatory reference

The auscultatory reference algorithm was developed based on blood pressure values obtained with a sphygmomanometer, a stethoscope, and listening to the Korotkoff sounds.

NOTE

NIBP values in the monitor are based on the oscillometric method of noninvasive blood pressure measurement taken with a cuff on the arm of adults/pediatrics (SuperSTAT and Classic technologies), a cuff on the calf of neonates (SuperSTAT technology), and a cuff on the arm of neonates (Classic technology). The values correspond to comparisons with intra-arterial values within ANSI/AAMI SP10 Standards for accuracy (a mean difference of ± 5 mmHg, and a standard deviation of $\leq$ 8 mmHg).

NOTE

Arrhythmias will increase the time required by the NIBP parameter to determine a blood pressure.

DANGER

Connect cuffs and inflation systems only to systems designed for non-invasive blood pressure monitoring. Devices with luers and locking luer connectors may be inadvertently connected to intravascular fluid systems that may allow air to be pumped into a blood vessel.

WARNINGS

The monitor will not measure blood pressure effectively on patients who are experiencing seizures or tremors.

Arrhythmias will increase the time required by the NIBP parameter to determine a blood pressure and may extend the time beyond the maximum allowed time for the parameter (120 seconds for adult/pediatric and 85 seconds for neonate).

WARNING

It is possible to set the alarm limits for pulse rate outside of the operating range for the NIBP parameter. Under such conditions, an alarm will not occur.

In Manual mode, the monitor displays the results of the last blood pressure determination for 30 minutes or until another determination is completed. If a patient's condition changes between one determination and the next, the monitor will not detect the change or indicate an alarm condition.

Carefully route the external AC/DC power converter, air hoses, and all cables to reduce the possibility of entanglement or strangulation.

Do not place the cuff on a limb being used for intravenous infusion or any area where circulation is compromised or has the potential to be compromised.

The monitor is designed for use only with GE CRITIKON BP dual-tube cuffs.

Use only GE CRITIKON Blood Pressure Cuffs. The size, shape, and bladder characteristics can affect the performance of the instrument. Inaccurate readings may occur unless GE CRITIKON Blood Pressure Cuffs are used.

A patient’s vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease heart rate.

The monitor will continue to operate until the battery is completely depleted in order to obtain the full use of the battery. However, if the battery reaches its '*empty*' point during a BP determination, it will simply stop in the middle of the determination.

Accuracy of NIBP measurement depends on using a cuff of the proper size. It is essential to measure the circumference of the limb and to select the proper size cuff. In addition, the air hoses are color-coded according to patient population. The gray 12- or 24-foot hose (3.66 m or 7.3 m) is required on patients who require cuff sizes from infant through thigh cuffs. The light blue 12-foot hose (3.66 m) is required for the neonatal cuff sizes #1 through #5. If it becomes necessary to move the cuff to another limb, make sure the appropriate size cuff is used.

CAUTIONS

Do not use an infant cuff with an auscultatory reference. The neonatal #5 cuff and neonatal hose may be used on patients with an arm circumference of 8 - 15 cm.

Blood pressure cuffs should be removed from the patient when the monitor is powered off. If the extremity remains cuffed under these conditions or if the interval between blood pressure determinations is prolonged, the patient's limb should be observed frequently and the cuff placement site should be rotated as needed.

The pulse rate derived from an NIBP determination may differ from the heart rate derived from an ECG waveform because the monitor measures actual peripheral pulses, not electrical signals or contractions from the heart. Differences may occur because electrical signals at the heart occasionally fail to produce a peripheral pulse or the patient may have poor peripheral perfusion. Also, if a patient's beat-to-beat pulse amplitude varies significantly (e.g., because of pulsus alternans, atrial fibrillation, or the use of a rapid-cycling artificial ventilator), blood pressure and pulse rate readings can be erratic, and an alternate measuring method should be used for confirmation.

Several conditions may cause the NIBP parameter to calculate and display only the mean arterial pressure (MAP) without systolic and diastolic readings. These conditions include very low systolic and amplitude fluctuations, so an accurate calculation for these values can't be made (e.g., patient in shock); too small of a difference between systolic and MAP calculations in relationship to the difference between diastolic and MAP; or a leak has occurred in the monitor. If only the MAP value is displayed, an alarm message code is displayed in the systolic window, while the ***Diastolic*** window remains blank.

Use care when placing cuff on extremity used to monitor other patient parameters.

Do not apply external pressure against cuff while monitoring. Doing so may cause inaccurate blood pressure values.

Devices that exert pressure on tissue have been associated with purpura, skin avulsion, compartmental syndrome, ischemia and/or neuropathy. To minimize these potential problems, especially when monitoring at frequent intervals or over extended periods of time, make sure the cuff is applied appropriately and examine the cuff site and the limb distal to the cuff regularly for signs of impeded blood flow.

Buttons associated with NIBP

The buttons associated with NIBP are **Inflate/Stop** and **Cycle**.

Inflate/Stop button

The **Inflate/Stop** button starts and stops NIBP determinations. When a determination is in progress, pressing this button stops the determination. While in Stat mode, pressing this button cancels Stat mode, as well a determination if in progress. When in auto cycle mode, pressing this button starts a determination or cancels a determination if in progress; it does not change the mode.

While an '***E80***' NIBP overpressure alarm is active, all presses of this button are ignored and you will hear the negative key tone. Pressing this button while the ***BATTERY LOW*** alarm is active as a high-priority alarm causes an '***E13***' ***BATTERY LOW*** alarm to sound and you will hear the negative key tone.

Cycle button

The **Cycle** button initiates the cycle mode, which is where you can choose Stat or an auto cycle time. Successive presses of the **Cycle** button show selections of: ***Stat***, ***1***, ***2***, ***3***, ***4***, ***5***, ***10***, ***15***, ***20***, ***30***, ***60***, ***90***, ***120*** (minutes), and **- -** (two dashes). Choose ***Stat*** to start Stat mode. Choose ***1-120*** to select the desired cycle time and start auto cycle mode. When you reach the desired setting, do not press the **Cycle** button again. After 2 seconds the cycle mode is deactivated and the main monitoring screen is displayed. Choose the two dashes to cancel auto cycle mode.

The **+/-** buttons can be used to scroll forwards or backwards through the cycle selections while the ***AUTO CYCLE*** indicator is flashing.

Pressing this button while the '***E80***' NIBP overpressure alarm is active results in the sounding of the negative key tone and no further action.

Pressing this button key while the ***BATTERY LOW*** alarm is active as a high-priority alarm results in the generation of the '***E13***' ***BATTERY LOW*** alarm and the sounding of the negative key tone.

Windows associated with NIBP

The windows associated with NIBP are **Systolic**, **Diastolic**, **MAP/Cuff**, **Pulse Rate**, and **min**. The **Systolic**, **Diastolic**, **MAP/Cuff**, and **Pulse Rate** (if SpO_2 is not active) windows are automatically cleared when a new NIBP determination is started. In manual mode, the displayed information is also cleared when it becomes older than 30 minutes.

The **Systolic** and **Diastolic** windows display values after a determination has completed successfully. While in Stat mode, the **Systolic** window flashes the early systolic value if it is available.

The **MAP/Cuff** window displays the derived mean arterial pressure (MAP) following the completion of a successful determination. During any type of NIBP determination, the pressure inside the cuff appears in this window.

The **Pulse Rate** window displays the NIBP-derived pulse rate when SpO_2 is inactive.

The **min** window displays the NIBP mode of operation and the age of the previous NIBP determination. When both types of information are present, they flash alternately in this window. When in manual mode, two dashes (**- -**) are displayed. When in auto cycle mode, the chosen Cycle time is displayed (e.g., ***15***). When in Stat mode, ***Stat*** is displayed. When displayed, the age of the previous NIBP determination is preceded by a minus sign (e.g., ***- 5*** for a determination that was taken 5 minutes ago).

Indicators associated with NIBP

The indicators associated with NIBP are Systolic ***HIGH*** and ***LOW***, Diastolic ***HIGH*** and ***LOW***, ***AUTO CYCLE***, ***INFLATE PRESSURE***, ***ADULT***, ***NEONATE***, and ***HISTORY***.

The ***AUTO CYCLE*** indicator appears solid green when auto mode is on. It flashes green when changes are being made to the current NIBP mode (e.g., cycle mode is active). The ***ADULT*** indicator appears solid green after the NIBP cuff typing has been completed, during determinations, and while systolic and diastolic limits and ***INFLATE PRESSURE*** for adult/pediatric are being adjusted. The ***NEONATE*** indicator appears solid green after the NIBP cuff typing has been completed, during determinations, and while limits for systolic and diastolic or ***INFLATE PRESSURE*** for neonate are being adjusted. After the determination has been completed, the solid green indicator turns off. The ***HISTORY*** indicator flashes green when the age of the previous NIBP determination is displayed in the **min** window.

NOTE

The ***ADULT*** indicator encompasses both adult and pediatric patients.

NIBP modes of operation

The monitor has three NIBP modes:

1. Manual
2. Auto cycle
3. Stat

The mode is selected by the user. NIBP determinations are automated and, upon completion, the values for systolic pressure, diastolic pressure, mean arterial pressure, and pulse rate (if SpO_2 is not active) are shown in their respective windows.

Manual NIBP determinations

Manual mode is always the NIBP mode of operation upon power-up. A normal, uninterrupted manual determination takes about 40 seconds. Following a determination, the cuff pressure must drop below 5 mmHg (neonate) or 15 mmHg (adult) before another determination can be started.

Manual NIBP determinations are started by pressing the **Inflate/Stop** button. To stop a manual NIBP determination press the **Inflate/Stop** button. The values displayed in the **Systolic**, **Diastolic**, **MAP**, and **Pulse Rate** (if SpO_2 is not active) windows are cleared after 30 minutes have lapsed.

Auto cycle determinations

Auto cycle mode automatically starts determinations at user-defined intervals. In the auto cycle mode, the pressure must be below 5 mmHg (neonate) or 15 mmHg (adult) for at least 30 seconds before the next auto determination will be started.

Auto cycle mode is started by selecting the **Cycle** button. When in auto cycle mode, the ***AUTO CYCLE*** indicator appears solid green. Manual determinations can be taken while in auto cycle mode without affecting when the next auto determination is to start. You can also change the time interval while in auto cycle mode.

Once the **Cycle** button is pressed, the first auto cycle determination is started, and the time between determinations appears in the **min** window. Successive presses of the **Cycle** button show selections of: ***Stat***, ***1***, ***2***, ***3***, ***4***, ***5***, ***10***, ***15***, ***20***, ***30***, ***60***, ***90***, ***120*** (minutes), and **- -** (two dashes)**.** When you reach the desired time interval, do not press the **Cycle** button again; after 2 seconds, the chosen time interval is retained and remains in the **min** window and the main monitoring screen is displayed.

Pressing the **Cycle** button when in auto cycle mode activates cycle mode again with two dashes (**- -**) appearing in the **min** window. If you press the **Cycle** button immediately after the first press, the next time interval appears in the **min** window. If you do not press the **Cycle** button immediately after the first press, cycle mode is deactivated. Press the **Inflate/Stop** button to stop the determination in progress without canceling the auto cycle mode. Choose the two dashes (**- -**) to cancel auto cycle mode.

If an auto cycle determination results in a limit alarm, a repeat determination is taken to verify the alarm. Only the first determination in a series of limit alarms will be followed by a repeat determination.

Whenever an Auto Cycle determination results in an '***E89***' NIBP no determination alarm, up to nine more repeat determinations are attempted until valid values are achieved. If at any time during this repeat cycle, the '***E89***' NIBP no determination alarm is silenced by pressing the **Silence** button or the **Inflate/ Stop** button, additional determinations are not attempted. If the repeat cycle completes all nine repeat determinations without reaching a valid value, the monitor returns to normal auto cycle mode. However, an auto cycle mode determination must complete successfully before a repeat cycle will follow a future auto cycle mode determination that results in an '***E89***' NIBP no determination alarm.

Stat NIBP determinations

Stat mode allows you to take as many determinations as possible within a 5-minute time period. The monitor will begin another determination once the pressure is below 5 mmHg for 8 seconds (neonates) or 15 mmHg for 4 seconds (adult/pediatric), unless the 5-minute period has ended or Stat mode has been canceled.

NOTE

NIBP and NIBP-derived pulse rate alarm limits are disabled while in Stat mode.

Stat NIBP determinations are started by selecting the **Cycle** button. Once the **Cycle** button is pressed, choose ***Stat***. The monitor automatically begins a 5-minute period of Stat determinations.

NOTE

If the monitor was previously in auto mode, the first Stat NIBP determination begins after 2 seconds.

After the first Stat determination, subsequent determinations display an early systolic value that displays in the **Systolic** window. If Stat mode is started when a determination is already in progress, that determination becomes the first in the series of Stat determinations. At the end of Stat mode, the NIBP mode prior to entering Stat mode is resumed. To cancel Stat mode, press the **Inflate/Stop** button.

User settings

Mode settings

There is one mode setting associated with this parameter: cycle. The cycle mode is started by pressing the **Cycle** button. While the cycle mode is active, cycle selections are displayed in the **min** window. Cycle selections appear: ***Stat***, ***1***, ***2***, ***3***, ***4***, ***5***, ***10***, ***15***, ***20***, ***30***, ***60***, ***90***, ***120*** (minutes), and **- -** (two dashes)**.** Refer to "Buttons associated with NIBP" on page 7-6.

Limit settings

There are two limit settings associated with this parameter: ***HIGH*** and ***LOW***. Both limit settings are available for **Systolic** and **Diastolic** windows, as well as **Pulse Rate** (refer Chapter 13, "Pulse Rate"). The settings appear in increments of 5 mmHg.

Systolic and Diastolic limits are adjustable for adult/pediatric and neonate patient types. The ***ADULT*** indicator is solid green while Systolic and Diastolic limits for adult/pediatric are being adjusted. The ***NEONATE*** indicator is solid green while Systolic and Diastolic limits for neonate are being adjusted. Upon completion of a determination, the monitor evaluates the results of that determination against the appropriate set of limits based upon the type of NIBP hose that is connected.

Systolic	**Range (in mmHg)**	
Patient type	**HIGH**	**LOW**
Adult/pediatric	35 to 290	30 to 285
Neonate	35 to 140	30 to 135

Diastolic	**Range (in mmHg)**	
Patient type	**HIGH**	**LOW**
Adult/pediatric	15 to 220	10 to 215
Neonate	15 to 110	10 to 105

Menu settings

The ***INFLATE PRESSURE*** menu setting is associated with the NIBP parameter. This option lets you adjust the target pressure that the monitor initially pumps to for the next determination.

Systolic window	**Setting**
Range: **Adult/pediatric** **Neonate**	 100 to 250 mmHg for adult/pediatric for Classic, Auscultatory, and SuperSTAT 70 to 140 SuperSTAT and auscultatory 100 to 140 for Classic
Steps of	5 mmHg

The ***INFLATE PRESSURE*** option is adjustable for adult/pediatric and neonate patient types, respectively. For all NIBP modes, the NIBP parameter detects the type of hose being used and automatically uses adult/pediatric or neonate monitoring settings, as appropriate.

Changing this setting for either patient type cancels a determination that is in progress and clears previously derived Systolic, Diastolic and MAP values in their associated windows.

The appropriate target inflation pressure for the next determination is used when any of the following are true:

- A current valid MAP value is not displayed.
- In manual mode and the last determination is greater than 2 minutes old.
- Any determination attempted that the detected hose type does not match that of the previous determination.

Sounds associated with NIBP

There is one tone associated with this parameter. The tone sounds at the completion of any NIBP determination.

Procedures

Checking the monitor's NIBP technology configuration setting

You should always check the NIBP technology configuration setting before using the monitor. Monitors located in the same clinical area but containing a different NIBP technology configuration setting could result in operational differences and a delay in performing vital sign measurements.

To check the monitor's NIBP technology configuration setting, you must enter the configuration mode:

1. With the monitor turned off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Watch the **min** window while the monitor starts up for one of the following settings to display:
   - ***StAt*** for SuperSTAT NIBP.
   - ***AUSC*** for Auscultatory NIBP.
   - ***CLAS*** for Classic NIBP.
3. To return the monitor to the clinical mode and begin monitoring patients, turn off the monitor, then back on again.

Taking NIBP measurements

1. Connect the end of the air hose which has quick-release clips to the NIBP connector on the front of the monitor. Make sure that the hose is not kinked or compressed.

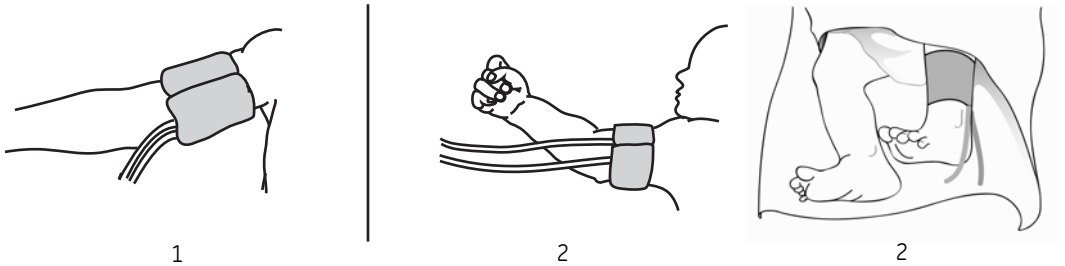
   NOTE

   To disconnect the hose from the monitor, squeeze the quick-release clips together and pull the plug from the NIBP connector.

2. Choose the appropriate blood pressure measurement site. In adult/ped patients, the upper arm is preferred for convenience and because normative values are generally based on this site. When factors prohibit use of the upper arm, the clinician must plan patient care accordingly, taking into account the patient's cardiovascular status and the effect of an alternative site on blood pressure values, proper cuff size, and comfort. The figure shows the recommended sites for placing cuffs.

   WARNING

   Do not place the cuff on a limb being used for intravenous infusion or any area where circulation is compromised or has the potential to be compromised.



1 2 2

Item	Name
1	Adult or pediatric cuff placement
2	Neonate cuff placement

3. If patient is standing, sitting, or inclined, ensure that cuffed limb is supported to maintain cuff at level of patient's heart. If cuff is not at heart level, the difference in systolic and diastolic values due to hydrostatic effect must be considered. Add 1.80 mmHg to values for every inch (2.54 cm) above heart level. Subtract 1.80 mmHg from values for every inch (2.54 cm) below heart level.

4. Select appropriate cuff size. Measure patient's limb and select appropriately sized cuff according to size marked on cuff or cuff packaging. When cuff sizes overlap for a specified circumference, choose the larger size cuff.

WARNING
Accuracy of NIBP measurement depends on using a cuff of the proper size. It is essential to measure the circumference of the limb and to select the proper size cuff. In addition, the air hoses are color-coded according to patient population. The gray 12- or 24-foot hose (3.66 m or 7.3 m) is required on patients who require cuff sizes from infant through thigh cuffs. The light blue 12-foot hose (3.66 m) is required for the neonatal cuff sizes #1 through #5. If it becomes necessary to move the cuff to another limb, make sure the appropriate size cuff is used.

NOTE
Use only GE CRITIKON BP cuffs. The size, shape, and bladder characteristics can affect the performance of the instrument. Inaccurate readings may occur unless GE CRITIKON BP cuffs are used.

5. Inspect cuff for damage. Replace cuff when aging, tearing, or weak closure is apparent. Do not inflate cuff when unwrapped.

CAUTION
Do not use cuff if structural integrity is suspect.

6. Connect the cuff to the air hose.
7. Inspect patient's limb prior to application.

CAUTION
Do not apply cuff to areas where skin is not intact or tissue is injured.

8. Palpate artery and place cuff so that patient's artery is aligned with cuff arrow marked "artery."
9. Squeeze all air from cuff and confirm that the connection is secure and unoccluded and that tubing is not kinked.

NOTE
Avoid compressing or restricting the NIBP pressure tubes.

10. Wrap cuff snugly around the patient's limb. Cuff index line must fall within the range markings. Ensure that hook and loop closures are properly engaged so that pressure is evenly distributed throughout cuff. If upper arm is used, place cuff as far proximally as possible.

11. Proper cuff wrapping should be snug, but should still allow space for a finger between patient and cuff. Cuff should not be so tight as to prevent venous return between determinations.

CAUTION
Using a cuff that is too tight will cause venous congestion and discoloration of the limb, but using a cuff that is too loose may result in no readings and/or inaccurate readings.

12. Proceed with monitoring in the manual, auto cycle, or Stat mode.

What to do when taking NIBPs on different patients

To ensure the previous patient's NIBP will not be used for adaptive target inflation pressure when taking an NIBP on a new patient, you can 1.) clear the history by holding the history key for more than 2 seconds, or 2.) if in manual mode, wait for more than 2 minutes since the last determination was taken on the previous patient.

In manual mode, the monitor will not use the displayed NIBP values for adaptive target inflation pressure if it has been more than 2 minutes since the end of the previous determination. In manual mode, the NIBP values are displayed for a maximum of 30 minutes. In auto mode, the displayed NIBP values are used for adaptive target inflation pressure independent of the length of time the values are displayed.

Alarms

Upon completion of a determination that results in Systolic and Diastolic values, these values are checked against the appropriate set of patient type limits based upon the hose type detected. During Stat mode determinations, Systolic and Diastolic values are not checked against their limits. When the limit alarms are active, they can be silenced by pressing the **Silence** or **Alarms** button.

The **Systolic** window is used for NIBP status alarms. When active, the status alarms, with the exception of the '***E80***' NIBP overpressure alarm, are acknowledged and cleared when a new determination is attempted. All NIBP alarms can be acknowledged and cleared by pressing the **Silence** button.

Specifications

Specifications	
Cuff pressure range (Normal operating range)	0 to 290 mmHg (adult/ped 0 to 145 mmHg (neonate)
Blood pressure accuracy (Classic and Auscultatory)	Meets ANSI/AAMI Standard SP-10:1992 (mean error ≤ 5 mmHg, standard deviation ≤ 8 mmHg)
Blood pressure accuracy (SuperSTAT)	Meets ANSI/AAMI Standard SP-10:2002 (mean error ≤ 5 mmHg, standard deviation ≤ 8 mmHg)
Maximum determination time	120 s (adult/ped) 85 s (neonate)
Overpressure cutoff	300 to 330 mmHg (adult/ped) 150 to 165 mmHg (neonate)
BP range (Classic and Auscultatory)	
Systolic	30 to 245 mmHg (adult/ped) 40 to 140 mmHg (neonate)
MAP	15 to 215 mmHg (adult/ped) 30 to 115 mmHg (neonate)
Diastolic	10 to 195 mmHg (adult/ped) 20 to 100 mmHg (neonate)
BP range (SuperSTAT)	
Systolic	30 to 290 mmHg (adult/ped) 30 to 140 mmHg (neonate)
MAP	20 to 260 mmHg (adult/ped) 20 to 125 mmHg (neonate)
Diastolic	10 to 220 mmHg (adult/ped) 10 to 110 mmHg (neonate)
Pulse rate range (Classic and Auscultatory)	30 to 200 beats/min (adult/ped) 30 to 220 beats/min (neonate)
Pulse rate range (SuperSTAT)	30 to 240 beats/min (adult/ped) 30 to 240 beats/min (neonate)
Pulse rate accuracy	± 3.5% or 3 bpm, whichever is higher
NOTE All CARESCAPE V100 vital sign monitor regulatory and accuracy studies have been performed using GE CRITIKON BP cuffs.	

Factory defaults

	Adult/pediatric	Neonate	Non-patient Specific
Systolic (mmHg)			
HIGH	200	100	
LOW	80	40	
Diastolic (mmHg)			
HIGH	120	60	
LOW	30	20	
Inflation pressure (for Auscultatory)	160	100	
Inflation pressure (for SuperSTAT)	135	100	
Inflation pressure (for Classic)	160	110	
Cycle button default			15 min

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5,170,795; 5,704,362; 5,518,870; 5,579,776; 6,358,213; 6,746,403; 6,893,403; 6,902,531; 7,070,566; 7,074,192; 7,186,218; 7,198,604 and international equivalents. US patents pending.

8 Ohmeda TruSignal SpO_2

Description

The SpO_2 parameter in the monitor is available in three different technologies: Ohmeda TruSignal, Nellcor and Masimo SET. Please refer to the front of your monitor to see which SpO_2 technology your monitor contains. If your monitor contains this parameter, the SpO_2 technology logo will be on the front fascia of the monitor. This section refers to Ohmeda TruSignal SpO_2 technology.

The SpO2 function is calibrated to read functional arterial oxygen saturation.

TruSignal enhanced SpO_2

TruSignal Enhanced SpO_2 offers improved performance, especially during challenging conditions of clinical motion and low perfusion. With ultra-low-noise technology, TruSignal selects the appropriate clinically developed algorithm to compensate for weak or motion-induced signals and generate reliable saturation readings.

The parameter automatically switches on when a sensor is connected to the monitor.

Pulse rate derived from SpO_2 appears in the **Pulse Rate** window and updates continuously. A tone sounds at a rate corresponding to the pulse rate and at a pitch corresponding to the SpO_2 saturation level. The pitch is highest at 100% oxygen saturation, and it continuously decreases as the saturation level falls. The monitor displays a pulse amplitude bar. The pulse amplitude bar graph is proportional to the arterial blood flow.

Audible and visible alarms occur when SpO_2 levels are outside the alarm limits. When a parameter status alarm occurs, an alarm message code appears in the **SpO_2** window.

NOTE

Limit alarms, printing, and trending are not available for the first 10 seconds of SpO_2 monitoring.

PIr pulsatile value

The perfusion index measurement—the PIr pulsatile value—is a clinical tool that provides a dynamic numeric reflection of perfusion at the sensor site. PIr is a relative value that varies from patient to patient.

The PIr pulsatile value indicates the strength of the pulse signal at the sensor site—the higher the PIr value, the stronger the pulse signal. A strong pulse signal increases the validity of SpO_2 and pulse rate data. Clinicians can use the PIr value to compare the strength of the pulse signal at different sites on a patient in order to locate the best site for the sensor-the site with the strongest pulse signal.

The perfusion index is only available on a current printout and when the sensor is in place; it does not appear on the monitor screen. On the PIr info line, a row is printed that contains the time the **Print** button was pressed followed by the current perfusion index measurement when it is valid.

WARNINGS

Many factors may cause inaccurate readings and alarms, decreased perfusion, and/or low signal strength:

Interfering substances:

- Carboxyhemoglobin may erroneously increase SpO_2 reading.
- Methemoglobin (MetHb) usually represents less than 1% of the total Hgb, but in the case of methemoglobinemia that can be congenital or induced by some IV dyes, antibiotics (such as sulphas), inhaled gases, etc., this level increases sharply. Methemoglobin may cause inaccurate SpO_2 readings.
- Intravascular dyes (such as indocyanine green, methylene blue, etc.) may cause inaccurate SpO_2 readings and/or decreased perfusion and corresponding signal strength, potentially causing inaccurate SpO_2 readings.

Physiological characteristics:

Physiological characteristics may cause decreased perfusion and/or low signal strength and may potentially cause inaccurate SpO_2 readings.

- Cardiac arrest
- Hypotension
- Shock
- Severe vasoconstriction
- Severe anemia
- Hypothermia
- Venous pulsations
- Darkly pigmented skin
- Ventricular septal defects (VSDs)

Environmental conditions:

Environmental conditions may cause interference or artifact and may potentially cause inaccurate SpO_2 readings.

- Excessive ambient light sources (e.g., infrared heat lamps, bilirubin lights, direct sunlight, operating room lights). To prevent such interference, cover the sensor with opaque material.
- Electrical interference
- Electrosurgery
- Defibrillation - May cause inaccurate reading for a short amount of time.
- Excessive patient/sensor motion. Artifact can simulate an SpO_2 reading, so that the monitor fails to sound an alarm. In order to ensure reliable patient monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

Sensor placement:
- Sensor placement on the same extremity as a blood pressure cuff, arterial catheter or intravascular line; or arterial occlusion proximal to the sensor may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Poor sensor fit may cause decreased or low signal strength and potentially cause inaccurate SpO_2 readings.
- Do not allow tape to block the sensor light emitter and detector as this may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Before using the sensor, carefully read the sensor manufacturer's instructions for use.

As with any clip-on sensor, pressure is exerted. The clinician should be cautious in using a clip-on sensor on patients with compromised circulation (e.g., because of peripheral vascular disease or vasoconstricting medications).

CAUTIONS

Do not sterilize reusable sensors by irradiation, steam, or ethylene oxide. See the sensor manufacturer's instructions for cleaning, sterilization, or disinfecting methods.

Do not place SpO_2 sensor on patient during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO_2 measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease pulse rate.
- SpO_2 and pulse rate values are filtered by an averaging technique, which determines how quickly the reported values respond to changes in the patient's saturation. Increased averaging time effects time to alarm for SpO2 saturation and pulse rate limits.
- The monitor that is labeled with TruSignal Technology is compatible only with the TruSignal and OxiTip interconnect cables and sensors.
- Software development, software validation, and Risk and Hazard Analysis has been performed to a registered quality system.
- User or patient-applied parts are latex-free.
- A functional tester cannot be used to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor.

Configuration settings associated with SpO_2

There is one configuration setting associated with this parameter: line frequency mode (***LF***). Refer to "SpO2 configuration settings" on page 2-12 to view or change the setting.

Line frequency mode (***LF***) allows the user to specify the line power frequency of your local AC power source for the best low perfusion performance. Choose *50* Hz filter or *60* Hz filter. The default value is 60 Hz.

WARNING
The Line Frequency mode (for Datex-Ohmeda oximetry) must be set according to each country's electrical power utilities implementation; and that it must be checked and reset any time the monitor is set to or reverts to factory default settings.

CAUTION
If the Line Frequency mode (for Datex-Ohmeda oximetry) is set incorrectly, the susceptibility to ambient light is increased and low perfusion performance may be effected resulting in inaccurate readings.

Buttons associated with SpO_2

There are no buttons associated with this parameter.

Windows associated with SpO_2

There is one window associated with this parameter: **SpO_2**. While in offline mode, nothing is displayed in the **SpO_2** window. When in ready mode and the parameter senses that a sensor is connected, a single dash (**-**) appears in this window. When it is in operate mode and the parameter is reporting a valid data, the derived SpO_2 value appears in this window and updates continuously. The values are displayed in %.

NOTE
If SpO_2 is the source for pulse rate, the **Pulse Rate** window is associated with this parameter. Refer to Chapter 13, "Pulse Rate" for more information.

Indicators associated with SpO_2

There is one indicator associated with this parameter: the pulse amplitude indicator bar. The red LED bar flashes to indicate that pulse rate measurements are being derived from SpO_2 signals and the height of the bar is proportional to the arterial blood flow.

User settings

Limit settings

There are two limit settings associated with this parameter: ***HIGH*** and ***LOW***. The range for ***HIGH*** is 71 to 100%. The range for ***LOW*** is 70 to 99%. The settings appear in increments of 1%.

Menu settings

The ***PULSE VOLUME*** menu setting is associated with the SpO_2 parameter. This option lets you adjust the volume of the tone that sounds after each detected pulse. It can be adjusted from ***0*** to ***10*** (10 being the loudest). If you set the volume to zero, no tone will sound.

Sounds associated with SpO_2

An audible tone is provided by the monitor for each pulse detected by the TruSignal SpO_2 parameter. The pitch of the audible tone is directly related to the calculated saturation value. As the saturation value increases, the pitch frequency increases. As the saturation value decreases, the pitch frequency decreases. This audible tone is silenced while an alarm sounds or the ***PULSE VOLUME*** is set to ***0***. Refer to "Menu settings" on page 8-6 in this section.

Procedures

1. Select a sensor that is appropriate for the patient and the clinical situation.

   NOTE

   Use only TruSignal OxiTip+ sensors and interconnect cables. Use of another pulse oximetry cable will have an adverse effect on performance. Do not attach any cable that is intended for computer use to the sensor port. Do not connect any device other than TruSignal-approved sensor to the sensor connector.

   WARNING

   Do not use a damaged sensor or one with exposed electrical contacts. Do not use sensor, cables, or connectors that appear damaged.

2. Following the directions for use supplied with the sensor, apply the sensor to the patient.

   WARNINGS

   The sensor disconnect error message and associated alarm indicate that the sensor is either disconnected or the wiring is faulty. The user should check the sensor connection and, if necessary, replace the sensor, interconnect cable, or both.

   Remove nail polish and artificial nails. Placing a sensor on a polished or an artificial nail may affect accuracy.

   Patient safety:

   Do not place any clip-on sensor in a patient's mouth, on their nose or toes, on their thumb, or across a child's foot or hand.

   Monitor performance:

   Place the sensor so that the LEDs and the photodiode are opposite each other.

CAUTIONS
Patient safety:

Observe the sensor site frequently to assure adequate distal circulation. Sensor sites should be checked at least every 2 hours and rotated at least every 4 hours.

If the sensor is not applied properly, the patient's skin could be injured or the ability of the monitor to measure oxygen saturation could be compromised. For example, a clip-on sensor should never be taped shut. Taping the sensor could damage the patient's skin or impair the venous return, thus causing venous pulsation and inaccurate measurement of oxygen saturation.

Excessive pressure from the sensor may cause necrosis of the skin.

Monitor performance:

When an SpO_2 sensor is located on the same limb as the NIBP cuff, SpO_2 readings will not be valid while the cuff is inflated. If valid SpO_2 readings are required during the entire blood pressure determination, attach the SpO_2 sensor to the limb opposite the one with the blood pressure cuff.

3. Plug the SpO_2 sensor into the SpO_2 interconnect cable. Then plug the SpO_2 interconnect cable into the SpO_2 sensor connector.
4. Proceed with monitoring. SpO_2 measurements run continuously and can run simultaneously with other measurements.

Alarms

If the signal derived by SpO_2 is determined to be valid, SpO_2 values are displayed. After values are displayed, if the signal quality drops to a point where the values are suspect, the values are removed, and an '***E25***' SpO_2 lost pulse alarm is generated.

SpO_2 hold-off period

The hold-off period is defined as the 10 seconds that follows when the SpO_2 parameter switches from ready mode to operate mode. This hold-off period helps prevent any nuisance alarms.

Parameter status alarms are not displayed and the derived SpO_2 value is not checked against user-set limits while the SpO_2 hold-off period is active.

Alarm timer

NOTE

This feature is available with the Legacy alarm mode setting only. Refer to the service manual to configure the Legacy alarm mode setting.

When a SpO_2 sensor is on a patient for less than 2 minutes, this is referred to as "spot mode." The SpO_2 '**---**' sensor off finger and SpO_2 '***E25***' lost pulse alarms are generated as low-priority alarms if they occur within the spot mode time. If a manual NIBP measurement is taken while "spot mode" is active, the time to generate a low priority alarm is increased until the NIBP measurement is completed. If the low priority SpO_2 alarms are not acknowledged within 1 minute, these SpO_2 alarms will escalate to high-priority alarms.

Under all other conditions, these alarms are generated as high-priority alarms.

Specifications

Specifications	
Measurement range	
SpO_2	1 to 100%
Pulse rate	30 to 250 bpm
Perfusion Index Value (Plr)	0.00 to 9.99
Accuracy*	
Saturation	
Adult*	70 to 100% ±2 digits whichever is greater, (without motion)
Neonate*	70 to 100% ±3 digits (without motion)
Adult/Neonate**	70 to 100% ±3 digits (during clinical motion)
Low perfusion	70 to 100% ±2 digits (during clinical low perfusion)
Pulse rate	
Adult /Neonate	30 to 250 bpm: ± 2 digits or ± 2%, whichever is greater, (without motion) 30 to 250 bpm: ± 5 digits (during motion)
Low perfusion	30 to 250 bpm: ± 3 digits

*SpO_2 measurement accuracy is based on deep hypoxia studies using OxyTip+ sensors on healthy adult volunteer subjects. Arterial blood samples were analyzed simultaneously on multiple CO-oximeters. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

**Applicability: OXY-AF and OXY-AP sensors.

NOTE

Accuracy may vary for some sensors; always check the instructions for the sensor.

Specifications: Sensor Accuracy	
Sensor model	**SpO_2 range 70% to 100%**
OxyTip+	
OXY-F-UN	±2 digits without motion
OXY-W-UN	±2 digits without motion
OXY-E-UN	±2 digits without motion
OXY-SE	±2 digits without motion
OXY-AP	±2 digits without motion
OXY-AF	±2 digits without motion
OXY-F2-GE	±2 digits without motion
OXY-F4-GE	±2 digits without motion
OXY-E2-GE	±2 digits without motion
OXY-E4-GE	±2 digits without motion
Sensor light source	
Wavelength*	Infrared: 930 to 950 nm (nominal) Red 650 to 670 nm (nominal)
Average power	< 1 mW
* Information about wavelength range can be especially useful to clinicians.	

Factory default settings

SpO_2 (%) HIGH alarm limit	***100***
SpO_2 (%) LOW alarm limit	***90***
Line frequency mode	***60*** (for 60 Hz)

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6,397,092; 6,748,253; 6,505,133; 7,062,307; 5,766,127; 5,503,148; 5,934,277; 6,385,471; 6,714,803; 6,987,994; 6,408,198; 6,434,408; 6,839,582; 6,505,060; 6,510,329; 6,650,918; 7,139,599; 6,707,257; 6,720,734; 6,825,619 pending.

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local representative. The service manual, which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The pulse amplitude bar indicates a pulse, but no oxygen saturation or pulse rate values appear on the screen.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- The sensor may be damaged.
- The patient's perfusion may be too low to allow the SpO_2 function to measure saturation and pulse rate.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the SpO_2 sensor is applied securely and properly, and replace it if necessary; use the PIr pulsatile value to determine the strength of the signal and move the sensor to a new site; or use a disposable adhesive sensor that may tolerate more motion.
- Replace the sensor.

PROBLEM: The SpO_2 value or the pulse rate changes rapidly; the pulse amplitude bar is erratic.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- An electrosurgical unit (ESU) may be interfering with performance.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the sensor is applied securely and properly, and replace it if necessary; use the PIr pulsatile value to determine the strength of the signal and move the sensor to a new site; use a sensor that tolerates more motion.

If an ESU is interfering:

- Move the SpO_2 cable as far from the ESU as possible.
- Plug the monitor and the ESU into different AC circuits.
- Move the ESU ground pad as close to the surgical site as possible.
- The sensor may need to be replaced with a new sensor.

PROBLEM: The oxygen saturation measurement does not correlate with the value calculated from a blood gas determination.

CAUSE:

- The SpO_2 calculation may not have correctly adjusted for the effects of pH; temperature; CO_2; fetal hemoglobin; or 2,3-DPG.
- Accuracy can be affected by incorrect sensor application or use; intravascular dyes; bright light; excessive patient movement; venous pulsations; electrosurgical interference; and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.

SOLUTION:

- Check that calculations have been corrected appropriately for the relevant variable. In general, calculated saturation values are not as reliable as direct laboratory hemoximeter measurements.
- If there is excessive light, cover the sensor with opaque material.
- Circulation distal to the sensor site should be checked routinely. Refer to the TruSignal sensor's directions for use supplied with the sensor for requirements on moving the sensor to another site to ensure adhesion, skin integrity, and correct optical alignment. If skin integrity changes, move the sensor to another site.
- Try to keep the patient still, or change the sensor site to one with less motion.
- Observe all instructions, warnings, and cautions in this manual and in the directions for use of the sensor.

PROBLEM: A valid SpO_2 signal was present but has disappeared.

CAUSE:

- An NIBP determination on the same limb is in progress.

SOLUTION:

Check the patient.

- An alarm message code appears on the screen, and the audible alarm will sound immediately.
- Move the sensor to the arm that is not connected to a blood pressure cuff.

PROBLEM: An **E21** REPLACE SENSOR error code has been detected.

CAUSE:

- The sensor or cable may be the wrong type or defective, the cabling may be improperly connected.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the proper sensor/cable is applied securely and properly, and replace it if necessary.
- Disconnect and reconnect the sensor.

PROBLEM: An **E20** SENSOR DISCONNECTED error code has been detected, but the sensor is still connected.

CAUSE:

- The sensor is not completely connected. The interconnect cable or sensor wiring is faulty.
- Ensure the appropriate sensor and cable are being used.

SOLUTION:

Check the patient.

- Check the sensor connection to the interconnect cable and the interconnect cable connection to the monitor. Then, if needed, replace the sensor or the interconnect cable.
- Use only compatible sensors and cables.

For your notes

9 Nellcor OxiMax SpO_2

Description

The SpO_2 parameter in the monitor is available in three different leading technologies: Ohmeda TruSignal, Nellcor and Masimo SET. Please refer to the front of your monitor to see which SpO_2 technology your monitor contains. If your monitor contains this parameter, the SpO_2 technology logo will be on the front fascia of the monitor. This section refers to Nellcor SpO_2 technology.

The SpO2 function is calibrated to read functional arterial oxygen saturation.

Pulse rate derived from SpO_2 appears in the **Pulse Rate** window and is continuously updated. A tone sounds at a rate corresponding to the pulse rate and at a pitch corresponding to the SpO_2 saturation level. The pitch is highest at 100% oxygen saturation, and it continuously decreases as the saturation level falls. The monitor displays a pulse amplitude bar. The pulse amplitude bar graph is proportional to the arterial blood flow.

The parameter automatically switches on when a sensor is connected to the monitor.

Audible and visible alarms occur when SpO_2 levels are outside the alarm limits. When a parameter status alarm occurs, an alarm message code appears in the **SpO_2** window.

NOTE

Limit alarms, printing, and trending are not available for the first 10 seconds of SpO_2 monitoring.

WARNING

Nellcor-labelled monitors are only compatible with Nellcor Oximax sensors and cables.

WARNINGS

Many factors may cause inaccurate readings and alarms, decreased perfusion, and/or low signal strength:

Interfering substances:

- Carboxyhemoglobin may erroneously increase SpO_2 reading.
- Methemoglobin (MetHb) usually represents less than 1% of the total Hgb, but in the case of methemoglobinemia that can be congenital or induced by some IV dyes, antibiotics (such as sulphas), inhaled gases, etc., this level increases sharply. Methemoglobin may cause inaccurate SpO_2 readings.
- Intravascular dyes (such as indocyanine green, methylene blue, etc.) may cause inaccurate SpO_2 readings and/or decreased perfusion and corresponding signal strength, potentially causing inaccurate SpO_2 readings.

Physiological characteristics:

Physiological characteristics may cause decreased perfusion and/or low signal strength and may potentially cause inaccurate SpO_2 readings.

- Cardiac arrest
- Hypotension
- Shock
- Severe vasoconstriction
- Severe anemia
- Hypothermia
- Venous pulsations
- Darkly pigmented skin
- Ventricular septal defects (VSDs)

Environmental conditions:

Environmental conditions may cause interference or artifact and may potentially cause inaccurate SpO_2 readings.

- Excessive ambient light sources (e.g., infrared heat lamps, bilirubin lights, direct sunlight, operating room lights). To prevent such interference, cover the sensor with opaque material.
- Electrical interference
- Electrosurgery
- Defibrillation - May cause inaccurate reading for a short amount of time.
- Excessive patient/sensor motion. Artifact can simulate an SpO_2 reading, so that the monitor fails to sound an alarm. In order to ensure reliable patient monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

Sensor placement:

- Sensor placement on the same extremity as a blood pressure cuff, arterial catheter or intravascular line; or arterial occlusion proximal to the sensor may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Poor sensor fit may cause decreased or low signal strength and potentially cause inaccurate SpO_2 readings.

- Do not allow tape to block the sensor light emitter and detector as this may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Before using the sensor, carefully read the sensor manufacturer's instructions for use.

As with any clip-on sensor, pressure is exerted. The clinician should be cautious in using a clip-on sensor on patients with compromised circulation (e.g., because of peripheral vascular disease or vasoconstricting medications).

CAUTIONS

Do not sterilize reusable sensors by irradiation, steam, or ethylene oxide. See the sensor manufacturer's instructions for cleaning, sterilization, or disinfecting methods.

Do not place SpO_2 sensor on patient during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO_2 measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease pulse rate.
- SpO_2 and pulse rate values are filtered by an averaging technique, which determines how quickly the reported values respond to changes in the patient's saturation. Increased averaging time effects time to alarm for SpO2 saturation and pulse rate limits.
- Software development, software validation, and Risk and Hazard Analysis has been performed to a registered quality system.
- User or patient-applied parts are latex-free.
- A functional tester cannot be used to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor.

Configuration settings associated with SpO_2

There are two configuration settings associated with this parameter: response mode (***n0d***) and *SatSeconds*™ (***SAt***). Refer to "SpO2 configuration settings" on page 2-12 to view or change the settings.

Response mode (***n0d***) allows the user to specify the averaging technique or how quickly the reported SpO_2 value responds to changes in the patient's saturation.

This will also effect time to alarm. Choose mode ***1*** (Normal Response; default setting) for the general patient population. Choose mode ***2*** (Fast Response) when patients are active as in exercise protocols.

SatSeconds

With traditional alarm management, upper and lower alarm limits are set for monitoring SpO_2. During monitoring, as soon as an alarm limit is violated by as little as one percentage point, an audible alarm immediately sounds. When the % SpO_2 fluctuates near an alarm limit, the alarm sounds each time the limit is violated. To prevent these nuisance alarms, the monitor uses the *SatSeconds* technique. The *SatSeconds* technique (***SAt***) controls the time that the % SpO_2 level may fall outside the alarm before an audible alarm sounds. Choose either ***0***, ***10***, ***25***, ***50***, or ***100*** seconds. If ***0*** is chosen this limit hold-off feature is disabled.

The *SatSeconds* number is calculated by taking the amount the current saturation value is out of limits and multiplying it by the amount of time it has been out of those limits. For example: if the lower limit is set to 95% and the patient's saturation is 90%, the amount out of limit is 5%. If the *SatSeconds* feature is set to 50, the alarm would sound in 10 seconds, because 5% saturation (out of limits) multiplied by 10 seconds (time out of limit) equals 50 *SatSeconds*.

The *SatSeconds* "Safety Net" is for patients with saturation levels having frequent excursions below the limit, but not staying below the limit long enough for the *SatSeconds* time setting to be reached. When 3 or more limit violations occur within 60 seconds, an alarm sounds even if the *SatSeconds* time setting has not been reached.

Buttons associated with SpO_2

There are no buttons associated with this parameter.

Windows associated with SpO_2

There is one window associated with this parameter: **SpO_2**. While in offline mode, nothing is displayed in the **SpO_2** window. When in ready mode and the parameter senses that a sensor is connected, a single dash (**-**) appears in this window. When it is in operate mode and the parameter is reporting valid data, the derived SpO_2 value appears in this window and updates continuously. The values are displayed in %.

NOTE

If SpO_2 is the source for pulse rate, the **Pulse Rate** window is associated with this parameter. Refer to Chapter 13, "Pulse Rate" for more information.

Indicators associated with SpO_2

There is one indicator associated with this parameter: the pulse amplitude indicator bar. The red LED bar flashes to indicate that pulse rate measurements are being derived from SpO_2 signals and the height of the bar is proportional to the arterial blood flow.

User settings

Limit settings

There are two limit settings associated with this parameter: ***HIGH*** and ***LOW***. The range for ***HIGH*** is 71 to 100%. The range for ***LOW*** is 70 to 99%. The settings appear in increments of 1%.

Menu settings

The ***PULSE VOLUME*** menu setting is associated with the SpO_2 parameter. This option lets you adjust the volume of the tone that sounds after each detected pulse. It can be adjusted from ***0*** to ***10*** (10 being the loudest). If you set the volume to zero, no tone will sound.

Sounds associated with SpO_2

An audible tone is provided by the monitor for each pulse detected by the Nellcor SpO_2 parameter. The pitch of the audible tone is directly related to the calculated saturation value. As the saturation value increases, the pitch frequency increases. As the saturation value decreases, the pitch frequency decreases. This audible tone is silenced while an alarm sounds or the ***PULSE VOLUME*** is set to ***0***. Refer to "Menu settings" on page 9-6.

Procedures

1. Select a sensor that is appropriate for the patient and the clinical situation. Verify that the monitor's patient type and sensor type match. Sensor sizing must be correct for the SpO_2 algorithm to function properly.

   NOTE

   To assure optimal performance, use only Nellcor sensors, which are available from GE or from Nellcor or its local representative. Use only Nellcor OxiMax sensors with PURPLE or WHITE plugs (connectors) and cables. Use of another pulse oximetry cable will have an adverse effect on performance. Do not attach any cable that is intended for computer

   use to the sensor port. Do not connect any device other than a Nellcor OxiMax sensor to the sensor connector.

   WARNING

   Do not use a damaged sensor or one with exposed electrical contacts. Do not use sensor, cables, or connectors that appear damaged.

2. Following the directions for use supplied with the sensor, apply the sensor to the patient.

   WARNINGS

   The sensor disconnect error message and associated alarm indicate that the sensor is either disconnected or the wiring is faulty. The user should check the sensor connection and, if necessary, replace the sensor, cable, or both.

   Remove nail polish and artificial nails. Placing a sensor on a polished or an artificial nail may affect accuracy.

   Patient safety:

   Do not place any clip-on sensor in a patient's mouth, on their nose or toes, on their thumb, or across a child's foot or hand.

   Monitor performance:

   Place the sensor so that the LEDs and the photodiode are opposite each other.

CAUTIONS

Patient safety:

Observe the sensor site frequently to assure adequate distal circulation. Sensor sites should be checked at least every 2 hours and rotated at least every 4 hours.

If the sensor is not applied properly, the patient's skin could be injured or the ability of the monitor to measure oxygen saturation could be compromised. For example, a clip-on sensor should never be taped shut. Taping the sensor could damage the patient's skin or impair the venous return, thus causing venous pulsation and inaccurate measurement of oxygen saturation.

Excessive pressure from the sensor may cause necrosis of the skin.

Monitor performance:

When an SpO_2 sensor is located on the same limb as the NIBP cuff, SpO_2 readings will not be valid while the cuff is inflated. If valid SpO_2 readings are required during the entire blood pressure determination, attach the SpO_2 sensor to the limb opposite the one with the blood pressure cuff.

3. Plug the SpO_2 sensor into the SpO_2 sensor extension cable. Then plug the SpO_2 sensor extension cable into the SpO_2 sensor connector.
4. Proceed with monitoring. SpO_2 measurements run continuously and can run simultaneously with other measurements.

Alarms

If the signal derived by SpO_2 is determined to be valid, SpO_2 values are displayed. After values are displayed, if the signal quality drops to a point where the values are suspect, the values are removed, and an '***E25***' SpO_2 lost pulse alarm is generated.

SpO_2 hold-off period

The hold-off period is defined as the 10 seconds that follows when the SpO_2 parameter switches from ready mode to operate mode. This hold-off period helps prevent any nuisance alarms.

Parameter status alarms are not displayed and the derived SpO_2 value is not checked against user-set limits while the SpO_2 hold-off period is active.

Alarm timer

NOTE

This feature is available with the Legacy alarm mode setting only. Refer to the service manual to configure the Legacy alarm mode setting.

When a SpO_2 sensor is on a patient for less than 2 minutes, this is referred to as "spot mode." The SpO_2 '**---**' sensor off finger and SpO_2 '***E25***' lost pulse alarms are generated as low-priority alarms if they occur within the spot mode time. If a manual NIBP measurement is taken while "spot mode" is active, the time to generate a low priority alarm is increased until the NIBP measurement is completed. If the low priority SpO_2 alarms are not acknowledged within 1 minute, these SpO_2 alarms will escalate to high-priority alarms.

Under all other conditions, these alarms are generated as high-priority alarms.

Specifications

Specifications	
Measurement range	
SpO_2	1 to 100%
Pulse rate	20 to 250 bpm
Perfusion range	0.03 to 20%
Accuracy	
Saturation	
Adult*	70 to 100% ±2 digits
Neonate*	70 to 100% ±3 digits
Low perfusion**	70 to 100% ±2 digits
Pulse Rate	
Adult and neonate	20 to 250 bpm ±3 digits
Low perfusion**	20 to 250 bpm ±3 digits

*Adult specifications are shown for OxiMax MAX-A and MAX-N sensors with the N-600. Saturation accuracy will vary by sensor type. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population. Accuracy is based on deep hypoxia studies on healthy adult volunteer subjects. Arterial blood samples were analyzed simultaneously on multiple CO-oximeters.

**Applicability: OxiMax MAX-A, MAX-AL, MAX-P, MAX-I, and MAX-N sensors.

Specifications: Nellcor OxiMax sensor accuracy	
NOTE All Nellcor OxiMax sensors must be used with the NELL cable; the SCP-10 cable. RS-10 and Oxisensor II sensors are not compatible with the CARESCAPE V100 Vital Signs Monitor.	
Sensor Model	**SpO_2 Range** **70% to 100%**
OxiMax	
MAX-A, MAX-AL	± 2 digits
MAX-N (adult)	± 2 digits
MAX-N* (neonate)	± 3 digits
MAX-P	± 2 digits
MAX-I	± 2 digits
MAX-FAST	± 2 digits
SC-A (adult)	± 2 digits
SC-PR (neonate)	± 3 digits
SC-NEO	± 3 digits
MAX-R**	± 3.5 digits
OxiCliq	
OxiCliq A	± 2.5 digits
OxiCliq P	± 2.5 digits
OxiCliq N (adult)	± 2.5 digits
OxiCliq N* (neonate)	± 3.5 digits
OxiCliq I	± 2.5 digits
Reusable sensor models	
D-YS (infant to adult)	± 3 digits
D-YS (neonate)	± 4 digits
D-YS & D-YSE	± 3.5 digits
D-YS & D-YSPD	± 3.5 digits
DS-100A	± 3 digits
OXI-A/N (adult)	± 3 digits
OXI-A/N (neonate)	± 4 digits

Specifications: Nellcor OxiMax sensor accuracy	
OXI-P/I	± 3 digits
Neonatal sensor accuracy	When sensors are used on neonatal subjects as recommended, the specified accuracy range is increased by ±1 digit, as compared to adult usage, to account for the theoretical effect on oximeter measurements of fetal hemoglobin in neonatal blood. For example, MAX-N accuracy on neonates is ±3 digits, rather than ±2 digits.
Sensor light source	
Wavelength***	Infrared: 890 nm (nominal) Red: 660 nm (nominal)
Power dissipation	Infrared: 22.5 mW (max) Red: 30 mW (max)
* The MAX-N, D-YS, OXI-A/N, and OxiCliq N were tested on patients >40 kg. ** The accuracy specification has been determined between saturations of 80%-100%. *** Information about wavelength range can be especially useful to clinicians.	

Factory default settings

SpO_2 (%) HIGH alarm limit	***100***
SpO_2 (%) LOW alarm limit	***90***
Response mode	***1*** (for Mode 1: Normal response)
SatSeconds™	***0***

Nellcor patents

Re.35,122; 4,802,486; 4,869,254; 4,928,692; 4,934,372; 4,960,126; 5,078,136; 5,485,847; 5,743,263; 5,865,736; 6,035,223; 6,298,252; 6,463,310; 6,591,123; 6,675,031; 6,708,049; 6,801,797 and international equivalents.

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local representative. The service manual, which is for use by qualified service personnel provides additional troubleshooting information.

PROBLEM: The pulse amplitude bar indicates a pulse, but no oxygen saturation or pulse rate values appear on the screen.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- The sensor may be damaged.
- The patient's perfusion may be too low to allow the SpO_2 function to measure saturation and pulse rate.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the SpO_2 sensor is applied securely and properly, and replace it if necessary; move the sensor to a new site; or use a disposable adhesive sensor that may tolerate more motion.
- Replace the sensor.

PROBLEM: The SpO_2 value or the pulse rate changes rapidly; the pulse amplitude bar is erratic.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- An electrosurgical unit (ESU) may be interfering with performance.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the sensor is applied securely and properly, and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.

If an ESU is interfering:

- Move the SpO_2 cable as far from the ESU as possible.
- Plug the monitor and the ESU into different AC circuits.
- Move the ESU ground pad as close to the surgical site as possible.
- The sensor may need to be replaced with a new sensor.
- If the patient weighs less than 3 kg or more than 40 kg, apply an OxiMax, reusable sensor (except DS-100, OXI-A/N, OXI-P/I), or OxiCliq oxygen transducer to an appropriate site. These sensors have Faraday shields which provide added protection from high electronic noise and ambient light.

PROBLEM: The oxygen saturation measurement does not correlate with the value calculated from a blood gas determination.

CAUSE:

- The SpO_2 calculation may not have correctly adjusted for the effects of pH; temperature; CO_2; fetal hemoglobin; or 2,3-DPG.
- Accuracy can be affected by incorrect sensor application or use; intravascular dyes; bright light; excessive patient movement; venous pulsations; electrosurgical interference; and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.

SOLUTION:

- Check that calculations have been corrected appropriately for the relevant variable. In general, calculated saturation values are not as reliable as direct laboratory hemoximeter measurements.
- If there is excessive light, cover the sensor with opaque material.
- Circulation distal to the sensor site should be checked routinely. Refer to the Nellcor sensor's directions for use supplied with the sensor for requirements on moving the sensor to another site to ensure adhesion, skin integrity, and correct optical alignment. If skin integrity changes, move the sensor to another site.
- Try to keep the patient still, or change the sensor site to one with less motion.
- Observe all instructions, warnings, and cautions in this manual and in the directions for use of the sensor.

PROBLEM: A valid SpO_2 signal was present but has disappeared.

CAUSE:

- An NIBP determination on the same limb is in progress.

SOLUTION:

Check the patient.

- An alarm message code appears on the screen, and the audible alarm will sound immediately.
- Move the sensor to the arm that is not connected to a blood pressure cuff.

PROBLEM: An '***E21***' replace sensor error code has been detected.

CAUSE:

- The sensor or cable may be the wrong type or defective, the cabling may be improperly connected.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the proper sensor/cable is applied securely and properly, and replace it if necessary.
- Disconnect and reconnect the sensor.

PROBLEM: An '***E20***' sensor disconnected error code has been detected, but the sensor is still connected.

CAUSE:

- The sensor is not completely connected. The sensor extension cable or sensor wiring is faulty.

SOLUTION:

Check the patient.

- Check the sensor connection to the sensor extension cable and the sensor extension cable connection to the monitor. Then, if needed, replace the sensor or the sensor extension cable.

10 Masimo SET SpO_2

Description

The SpO_2 parameter in the monitor is available in three different leading technologies: Ohmeda TruSignal, Nellcor and Masimo SET. Please refer to the front of your monitor to see which SpO_2 technology your monitor contains. If your monitor contains this parameter, the SpO_2 technology logo will be on the front fascia of the monitor. This section refers to Masimo SET SpO_2 technology**.**

The SpO2 function is calibrated to read functional arterial oxygen saturation.

Functional oxygen saturation (SpO_2) of arterial blood is noninvasively and continuously monitored in the monitor using pulse oximetry technology from Masimo SET. Functional SpO_2 is the ratio of oxygenated hemoglobin to hemoglobin that is capable of transporting oxygen. This ratio, expressed as a percentage, is shown in the **SpO_2** window, which is continually updated.

Pulse rate when associated with SpO_2 appears in the **Pulse Rate** window and updates continuously. A tone sounds at a rate corresponding to the pulse rate and at a pitch corresponding to the SpO_2 saturation level. The pitch is highest at 100% oxygen saturation, and it becomes lower as the saturation level falls. The monitor displays a pulse amplitude bar. The pulse amplitude bar graph is proportional to the arterial blood flow.

The parameter automatically switches on when a sensor is connected to the monitor.

Audible and visible alarms occur when SpO_2 levels are outside the alarm limits. When a parameter status alarm code occurs, an alarm message appears in the **SpO_2** window.

NOTE

Limit alarms, printing, and trending are not available for the first 10 seconds of SpO_2 monitoring.

Indications and contraindications

The SpO_2 parameter is indicated for use in continuous, noninvasive monitoring of functional oxygen saturation and in providing pulse rate data as a component of the monitor. This device is not designed, sold, or intended for use except as indicated.

WARNINGS

Many factors may cause inaccurate readings and alarms, decreased perfusion, and/or low signal strength:

Interfering substances:

- Carboxyhemoglobin may erroneously increase SpO_2 reading.
- Methemoglobin (MetHb) usually represents less than 1% of the total Hgb, but in the case of methemoglobinemia that can be congenital or induced by some IV dyes, antibiotics (such as sulphas), inhaled gases, etc., this level increases sharply. Methemoglobin may cause inaccurate SpO_2 readings.
- Intravascular dyes (such as indocyanine green, methylene blue, etc.) may cause inaccurate SpO_2 readings and/or decreased perfusion and corresponding signal strength, potentially causing inaccurate SpO_2 readings.

Physiological characteristics:

Physiological characteristics may cause decreased perfusion and/or low signal strength and may potentially cause inaccurate SpO_2 readings.

- Cardiac arrest
- Hypotension
- Shock
- Severe vasoconstriction
- Severe anemia
- Hypothermia
- Venous pulsations
- Darkly pigmented skin
- Ventricular septal defects (VSDs)

Environmental conditions:

Environmental conditions may cause interference or artifact and may potentially cause inaccurate SpO_2 readings.

- Excessive ambient light sources (e.g., infrared heat lamps, bilirubin lights, direct sunlight, operating room lights). To prevent such interference, cover the sensor with opaque material.
- Electrical interference
- Electrosurgery
- Defibrillation - May cause inaccurate reading for a short amount of time.
- Excessive patient/sensor motion. Artifact can simulate an SpO_2 reading, so that the monitor fails to sound an alarm. In order to ensure reliable patient monitoring, the proper application of the probe and the signal quality must be checked at regular intervals.

Sensor placement:
- Sensor placement on the same extremity as a blood pressure cuff, arterial catheter or intravascular line; or arterial occlusion proximal to the sensor may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Poor sensor fit may cause decreased or low signal strength and potentially cause inaccurate SpO_2 readings.
- Do not allow tape to block the sensor light emitter and detector as this may cause decreased perfusion and/or low signal strength and potentially cause inaccurate SpO_2 readings.
- Before using the sensor, carefully read the sensor manufacturer's instructions for use.

Monitors identified as having Masimo SET technology are compatible only with Masimo SET sensors and cables.

Use only Masimo oximetry sensors for SpO_2 measurements. Other oxygen transducers (sensors) may cause improper SpO_2 performance.

As with any clip-on sensor, pressure is exerted. The clinician should be cautious in using a clip-on sensor on patients with compromised circulation (e.g., because of peripheral vascular disease or vasoconstricting medications).

CAUTIONS

Do not sterilize reusable sensors by irradiation, steam, or ethylene oxide. See the sensor manufacturer's instructions for cleaning, sterilization, or disinfecting methods.

Do not place SpO_2 sensor on patient during magnetic resonance imaging (MRI). Adverse reactions include potential burns to patients as a result of contact with attachments heated by the MRI radio frequency pulse, potential degradation of the magnetic resonance image, and potential reduced accuracy of SpO_2 measurements. Always remove oximetry devices and attachments from the MRI environment before scanning a patient.

Do not use damaged patient cables. Do not immerse the patient cables in water, solvents, or cleaning solutions (the patient cable connectors are not waterproof).

NOTES

- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease pulse rate.
- SpO_2 and pulse rate values are filtered by an averaging technique, which determines how quickly the reported values respond to changes in the patient's saturation. Increased averaging time effects time to alarm for SpO2 saturation and pulse rate limits.
- The monitor that is labeled with Masimo SET Technology is compatible only with Masimo SET sensors.
- Software development, software validation, and Risk and Hazard Analysis has been performed to a registered quality system.
- User or patient-applied parts are latex-free.
- A functional tester cannot be used to assess the accuracy of a pulse oximeter probe or a pulse oximeter monitor.
- Pulse rate measurement is based on the optical detection of a peripheral flow pulse and therefore may not detect certain arrhythmias. The pulse oximeter should not be used as a replacement or substitute for ECG based arrhythmia analysis.

Configuration settings associated with SpO_2

There are three configuration settings associated with this parameter: averaging time (***n0d***), FastSAT (***Sat***), and sensitivity mode (***Sen***). Refer to "SpO2 configuration settings" on page 2-12 to view or change the settings.

Averaging Time (***n0d***) allows you to choose the number of seconds over which SpO_2 data is averaged. Choose ***4*** to ***16*** in steps of 2 (alarms are delayed by this amount).

NOTE

Increased averaging time effects time to alarm for saturation and pulse rate limits.

FastSAT (***Sat***) allows you to choose ***0*** (for Off) or ***1*** (for On). If FastSAT is configured to ***1*** (On), the SpO_2 values are calculated quicker.

Sensitivity mode (***Sen***) setting allows you to adjust the thresholds for calculating SpO_2 values under low perfusion conditions. Choose ***1*** (low perfusion-Maximized), ***2*** (low perfusion-Default), or ***3*** (adaptive probe off).

NOTE

Adaptive probe off provides a mode with enhanced detection of "probe off" conditions. It is intended to be used if normal mode is not detecting "probe off" with some sensors and conditions.

Buttons associated with SpO_2

There are no buttons associated with this parameter.

Windows associated with SpO_2

There is one window associated with this parameter: ***SpO_2***. While in offline mode, nothing is displayed in the ***SpO_2*** window. When in ready mode and the parameter senses that a sensor is connected, a single dash (**-**) appears in this window. When it is in operate mode and the parameter is reporting valid data, the derived SpO_2 value appears in this window and updates continuously. The values are displayed in %.

NOTE

If SpO_2 is the source for pulse rate, the ***Pulse Rate*** window is associated with this parameter. Refer to Chapter 13, "Pulse Rate" for more information.

Indicators associated with SpO_2

There is one indicator associated with this parameter: the pulse amplitude indicator bar. The red LED bar flashes to indicate that pulse rate measurements are being derived from SpO_2 signals and the height of the bar is proportional to the arterial blood flow.

User settings

Limit settings

There are two limit settings associated with this parameter: ***HIGH*** and ***LOW***. The range for ***HIGH*** is 71 to 100%. The range for ***LOW*** is 70 to 99%. The settings appear in increments of 1%.

Menu settings

The ***PULSE VOLUME*** menu setting is associated with the SpO_2 parameter. This option lets you adjust the volume of the tone that sounds for each pulse detected. It can be adjusted from ***0*** to ***10*** (10 being the loudest). If you set the volume to zero, no tone will sound.

Sounds associated with SpO_2

An audible tone is provided by the monitor for each pulse detected by the Masimo SET SpO_2 parameter. This audible tone is synchronized directly to a clean, non-noisy SpO_2 waveform. The pitch of the audible tone is directly related to the calculated saturation value. As the saturation value increases, the pitch frequency increases. As the saturation value decreases, the pitch frequency decreases. This audible tone is silenced while an alarm sounds or the ***PULSE VOLUME*** is set to ***0***. Refer to "Menu settings" on page 10-6.

Procedures

1. Select a sensor that is appropriate for the patient and the clinical situation.

WARNING
Do not use a damaged sensor or one with exposed electrical contacts. Do not use sensor, cables, or connectors that appear damaged.

NOTE
Use only Masimo sensors, which are available from Masimo Corporation and GE.

2. Following the directions for use supplied with the sensor, apply the sensor to the patient.

WARNINGS
The sensor disconnect error message and associated alarm indicate that the sensor is either disconnected or the wiring is faulty. The user should check the sensor connection and, if necessary, replace the sensor, interconnect cable, or both.

Remove nail polish and artificial nails. Placing a sensor on a polished or an artificial nail may affect accuracy.

Patient safety:
Do not place any clip-on sensor in a patient's mouth, on their nose or toes, on their thumb, or across a child's foot or hand.

Monitor performance:
Place the sensor so that the LEDs and the photodiode are opposite each other.

CAUTIONS
Patient safety:
Observe the sensor site to assure adequate distal circulation. Sensor sites should be checked at least every 2 hours and rotated at least every 4 hours.

If the sensor is not applied properly, the patient's skin could be injured or the ability of the monitor to measure oxygen saturation could be compromised. For example, a clip-on sensor should never be taped shut. Taping the sensor could damage the patient's skin or impair the venous return, thus causing venous pulsation and inaccurate measurement of oxygen saturation.

CAUTIONS

Excessive pressure from the sensor may cause necrosis of the skin.

Monitor performance:

When an SpO_2 sensor is located on the same limb as the NIBP cuff, SpO_2 readings will not be valid while the cuff is inflated. If valid SpO_2 readings are required during the entire blood pressure determination, attach the SpO_2 sensor to the limb opposite the one with the blood pressure cuff.

3. Plug the SpO_2 sensor into the SpO_2 sensor extension cable. Then plug the SpO_2 sensor extension cable into the SpO_2 sensor connector.
4. Proceed with monitoring. SpO_2 measurements run continuously and can run simultaneously with other measurements.

Alarms

If the signal derived by SpO_2 is determined to be valid, SpO_2 values are displayed. After values are displayed, if the signal quality drops to a point where the values are suspect, the values are removed, and an '***E25***' SpO_2 lost pulse alarm is generated.

SpO_2 hold-off period

The hold-off period is defined as the 10 seconds that follows when the SpO_2 parameter switches from ready mode to operate mode. This hold-off period helps prevent any nuisance alarms.

Parameter status alarms are not displayed and the derived SpO_2 value is not checked against user-set limits while the SpO_2 hold-off period is active.

Alarm timer

NOTE

This feature is available with the Legacy alarm mode setting only. Refer to the service manual to configure the Legacy alarm mode setting.

When a SpO_2 sensor is on a patient for less than 2 minutes, this is referred to as "spot mode." The SpO_2 '**---**' sensor off finger and SpO_2 '***E25***' lost pulse alarms are generated as low-priority alarms if they occur within the spot mode time. If a manual NIBP measurement is taken while "spot mode" is active, the time to generate a low priority alarm is increased until the NIBP measurement is completed. If the low priority SpO_2 alarms are not acknowledged within 1 minute, these SpO_2 alarms will escalate to high-priority alarms.

Under all other conditions, these alarms are generated as high-priority alarms.

Specifications

Specifications	
Measurement range	
SpO_2	1 to 100%
Pulse rate	25 to 240 bpm
Perfusion range	0.02 to 20%
Accuracy and motion tolerance	
Saturation	
Without motion - adult/pediatric*	70 to 100% ± 2 digits
Without motion - neonate*	70 to 100% ± 3 digits
With motion - adult/pediatric/neo**†	70 to 100% ± 3 digits
Low perfusion‡	70 to 100% ± 2 digits 0 to 69% unspecified
Pulse rate	
Without motion	25 to 240 bpm ±3 digits
With motion	normal physiologic range 25 to 240 bpm ±5 digits

* The Masimo SET SpO_2 parameter with LNOP-Adt sensors has been validated for no motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies in the range of 70-100% SpO_2 against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

**The Masimo SET SpO_2 parameter with LNOP-Adt sensors has been validated for motion accuracy in human blood studies on healthy adult volunteers in induced hypoxia studies while performing rubbing and tapping motions at 2 to 4 Hz at an amplitude of 1 to 2 cm and a nonrepetitive motion between 1 to 5 Hz at an amplitude of 2 to 3 cm in induced hypoxia studies in the range of 70-100% SpO_2 against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

†The Masimo SET SpO_2 parameter with LNOP-Neo Pt sensors has been validated for neonatal motion accuracy in human blood studies on neonates while moving the neonate's foot at 2 to 4 cm against a laboratory co-oximeter and ECG monitor. This variation equals plus or minus, one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

‡The Masimo SET SpO_2 parameter has been validated for low perfusion accuracy in bench top testing against a Biotek Index 2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and a % transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus, one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.

Specifications: Masimo sensor accuracy	
Sensor model	**SpO_2 range 70% to 100%**
LNOP	
LNOP ADT	± 2 digits without motion
LNOP NEO	± 3 digits without motion
LNOP NEO-L Foot Finger	 ± 3 digits without motion ± 2 digits without motion
LNOP NEO PT-L	± 3 digits without motion
LNOP Adtx	± 2 digits without motion
LNOP Pdtx	± 2 digits without motion
LNOP DCI	± 2 digits without motion
LNOP DCIP	± 2 digits without motion
LNOP Hi Fi-Neo/adult Foot Finger	 ± 3 digits without motion ± 2 digits without motion
LNOP Hi Fi-Infant/Ped	± 2 digits
LNOP Blue Infant Thumb/Toe*	± 3 digits (for 80-100) without motion ± 4 digits (for 60-80) without motion ± 3.3 digits (for 70-100) without motion
LNOP YI Multi-Site Foot/hand Finger/toe	 ± 3 digits without motion ± 2 digits without motion
LNOP DC-195	± 2 digits without motion
LNOP TC-I	± 3.5 digits without motion
LNCS	
LNCS TCI	± 3.5 digits without motion
LNCS DC-I	± 2 digits without motion
LNCS DC-IP	± 2 digits without motion
LNCS Adult Adtx	± 2 digits without motion
LNCS Ped Pdtx	± 2 digits without motion
LNCS Infant-L	± 2 digits without motion
LNCS Neo PT-L	± 3 digits without motion
Resolution	
Saturation (% SpO_2)	1%

Specifications: Masimo sensor accuracy	
Pulse rate (bpm)	1
Low perfusion performance	
0.02% Pulse amplitude and % transmission >5%	Saturation (% SpO_2) ±2 digits Pulse rate ±3 digits
Interfering substances	Carboxyhemoglobin may erroneously increase readings. The level of increase is approximately equal to the amount of carboxyhemoglobin present. Dyes, or any substance containing dyes, that change usual arterial pigmentation may cause erroneous readings.
Sensor light source	
Wavelength*	Infrared: 905 nm (nominal) Red: 660 nm (nominal)
Power dissipation	Infrared: 22.5 mW (max) Red: 27.5 mW (max)
*Masimo SET Technology with LNOP Blue sensors have been validated for no motion accuracy in human blood studies on neonatal, infant, and pediatric patients with congenital, cyanotic cardiac lesions in the range of 60% to 100% SpO_2 against a laboratory co-oximeter. This variation equals plus or minus one standard deviation, which encompasses 68% of the population. ** Information about wavelength range can be especially useful to clinicians.	

Factory default settings

SpO_2 (%) HIGH alarm limit	***100***
SpO_2 (%) LOW alarm limit	***90***
Averaging time	***12*** seconds
FastSAT mode	***0*** (for Off)
Sensitivity mode	***2*** (for Low Perfusion)

Masimo patents

5,823,950; 5,758,644; 6,011,986; 6,501,975; 6,157,850; 6,263,222 and other applicable patents listed at: www.masimo.com/patents.htm.

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local representative.

The service manual, which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The pulse amplitude bar indicates a pulse, but no oxygen saturation or pulse rate values appear on the screen.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- The sensor may be damaged.
- The patient's perfusion may be too low to allow the SpO_2 function to measure saturation and pulse rate.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the SpO_2 sensor is applied securely and properly, and replace it if necessary; move the sensor to a new site; or use a disposable adhesive sensor that may tolerate more motion.
- Replace the sensor.

PROBLEM: The SpO_2 value or the pulse rate changes rapidly; the pulse amplitude bar is erratic.

CAUSE:

- Excessive patient motion may be making it impossible for the SpO_2 function to find a pulse pattern.
- An electrosurgical unit (ESU) may be interfering with performance.

SOLUTION:

Check the patient.

- If possible, keep the patient still; check whether the sensor is applied securely and properly, and replace it if necessary; move the sensor to a new site; use a sensor that tolerates more motion.

If an electrosurgical unit (ESU) is interfering:

- Move the SpO_2 cable as far from the ESU as possible.
- Plug the monitor and the ESU into different AC circuits.
- Move the ESU ground pad as close to the surgical site as possible.
- The sensor may be damp or may need to be replaced with a new sensor.

PROBLEM: The oxygen saturation measurement does not correlate with the value calculated from a blood gas determination.

CAUSE:

- The SpO_2 calculation may not have correctly adjusted for the effects of pH; temperature; CO_2; fetal hemoglobin; or 2,3-DPG.
- Accuracy can be affected by incorrect sensor application or use; intravascular dyes; bright light; excessive patient movement; venous pulsations; electrosurgical interference; and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intravascular line.

SOLUTION:

- Check that calculations have been corrected appropriately for the relevant variable. In general, calculated saturation values are not as reliable as direct laboratory hemoximeter measurements.
- If there is excessive light, cover the sensor with opaque material.
- Circulation distal to the sensor site should be checked routinely. The site must be inspected every 8 hours to ensure adhesion, skin integrity, and correct optical alignment. If skin integrity changes, move the sensor to another site.
- Try to keep the patient still, or change the sensor site to one with less motion.
- Observe all instructions, warnings, and cautions in this manual and in the directions for use of the sensor.

PROBLEM: A valid SpO_2 signal was present but has disappeared.

CAUSE:

- An NIBP determination on the same limb is in progress.

SOLUTION:

Check the patient.

- An alarm message code appears on the screen, and the audible alarm will sound immediately.
- Move the sensor to the arm that is not connected to a blood pressure cuff.

For your notes

11 Alaris Temperature – Turbo Temp and Tri-Site

Description

The monitor can use Alaris temperature technology with both oral and rectal temperature probes if your monitor has the Alaris Temperature parameter.

An electronic thermometer with a temperature-sensing device known as a thermistor is used. The thermistor is part of the electrical circuit and is located at the tip of the probe.

The electrical resistance of the thermistor varies with temperature. In continuous (monitor) mode, the V100 measures this resistance, from which it calculates and displays the temperature. In fast (predictive) mode, the monitor measures the rate of change in temperature when the thermistor comes into contact with surrounding tissue. A final temperature value is calculated based on this rate of change, without the need to wait for the probe tip to warm up to the patient's tissues.

Alaris Turbo Temp or Tri-Site temperature options

NOTE

Only one temperature option can be enabled on the monitor at a time.

The Alaris temperature technology supports two temperature options: Turbo Temp or Tri-Site. The Turbo Temp and Tri-Site temperature options allow you to take oral, rectal, or axillary temperature readings.

The Turbo Temp or Tri-Site temperature options support two different temperature measurement modes of operation: fast (predictive) or continuous (monitor).

- The Turbo Temp temperature option can take a fast (predictive) oral or rectal temperature measurement, but not a fast (predictive) axillary temperature measurement.
- The Tri-Site temperature option can take a fast (predictive) oral, rectal, or axillary measurement.
- Both the Turbo Temp and Tri-Site temperature options can take a continuous (monitor) oral, rectal, or axillary measurement.

Temperature measurement modes

The Alaris temperature technology supports two different modes for measuring temperature:

- Fast (or predictive) measurement mode
- Continuous (or monitor) measurement mode

WARNINGS

Keep accessories out of patient's reach when not in use.

Do not leave the patient unsupervised during use of the probe and probe covers.

Blue-colored temperature probes can be used to take either oral or axillary temperatures. Verify that the correct temperature measurement mode has been activated before positioning probe.

Always dispose of probe covers properly to prevent potential injury due to choking or slip-and-fall hazards.

Be careful not to overextend the coiled cord of the temperature probe. Overextension can damage the probe coil connector interfaces.

Keep the temperature probe secured when not in use.

CAUTION

Do not allow the tip of the fast (predictive) temperature probe to come into contact with a heat source (e.g., hands or fingers) prior to taking a temperature measurement. If this occurs, allow 5 seconds for the probe tip to cool before proceeding.

Fast (predictive) temperature measurement mode

In the fast (predictive) temperature measurement mode, the temperature result is a calculated estimate of the patient's actual temperature. More specifically, the patient's temperature is estimated mathematically on the basis of the rate of temperature rise of the probe upon coming into contact with the patient's tissues. A final temperature is displayed and an audible triple tone sounds.

NOTES

- Upon initiation of a measurement, the previous temperature measurement, if present, is cleared.
- A fast (predictive) temperature measurement value is automatically cleared after 2 or 5 minutes, depending on the setting. The temperature display time is adjusted in the menu.

Guidelines for starting or ending a fast (predictive) temperature measurement

A fast (predictive) temperature measurement starts when the probe is removed from the probe holster.

The fast (predictive) temperature measurement ends when one of the following occurs:

- A final value is determined.
- The probe is inserted into the probe holster.
- The temperature measurement mode is automatically switched to continuous (monitor) mode because a fast (predictive) temperature result could not be determined.
- A temperature alarm is issued.

Continuous (monitor) temperature measurement mode

In the continuous (monitor) mode, the actual temperature measured by the probe tip is displayed continuously. With adequate tissue contact and after the temperature at the probe tip and the surrounding tissues has stabilized (approximately 3 to 5 minutes), the displayed temperature accurately represents the patient's temperature.

The displayed continuous (monitor) temperature value flashes and the displayed value updates continually as the patient's temperature rises or falls. When the temperature parameter enters continuous (monitor) mode, two tones sound.

NOTES

- The continuous (monitor) mode provides a more accurate reading based upon continuous measurement updates over time.
- The continuous (monitor) temperature measurement values are not stored in history, printed, or reported via the host port connector.
- The tip of the temperature probe continuously measures the temperature. Be careful to record the patient's temperature when the probe is properly positioned, and the temperature has stabilized.

Guidelines for starting or ending a continuous (monitor) temperature measurement

When using the Turbo Temp temperature option, continuous (monitor) temperature measurement starts when one of the following occurs:

- Immediately upon removing the probe from the holster and the temperature at the probe tip is less than 15.6°C. (60°F).
- The termination of a fast (predictive) temperature measurement that is unable to complete successfully within 30 seconds after tissue contact is established.
- The termination of a fast (predictive) temperature measurement that is unable to complete successfully within 40 seconds after the probe is removed from the holster because tissue contact was never established.
- The probe is removed from the holster twice within less than 0.4 seconds.
- The probe is removed from the holster and the **+** key on the monitor is pressed to activate the continuous (monitor) temperature measurement mode.

When using the Tri-Site temperature option, a continuous (monitor) temperature measurement starts when one of the following occurs:

- Immediately upon removing the probe from the holster and the temperature at the probe tip is less than 16°C (60.8°F).
- The termination of a fast (predictive) temperature measurement that is unable to complete successfully within 60 seconds after probe is removed from the holster and no tissue contact is established.
- The probe is removed from the holster and the **+** key on the monitor is pressed to activate the continuous (monitor) temperature measurement mode.

A continuous (monitor) temperature measurement ends when the probe is inserted into the probe holster, or a temperature status alarm is issued.

Calibration and self-checks of Alaris Turbo Temp or Tri-Site temperature

When the monitor is powered on, the monitor automatically calibrates the temperature circuit to account for ambient room temperature.

NOTE

If large changes occur in the ambient temperature, the temperature system can be recalibrated by cycling the monitor's power using the **On/Off** button.

Configuration settings associated with Alaris Turbo Temp and Tri-Site temperature

NOTE

There are no alarm limit settings associated with this parameter.

There are two configuration settings associated with this parameter. Refer to "Temperature hardware configuration settings" on page 2-13 to view or change the settings.

- Unit of Measure (***Unt***). This setting allows you to choose °Fahrenheit (***F***) or °Celsius (***C***). The default, which is Fahrenheit, must be changed in the configuration mode.
- Temperature Display Time (***tdt***). This setting allows you to choose ***2*** or ***5*** minutes, the length of time the fast (predictive) temperature value is displayed in the **Temperature** window.

Also, the temperature option selected in the monitor is displayed in the **Temperature** window briefly when the user enters configuration mode:

- ***trb0*** is displayed if the monitor is configured for Alaris Turbo Temp.
- ***trI*** is displayed if the monitor is configured for Alaris Tri-Site.
- ***tat*** is displayed if the monitor is configured for Exergen.

Buttons associated with temperature

Pressing the **+** button after removing the temperature probe from the holster activates the continuous (monitor) temperature measurement mode.

Windows associated with temperature

The **Temperature** window displays the value in °C or °F.

When the unit of measure is configured for ***°C*** and a probe is connected, the ***°C*** indicator is backlit red and the ***°F*** indicator is turned off. When the unit of measure is configured for ***°F*** and a probe is connected, the ***°F*** indicator is backlit red and the ***°C*** indicator is turned off. Unless specified otherwise, both indicators are turned off when a probe is not connected.

Indicators associated with temperature

The indicators associated with temperature are °C or °F.

Measurement in progress indicators

Fast (predictive) temperature measurement mode

A single dash appears in the left side of the **Temperature** window indicating a fast oral measurement is in progress.

Two dashes appear in the left side of the **Temperature** window indicating a fast rectal measurement in progress.

(Tri-Site only) Three dashes appear in the left side of the **Temperature** window indicating a fast axillary measurement in progress.

A “chase sequence” of dashes around the outside of the right-most digit of the **Temperature** window appears indicating that the probe is in contact with tissue.

Continuous (monitor) temperature measurement mode

The temperature value flashes indicating a continuous (monitor) temperature measurement mode active measurement.

Four dashes may flash in the **Temperature** window indicating that the measured continuous temperature is < 26.7°C (80.0°F).

Measurement not in progress indicators

Two dashes appear in the center of the **Temperature** window indicating no values are present, and the probe is connected.

Blank: The **Temperature** window appears blank indicating that no probe is connected.

User settings

There are no user settings or alarm limits associated with this parameter.

Menu settings

There are no menu settings associated with this parameter.

Sounds associated with Alaris temperature probes

There are three sounds associated with the Alaris temperature parameter.

- Single tone: sounds whenever a temperature probe is removed from or inserted into the probe holster.
- Double tone: sounds whenever continuous (monitor) temperature measurement mode is activated.
- Triple tone: sounds at the completion of a fast (predictive) temperature measurement that results in a final value.

Protective thermometer probe covers

Alaris thermometer probe covers

WARNING
Use only recommended temperature probes and probe covers. The size, shape, and thermal characteristics of the probe covers can affect the performance of the instrument. Inaccurate readings may occur unless recommended probes and probe covers are used. Visually inspect the probe prior to use to be sure it is defect free.

Refer to Appendix B, "Accessories" for temperature probe and probe cover reorder codes.

Proper storage of thermometer probe covers

To reduce the risk of contamination, keep the thermometer probe covers in their original 20-count box and store the box in the storage well provided on the monitor.

Guidelines for Alaris temperature measurements

The following table summarizes your actions for measuring temperature with the Alaris Turbo Temp or Tri-Site options using the fast (predictive) or continuous (monitor) temperature measurement modes.

Temperature option	Fast (predictive) measurement mode			Continuous (monitor) measurement mode		
	Oral	Rectal	Axillary	Oral	Rectal	Axillary
Turbo Temp	Single dip[1]		N/A	Double dip[2] or Single dip[1]. Then, press the **+** key on the monitor to begin a continuous (monitor) measurement.		
Tri-Site	Single dip[1]		Double dip[2]	Single dip[1]. Then, press the **+** key on the monitor to begin a continuous (monitor) measurement.		

[1] Single dip: Remove probe from the holster once.

[2] Double dip: Remove, reinsert, and remove probe from the holster within 0.4 seconds.

The temperature probes are color-coded to indicate which probes are used for rectal and non-rectal measurement sites.

Color-coded temperature probes	
Probe color	**Measurement site**
Blue	Oral or axillary
Red	Rectal

NOTES

- If an alarm is actively sounding, temperature-related audible tones will not sound.
- Once the probe is removed from the probe holster and tissue contact is not established—within 40 seconds for Turbo Temp option or 60 seconds for Tri-Site option—continuous (monitor) temperature measurement mode will be entered.
- When the thermometer probe is removed from the holster and the probe tip is either too warm or too cold, the thermometer will not be able to perform a fast (predictive) measurement and will automatically go into the continuous (monitor) temperature measurement mode.

  The following probe tip temperatures will cause the thermometer to automatically go into the continuous (monitor) mode:

  - 92.0°F (33.3°C) or higher (Turbo Temp or Tri-Site)
  - 60°F (15.6°C) or lower (Turbo Temp)

- 60.8°F (16°C) or lower (Tri-Site)

Once in the continuous monitor mode, the following occurs:

- The temperature reading will flash.
- A correct final temperature reading may require 3 minutes or longer.
- The monitor will not beep at final temperature.
- The monitor will continue to measure the patient's temperature until tissue contact is lost and the probe is returned to the probe holster.

Procedures for oral fast (predictive) temperature measurements

Checking the monitor's Alaris temperature technology configuration setting

You should always check the Alaris temperature technology configuration setting before using the monitor. Monitors located in the same clinical area but containing a different temperature technology configuration setting could result in operational differences and a delay in performing vital sign measurements.

To check the monitor's Alaris temperature technology configuration setting, you must enter the configuration mode:

1. With the monitor turned off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Watch the **Temperature** window while the monitor starts up for one of the following settings to display:
   - ***trb0*** if the monitor is configured for Alaris Turbo Temp.
   - ***trl*** if the monitor is configured for Alaris Tri-Site.
   - ***tat*** if the monitor is configured for Exergen.

   NOTE
   A monitor with the Exergen temperature technology configuration setting cannot perform Alaris temperature measurements.
3. To return the monitor to the clinical mode and begin monitoring patients, turn off the monitor, then back on again.

Taking oral fast (predictive) temperature measurements

WARNINGS
Accurate oral temperatures can only be obtained by placing the blue-colored probe under the tongue in the right or left sublingual pocket. Temperatures in other locations in the mouth can vary by more than 1°C or 2°F.

If a patient's temperature is below 35.6°C (96.0°F) with the Turbo Temp option or below 35.0°C (95.0°F) with the Tri-Site option, the unit will automatically switch from the normal mode into the continuous (monitor) mode within 40 seconds. Allow the temperature values to stabilize before recording the temperature. It will continue to monitor the patient's temperature until the probe is removed from the patient and returned to the storage well.

NOTES

- Use the blue-colored probes for oral or axillary temperature measurements.
- Temperature probe placement for fast (predictive) mode and continuous (monitor) mode determinations are the same and equally important for accurate temperature readings.
- Loss of tissue contact terminates fast (predictive) mode and starts monitor mode.

If there is a long delay from the time the probe is removed from the probe holster until it is inserted into the patient's mouth, it is possible that the probe will not display a final temperature. If this occurs, insert the probe into the probe holster, remove it again, and start a new measurement.

1. Connect the temperature probe cable to the temperature probe connector.
2. Remove the temperature probe from the probe holster. An audible single tone sounds.

WARNINGS

Do not reuse, or sterilize and reuse, protective covers. Apply a new cover before each use.

Inspect the probe covers for contaminants or damage prior to use.

3. Always place a fresh protective temperature probe cover on the probe before every use:
   - Hold the probe body between your thumb and forefinger, by the blue-colored base and remove the probe from the probe holster.
   - Insert the probe shaft into a probe cover and firmly press down until the cover is seated tightly against the probe body.
4. Verify that the probe cover fits snugly.

NOTE

Failure to firmly install the probe cover may result in the probe cover becoming loose or disengaged during use. Unintended probe cover ejection can lead to patient injury.

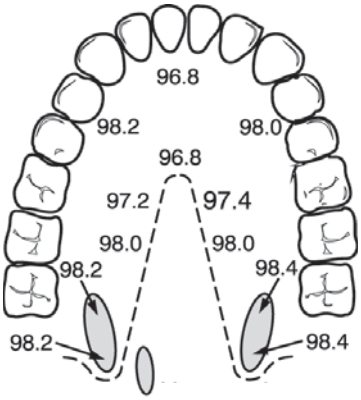
CAUTION

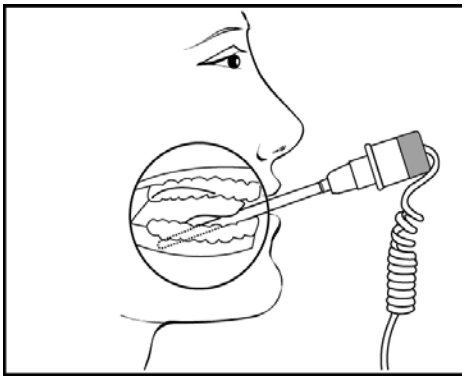
Injury may occur as a result of patient movement during procedure.

5. Have the patient open his/her mouth and carefully insert the probe tip deep into the right or left posterior sublingual pocket (heat pocket) at the base of the tongue.

   NOTE

   Be careful not to press the probe ejection button where the cord exits the probe as this might loosen or eject the probe cover. Unintended probe cover ejection can lead to patient injury.





6. Hold the probe steady during the entire temperature measurement process, and keep the probe tip in contact with the tissue at all times. Do not allow the patient to reposition the probe.

   The determination begins automatically and takes approximately 7 seconds for TurboTemp, or 12 seconds for Tri-Site, during which time a “chase sequence” appears in the right side of the **Temperature** window to indicate progress as well as tissue contact.

   When the determination is complete, an audible triple tone sounds and the temperature appears on the display.

7. Remove the probe from the patient.

   CAUTION

   To prevent cross-contamination, properly dispose of the probe cover when done with its use.

8. Discard the disposable probe cover by holding the probe as you would a syringe and pressing the button on the probe handle.

9. Place the probe in the probe holster.

   An audible single tone sounds. Once you place the probe in the probe holster, the temperature values will be cleared in 2 or 5 minutes, depending on the setting.

Procedures for rectal fast (predictive) temperature measurements

Checking the monitor's Alaris temperature technology configuration setting

You should always check the Alaris temperature technology configuration setting before using the monitor. Monitors located in the same clinical area but containing a different temperature technology configuration setting could result in operational differences and a delay in performing vital sign measurements.

To check the monitor's Alaris temperature technology configuration setting, you must enter the configuration mode:

1. With the monitor turned off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Watch the **Temperature** window while the monitor starts up for one of the following settings to display:
   - ***trb0*** if the monitor is configured for Alaris Turbo Temp.
   - ***trl*** if the monitor is configured for Alaris Tri-Site.
   - ***tat*** if the monitor is configured for Exergen.

   NOTE
   A monitor with the Exergen temperature technology configuration setting cannot perform Alaris temperature measurements.
3. To return the monitor to the clinical mode and begin monitoring patients, turn off the monitor, then back on again.

Taking rectal fast (predictive) temperature measurements

WARNINGS
Accurate rectal temperatures can only be obtained by using the red temperature probe. Red and blue temperature probes are *not* interchangeable.

If a patient's temperature is below 35.6°C (96.0°F) with the Turbo Temp option or below 95.0°F (35.0°C) with the Tri-Site option, the unit will automatically switch from the normal mode into the continuous (monitor) mode within 40 seconds. Allow the temperature values to stabilize before recording the temperature. It will continue to monitor the patient's temperature until the probe is removed from the patient and returned to the storage well.

NOTES

- Use the red-colored probes for rectal temperature measurements.
- Temperature probe placement for fast (predictive) mode and continuous (monitor) mode determinations are the same and equally important for accurate temperature readings.
- Loss of tissue contact terminates fast (predictive) mode and starts monitor mode.

1. Connect the temperature probe cable to the temperature probe connector.
2. Remove the temperature probe from the probe holster.

   An audible single tone sounds.

WARNINGS

Do not reuse, or sterilize and reuse, protective covers. Apply a new cover before each use.

Inspect the probe covers for contaminants or damage prior to use.

3. Always place a fresh protective temperature probe cover on the probe before every use:
   - Hold the probe body between your thumb and forefinger, by the red colored base and remove the probe from the probe holster.
   - Insert the probe shaft into a probe cover and firmly press down until the cover is seated tightly against the probe body.
4. Verify that the probe cover fits snugly.

   NOTE

   Failure to firmly install the probe cover may result in the probe cover becoming loose or disengaged during use. Unintended probe cover ejection can lead to patient injury.

CAUTION

Injury may occur as a result of patient movement during procedure.

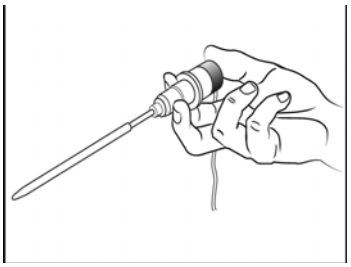
5. Insert the probe tip according to hospital protocol – but no further than one-half inch (1.3 cm) for adults, less for pediatric patients. If the tip is inserted too far, damage may occur and the probe tip may not have good contact with tissue. (The use of a lubricant is optional.)

   NOTE

   Be careful not to press the probe ejection button where the cord exits the probe as this might loosen or eject the probe cover. Unintended probe cover ejection can lead to patient injury.

6. The determination begins automatically. To ensure continuous tissue contact and maximize patient comfort, hold the probe in position until the determination is complete. This takes approximately 7 seconds for TurboTemp, or 11 seconds for Tri-Site, during which time a “chase sequence” appears in the right-side of the **Temperature** window to indicate progress as well as tissue contact.
7. When the determination is complete, an audible triple tone sounds and the temperature appears on the display.
8. Remove the probe.
9. Discard the disposable cover by holding the probe as you would a syringe and pressing the button on the probe handle.
10. Place the probe in the probe holster.

    An audible single tone sounds. Once you place the probe in the probe holster, the temperature values will be cleared in 2 or 5 minutes, depending on the setting.



Procedures for axillary temperature measurements

Checking the monitor's Alaris temperature technology configuration setting

You should always check the Alaris temperature technology configuration setting before using the monitor. Monitors located in the same clinical area but containing a different temperature technology configuration setting could result in operational differences and a delay in performing vital sign measurements.

To check the monitor's Alaris temperature technology configuration setting, you must enter the configuration mode:

1. With the monitor turned off, press and hold the **Menu** button at the same time as pressing the **On/Off** button until the display test completes.
2. Watch the **Temperature** window while the monitor starts up for one of the following settings to display:
   - ***trb0*** if the monitor is configured for Alaris Turbo Temp.
   - ***trl*** if the monitor is configured for Alaris Tri-Site.
   - ***tat*** if the monitor is configured for Exergen.

   NOTES
   - A monitor with the Alaris Turbo Temp temperature option cannot take a fast (predictive) axillary temperature measurement.
   - A monitor with the Exergen temperature technology configuration setting cannot perform Alaris temperature measurements.
3. To return the monitor to the clinical mode and begin monitoring patients, turn off the monitor, then back on again.

Taking axillary temperature measurements

NOTES

- Use the blue-colored probes for oral or axillary temperature measurements.
- Temperature probe placement for fast (predictive) mode and continuous (monitor) mode temperature measurements are the same and equally important for accurate temperature readings.
- Loss of tissue contact terminates fast (predictive) temperature measurement mode and starts the continuous (monitor) temperature measurement mode.

Using the following steps for axillary measurement, the Turbo Temp probe will be in the continuous (monitor) temperature measurement mode. The Tri-Site probe will be in the fast (predictive) temperature measurement mode. In this instance, both modes are activated the same way.

1. Connect the temperature probe cable to the temperature probe connector.
2. Insert the probe into the probe holster. Then remove, reinsert, and remove the probe from the probe holster within 0.4 seconds. An audible tone sounds when you remove the probe from the probe holster. When the Turbo Temp probe's continuous (monitor) temperature measurement mode is activated, an audible double tone sounds and flashing numbers appear in the **Temperature** window.

WARNINGS

Do not reuse, or sterilize and reuse, protective covers. Apply a new cover before each use.

Inspect the probe covers for contaminants or damage prior to use.

3. Always place a fresh protective temperature probe cover on the probe before every use:
   - Hold the probe body between your thumb and forefinger, by the blue-colored base and remove the probe from the probe holster.
   - Insert the probe shaft into a probe cover and firmly press down until the cover is seated tightly against the probe body.
4. Verify that the probe cover fits snugly.

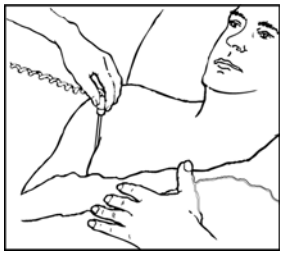
NOTE

Failure to firmly install the probe cover may result in the probe cover becoming loose or disengaged during use. Unintended probe cover ejection can lead to patient injury.

CAUTION

Injury may occur as a result of patient movement during procedure.

5. Insert the probe in the patient's axilla, making sure the tip of the probe is in contact with the skin and positioned as close as possible to the axillary artery with the patient's arm held close to his/her side.



NOTE

Be careful not to press the probe ejection button where the cord exits the probe as this might loosen or eject the probe cover. Unintended probe cover ejection can lead to patient injury.

6. Complete one of the following, depending on the temperature technology used on the monitor:

   - Turbo Temp option — The temperature reading will flash. Leave the probe in place for the same length of time as required by standard hospital procedure for taking an axillary temperature, or until the temperature stabilizes. This may take as long as 3 minutes. The monitor does not beep to indicate a final reading. It will continue to monitor the patient's temperature until the probe is removed from the patient.

     NOTE

     The temperature reading will change as soon as the probe is removed from the patient, record the patient's temperature before removing the probe.

   - Tri-Site option — Leave the probe in place for approximately 13 seconds, until the fast (predictive) determination is complete. An audible triple tone sounds and the temperature appears on the display.

7. Remove the probe.
8. Discard the disposable cover by holding the probe as you would a syringe and pressing the button on the probe handle.
9. Place the probe in the probe holster.

   An audible single tone sounds. If using the Tri-Site option, the displayed temperature values will clear in 2 or 5 minutes, depending on the configuration setting.

Troubleshooting

PROBLEM: Temperature readings are lower than expected.

CAUSE:

- The measurement may be influenced by external influences.
- The probe may not be in consistent tissue contact.
- The probe may be incorrectly positioned.
- Incorrect probe covers are used.

SOLUTION:

- Eliminate external influences caused by ambient air temperature or the intake of any liquids by mouth before taking a measurement.
- To take an accurate oral temperature reading, place the thermometer tip in either the right or left posterior pocket (heat pocket) at the base of the tongue. Have the patient close his or her lips over the probe. Continue to hold the probe in place, as motionless as possible until the final reading is obtained.
- Verify the temperature probe is correctly positioned for the site being measured:
  - Axillary measurement: Insert the probe in the patient's axilla, making sure the tip of the probe is in contact with the skin and positioned as close as possible to the axillary artery with the patient's arm held close to his/her side.
  - Oral measurement: Insert the probe tip deep into the right or left posterior sublingual pocket (heat pocket) at the base of the tongue.
  - Rectal measurement: Insert the probe, using current hospital technique for penetration.
- Use only Turbo Temp thermometer oral or rectal probe covers on the Alaris Turbo Temp and Tri-Site temperature probes. Refer to Appendix B, "Accessories" for reorder codes.

PROBLEM: Repeated error messages appear when taking a rectal temperature.

CAUSE:

- The lubricant applied to the probe is too thick, reducing the heat transfer from the patient to the probe.
- The lubricant is too cool.
- The probe may not be in consistent tissue contact.

SOLUTION:

- Do not over-apply lubricant to the probe.
- Allow the lubricant to warm to room temperature before application to the probe.
- To take an accurate rectal temperature reading, insert the probe tip according to hospital protocol – but no further than one-half inch (1.3 cm) for adults, less for pediatric patients. If the tip is inserted too far, damage may occur and the probe tip may not have good contact with tissue.

PROBLEM: Temperature readings do not register on hypothermic patients.

CAUSE/SOLUTION: If a patient's temperature is below 35.6°C (96.0°F) with the Turbo Temp option or below 35.0°C (95.0°F) with the Tri-Site option, the unit will automatically switch from the normal mode into the continuous (monitor) mode within 40 seconds. Allow the temperature values to stabilize before recording the temperature. It will continue to monitor the patient's temperature until the probe is removed from the patient (the temperature reading will change as soon as the probe is removed from the patient; you'll want to record the temperature displayed at the prescribed time before removing the probe from the patient).

The monitor does not beep to indicate a final reading. Leave the probe in place for the same length of time as required by standard hospital procedure for taking a continuous (monitor) temperature measurement.

Specifications

Specifications	
Units of measure	°Fahrenheit (F) or °Celsius (C)
Range	
Turbo Temp	
Predictive mode	Max: 41.1°C; 106.0°F Min: 35.6°C; 96.0°F
Monitor mode	Max: 42.1°C; 107.9°F Min: 26.7°C; 80.0°F
Tri-Site	
Predictive mode	Max: 41.1°C; 106.0°F Min: 35.0°C; 95.0°F
Monitor mode	Max: 42.1°C; 107.9°F Min: 26.7°C; 80.0°F
Turbo Temp and Tri-Site Continuous (monitor) mode accuracy	±0.1°C; ±0.2°F (when tested in a calibrated liquid bath; meets ASTM E1112, Table 1, in range specified) **NOTE** If large changes occur in the ambient temperature, the temperature system can be recalibrated by cycling the monitor's power using the **On/Off** button.

Specifications	
Determination time	
Turbo Temp Oral or rectal	 As fast as 7 seconds
Tri-Site Oral Rectal Axillary	 As fast as 12 seconds As fast as 11 seconds As fast as 13 seconds

NOTE

Use only Turbo Temp thermometer oral or rectal probe covers on the Alaris Turbo Temp and Tri-Site temperature probes. The size, shape, and thermal characteristics of the probe covers can affect the performance of the probe. Inaccurate readings or retention problems may occur unless Alaris probes and Turbo Temp thermometer oral or rectal probe covers are used. Refer to Appendix B, "Accessories" for reorder codes.

Factory default settings

- Unit of measure: ***°F***
- Temperature display time: ***2*** minutes

For your notes

12 Exergen Temperature

Description

The monitor can use Exergen temporal scanner (scanner) technology if your monitor has the Exergen parameter. Temporal scanner technology provides a method of temperature assessment based on infrared measurement of the thermal radiation of the skin. The temporal artery is used as a sampling site because of its relatively constant perfusion rate.

Temperature values are shown in degrees Celsius or Fahrenheit in two places: the scanner's LED display screen and the monitor's **Temperature** window.

On the monitor, the unit of measure is indicated by the ***°C***/***°F*** display.

On the scanner, the unit of measure (Celsius or Fahrenheit) is not indicated on the LED display screen. The scanner comes preset with the requested unit of temperature measurement, but can be changed. Refer to "Changing the Exergen temperature unit of measurement" on page 2-13.

The scanner takes a single instance of a temperature measurement. Exergen technology does not support monitor mode (i.e., continuous monitoring), or predictive mode (i.e., mathematically estimated) measurements.

Item	Name
1	Probe cone
2	On button
3	LED display screen

Temperature measurement mode

In measurement mode, a final temperature is displayed and an audible triple tone sounds. Upon initiation of a measurement, the previous temperature measurement, if present, is cleared. A measurement is initiated when the user presses the **On** button on the scanner. A measurement is terminated when one of the following occurs:

- The user releases the **On** button and final value is determined.
- A temperature alarm is issued.

WARNINGS

Keep accessories out of patient's reach when not in use,

Do not allow the scanner to come into contact with open wounds or mucous membranes.

Keep the temperature scanner secured when it is not in use.

NOTE

Only one integrated Exergen TAT-5000 scanner intended for use with the monitor should be connected at one time.

NOTE

The operational temperature range differs between the monitor and scanner. The monitor’s display range is more limited than that of the scanner. Please review monitor and scanner specifications. The scanner will issue an error code to indicate that a temperature determination is not possible, and the monitor will also indicate an error in the temperature window. In addition, at temperatures between 16.1°C and 26.7°C (61°F and 80°F), the scanner will display a value, the monitor will indicate the value is out of range, with a ‘**----**’ in the temperature window.

Configuration settings associated with Exergen temperature

There is one configuration setting associated with this parameter. Refer to "Temperature hardware configuration settings" on page 2-13 to view or change the settings.

- Temperature Display Time (***tdt***). This setting allows you to choose ***2*** or ***5*** minutes, the time at which a temperature value is cleared from the **Temperature** window.

Also, the temperature device selected in the monitor is displayed in the **Temperature** window at the beginning of configuration mode, as follows:

- ***tat*** if the monitor is configured for Exergen. The setting is configured at the factory, but can be changed by service.

Buttons associated with temperature

There are no buttons on the monitor associated with this parameter.

The red **On** button is located on the scanner.

Windows associated with temperature

The ***Temperature*** window on the monitor displays the value in °C or °F.

The LED display screen on the scanner displays the temperature, but does not display the unit of measurement.

Indicators associated with temperature

The units of measure on the monitor display when there is a number displayed, or when an out of range indicator is displayed. The units indicator does not stay lit if the display is cleared in between readings, even if the scanner is still connected.

Measurement in progress indicators

The ***Temperature*** window on the monitor remains blank while a measurement is in progress.

Measurement not in progress indicators

The ***Temperature*** window on the monitor displays four dashes indicating that the final measurement is < 26.7°C (80.0°F).

Additional indicators

If the scanner is unable to take a temperature determination, or has a low battery, the monitor will display the '***E--***' error code and generate an audible alarm. The scanner may also display additional indicators on the LED display.

LED display	Condition	Description
HI	High target	> 43 °C (110 °F)
LO	Low target	< 16 °C (61 °F)
HI A	High ambient	> 40 °C (104 °F)
LO A	Low ambient	< 16 °C (60 °F)
bAtt	Low battery	Replace battery soon.
(blank display)	Dead battery	Replace battery.
Err	Processing error	Restart scanner. Return to Exergen for repair if unit is defective or contact GE Technical Support.

User settings

There are no user settings associated with this parameter.

Menu settings

There are no menu settings associated with this parameter.

Sounds associated with Exergen temporal scanner

There are two sounds associated with the Exergen temporal scanner parameter.

- Single tone: sounds upon detection of a temperature status alarm regardless of the state of alarm silence.
- Triple tone: sounds at the completion of a temperature measurement that results in a final value.

Procedures for temperature determination

Familiarize yourself with the scanner

- To Scan: Press the red **On** button. The scanner will continually scan for the highest temperature (peak) as long as the button is pressed.

  NOTE

  Be aware that if you accidentally press and release the red **On** button without applying the scanner to a patient's forehead, the scanner will include this erroneous ambient room temperature value in ***History***.

- Audible clicking tone: Each fast click tone indicates a rise to a higher temperature. A slow clicking tone indicates that the scanner is still scanning, but not finding any higher temperature.
- To view the displayed temperature value: After taking a temperature measurement, the temperature value will remain on the display for 30 seconds after button is released. If measuring room temperature, the temperature value will remain on the display for only 5 seconds.
- To Restart: Press the red **On** button to restart. It is not necessary to wait until the display is clear. The thermometer will immediately begin a new scan each time the button is pressed.

Basics of using the temporal scanner

CAUTION

To prevent cross-contamination between patients, wipe the temporal scanner's probe cone and metal neck with alcohol or apply a fresh protective probe cover or protective sheath between patient use.

NOTE

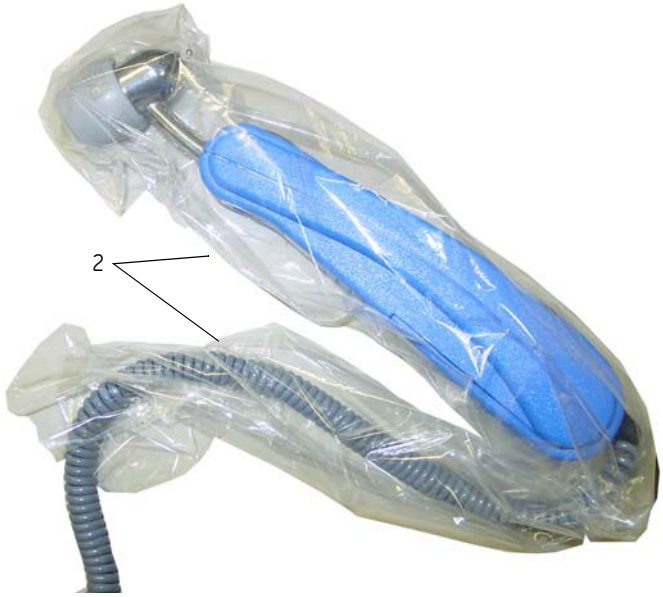
To prevent the spread of infection between patients, you should wipe the temporal scanner's probe cone and metal neck with alcohol or apply a fresh protective probe cover or protective sheath between patient use.

1. Confirm the temporal scanner is connected to the monitor. Refer to "Exergen" on page 2-4 for more information.

   NOTE

   Be careful not to overextend the coiled cord of the scanner. Overextension can damage the scanner coil connector interfaces.

2. If required by your patient care guidelines, place a protective probe cover over the probe head or a protective sheath over the entire scanner. Be sure to inspect the protective cover or sheath before every use to make sure the cover or sheath is defect free, contamination free, and installed properly with a snug fit. When using a protective probe cover or sheath, always use a new protective cover or sheath when taking a measurement on a different patient.



Item	Name
1	Protective probe cover
2	Protective sheath

CAUTION
Patient movement during temperature measurement may result in patient injury.

3. Brush patient's hair aside if covering the temporal artery area.
4. Gently place the scanner flush on the center of forehead, press and hold down the red **On** button on the scanner.

5. Slowly and gently, slide the scanner straight across forehead to the patient's hair line, *not* down side of face.

6. Brush patient's hair away if covering ear. Keeping the button pressed, lift probe from forehead, gently touch behind ear halfway down the mastoid process and slide down to the soft impression behind the earlobe.

7. Release the red ***On*** button, read, and record temperature.

   When the determination is complete, an audible triple tone sounds and the temperature displays on the scanner's LED display screen, and on the monitor. The reading will remain on the scanner's LED display screen for 30 seconds after button is released. The reading will remain on the monitor's display for 2 or 5 minutes, depending on the configuration.

8. If you placed a protective probe cover or scanner sheath on the scanner, dispose of the protective probe cover or scanner sheath according to the applicable waste control regulations of your facility.

CAUTION
To prevent cross-contamination, properly dispose of the probe cover when done with its use.

CAUTION
To prevent cross-contamination between patients, wipe the temporal scanner's probe cone and metal neck with alcohol or apply a fresh protective probe cover or protective sheath between patient use.

9. Place the scanner in the holster or basket for safety.

NOTE
Arterial temperature is close to rectal temperature, approximately 0.4°C (0.8°F) higher than oral temps. Expect larger differences at times, however, as the dynamics of thermoregulation favor the temporal artery method.

Alternate sites when temporal artery or behind ear is unavailable

- Femoral artery: slowly slide the probe across groin.
- Lateral thoracic artery: slowly scan side-to-side in the area, midway between the axilla and the nipple.

Troubleshooting

PROBLEM: Unable to take a measurement from the patient's forehead.

CAUSE: The patient has bandages or pressure dressings covering the forehead or abrasions, burns, or sweat on the forehead.

SOLUTION:

- If accessible and dry, measure on the area behind the ear lobe only.
  - If the temporal artery (TA) area has been traumatized by burns or lacerations, is completely covered with dressings, or the head has suffered surgical or accidental trauma, the temperature can be obtained from the alternative site behind the ear lobe. As with diaphoresis, the perfusion will be high in the presence of head trauma.
  - Behind the ear lobe is the alternate site because sweat causes evaporative cooling of the skin on the forehead and may produce a false low reading. During diaphoresis, the area on the head behind the ear lobe will always exhibit the high blood flow necessary for the arterial measurement.
  - Measurement behind the ear lobe is not the *sole* recommended area because the arterial branch is deeper behind the ear lobe than at the temple, and under normal conditions it is less accurate because of its variability. But under diaphoretic conditions, the blood flow behind the ear lobe is as high as at the TA, making it as accurate as the TA, but only during diaphoresis or with head trauma as previously mentioned.

- If the temporal artery or the area behind the ear lobe is not accessible and dry, choose one of the following alternate temperature measurement sites:
  - Femoral artery: slowly slide the probe across groin.
  - Lateral thoracic artery: slowly scan side-to-side in the area, midway between the axilla and the nipple.

PROBLEM: Unable to get an accurate measurement.

CAUSE: The patient is agitated or combative.

SOLUTION: Consider using the alternate sites: femoral artery or lateral thoracic.

PROBLEM: Possible false reading.

CAUSE: The patient's forehead is in direct draft from vent or fan; thermometer is in a different ambient temperature than patient (e.g., window ledge directly exposed to hot sun or cold weather, or in direct line of air conditioning or fan).

SOLUTION: Store the scanner in the same ambient temperature as the patient for at least 20 minutes before taking a temperature measurement. Each 10° difference in ambient temperature can cause a 1° error in the reading.

PROBLEM: Scanner readings are not comparable to current/traditional methods.

CAUSE: Arterial temperature is close to rectal temperature, approximately 0.4°C (0.8°F) higher than oral temps.

SOLUTION: Expect larger differences at times, as the dynamics of thermoregulation favor the temporal artery method.

PROBLEM: Scanner readings are lower than current/traditional methods; false low readings.

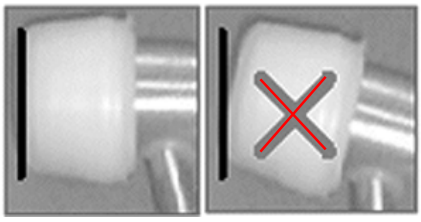
CAUSE:

- A patient's temperature measured with the scanner is normally never appreciably lower than oral temperature. Lower temperatures are usually from scanning too fast, not keeping the button pressed, a dirty lens, or a sweaty forehead.
- Multiple readings can cool the skin, so if you take another measurement immediately, expect a slightly lower reading.
- Improper scanning method.

SOLUTION:

- Slide the scanner straight across the forehead, not down the side of the face where the TA could be embedded under cartilage or fat.

- Keep the probe cone flush on the skin. If angled, you will be measuring ambient air as well as the TA area.



- Refer to "Basics of using the temporal scanner" on page 12-6 for user instructions.

WARNING
A dirty scanner lens may result in inaccurate measurement determinations.

PROBLEM: Scanner appears to work properly, but does not communicate with the monitor.

CAUSE:

- Incorrect baud rate setting.
- The scanner's connector is not securely fastened to the monitor.
- The scanner's battery door is not securely fastened.
- Loss of electrical contact between the scanner and the monitor (e.g., corrosion on the connector inside the scanner).
- The monitor is not configured to interface with an Exergen scanner.

SOLUTION:

- Confirm the monitor's Host Comm bit rate (baud rate) is set at the default value of ***9600***. Refer to the "CARESCAPE V100 Vital Signs Monitor Service Manual" to review the advanced configuration settings.
- Confirm the scanner's connector is securely fastened to the monitor.
- Confirm the scanner's battery door is securely fastened.
- Plug and unplug the scanner connector several times. Rub off any corrosion on the connector inside the scanner.
- Contact a qualified service person to configure the monitor for use with an Exergen scanner.

PROBLEM: Scanner readings are higher than current/traditional methods; false high readings.

CAUSE:

- The forehead is covered during a temperature measurement.
- Temperatures measured with the scanner may be higher than your current method, especially if you are familiar with oral or axillary temps.

SOLUTION:

- Any covering, hair, hat, bandages, etc., would prevent the heat from dissipating, causing the reading to be falsely high. Only measure skin that is exposed to the environment.
- Oral and axillary temperatures can be misleadingly lowered due to patient activity such as mouth breathing, drinking, tachypnea, coughing, talking, etc., and periods of vasoconstriction during the fever process. Any or all of these conditions may even mask fevers that the scanner will detect.

Specifications

Specifications	
Units of Measure	°Fahrenheit (F) or °Celsius (C) Defined by Exergen scanner purchased.
Range	
Measurement Mode	Max: 43°C; 110°F Min.: 16°C; 61°F
Accuracy	±0.1°C (±0.2°F) meets EN 12470-5
Predictive mode	Not applicable
Monitoring mode	Not applicable
Operating environment	16° to 40°C; 60° to 104°F (ambient)
Arterial head balance range for body temperature[1]	34.5 to 43°C; 94° to 110°F
Resolution	0.1 °C or 0.1°F
Response time	Approximately 0.04 seconds, typical

[1] Automatically applied when temperature is within normal body temperature range, otherwise reads surface temperature.

NOTE

Use only Exergen probe covers. The size and shape of the probe covers can affect the performance of the scanner. Inaccurate readings occur unless the proper probe covers are used. Refer to Appendix B, "Accessories" for reorder codes.

Factory default settings

- Scanner unit of measure: ***°F*** or ***°C***. Preset from manufacturing per request. Refer to the "CARESCAPE V100 Vital Signs Monitor Service Manual" for information on how to change the default unit of measurement on the scanner. The monitor will display temperature in the same units of measure as the scanner.
- Monitor temperature display time: ***2*** minutes

Batteries

Refer to Appendix C, "Maintenance" for details on storage, care, replacement, and disposal of batteries for the monitor and the Exergen temporal scanner.

Battery specifications

Exergen Scanner Battery Specifications	
Capacity	One 9 volt alkaline
Battery life	Approx. 15,000 readings (When scanning for 5 seconds and reading the temperature display for 2 seconds before turning thermometer off.)

13 Pulse Rate

Description

The Pulse Rate parameter is included in all Models. Pulse rate values can be derived from one of two sources. In descending order of priority, they are pulse oximetry (SpO_2) and noninvasive blood pressure (NIBP). The derived values for pulse rate appear in the **Pulse Rate** window.

While SpO_2 is in operate mode, SpO_2 is the primary source of the pulse rate. At any time while SpO_2 is the source and it is unable to publish a value for pulse rate, three dashes '**- - -**' are displayed in the **Pulse Rate** window.

NOTE

SpO_2 and pulse rate values are filtered by an averaging technique, which determines how quickly the reported values respond to changes in the patient's saturation. Increased averaging time effects time to alarm for SpO_2 saturation and pulse rate limits.

NIBP is the secondary source of pulse rate. Upon completion of a NIBP determination, a pulse rate value is displayed in the **Pulse Rate** window. A pulse rate value is displayed as long as the results of that determination are displayed or until SpO_2 switches to operate mode.

NOTE

When NIBP is in Stat mode and is the source of pulse rate, the pulse rate value is not checked against its limits upon completion of the determination.

When SpO_2 and NIBP are in operate mode, their associated alarms affect their availability to act as the pulse rate source.

NOTES

- Because the various sources measure or derive pulse rate differently from each other, when the monitor changes from one source to another the value in the **Pulse Rate** window may change.
- A patient's vital signs may vary dramatically during the use of cardiovascular agents such as those that raise or lower blood pressure or those that increase or decrease heart rate.
- If an SpO_2-derived pulse rate is erratic, the pulse oximeter parameter may be unable to measure the pulse and may cause an alarm.

Buttons associated with pulse rate

There are no buttons associated with this parameter.

Windows associated with pulse rate

The **Pulse Rate** window displays the pulse rate value in beats per min (bpm).

Indicators associated with pulse rate

The indicators associated with pulse rate are ***HIGH*** and ***LOW***. Refer to "Limit settings" on page 13-3.

User settings

Limit settings

There are two limit settings associated with this parameter: ***HIGH*** and ***LOW***. The range for all sources (NIBP and SpO_2 is the same: ***HIGH 35*** to ***235*** bpm and ***LOW*** is ***30*** to ***230*** bpm. The settings appear in increments of 5 bpm.

Upon completion of Stat mode determinations—when NIBP is the source—the pulse rate value is not checked against its limits. The pulse rate value is not checked against user-set limits while the SpO_2 hold-off period is active (refer to "SpO_2 hold off period" in each "*SpO_2*" chapter).

Menu settings

If SpO_2 is the source, the ***PULSE VOLUME*** menu setting is associated with this parameter. This option lets you adjust the volume of the pulse tones that are generated when SpO_2 is the source. It can be adjusted from ***0*** to ***10*** (10 being the loudest). If you set the volume to zero, no tone will sound.

Sounds associated with pulse rate

If SpO_2 is the source, there is one sound associated with this parameter: a beat detected sound. A pulse rate tone is indicated by an audible beep each time a beat is detected by the SpO_2 parameter.

NOTE

When the pulse rate is derived from NIBP, there is no audible pulse beat.

Factory defaults

Pulse rate HIGH alarm limit	***150*** bpm
Pulse rate LOW alarm limit	***50*** bpm
Alarm volume	***5***

Refer to the individual SpO_2 and NIBP chapters.

For your notes

14 Battery

Description

The monitor uses an internal battery. The battery is a sealed lead acid battery that can be charged at any time without fear of reducing its charge capacity. The monitor is always powered by the battery; and the battery is constantly being charged whenever the external DC charger is connected.

The monitor is designed to operate from an internal lead-acid battery (refer to "Specifications" on page 3-13).

NOTES

- The monitor is designed to operate with the internal battery in place at all times.
- When the monitor's battery has been completely discharged, the monitor must be connected to an external power supply before monitoring can resume.
- Be sure to unplug the monitor before transport.

WARNINGS

Do not use any battery other than a GE recommended battery. Other batteries may not provide the same operating time and may cause unexpected monitor shut-down. Other batteries may be incompatible with the internal charger and may cause battery acid leakage, fire, or explosion.

Do not disassemble, modify, or destroy the battery. Doing so can cause battery fluid leakage, heat generation, fire, and/or explosion.

Do not incinerate the battery or store at high temperatures. Doing so may cause the battery to explode.

Do not short-circuit the battery terminals by directly connecting the metal terminals together. Be certain that no metal objects (e.g., coins, paper clips, etc.) touch both battery terminals simultaneously. Doing so can cause the battery to overheat and/or explode, resulting in possible caustic burns and/or battery damage.

Charge the battery pack with the monitor's internal charger only. Use of an unrecommended charger may cause battery fluid leakage, overheating of the battery or may cause the battery to explode.

The battery will completely discharge if the monitor is stored for a prolonged period of time with the battery left inside and not periodically recharged. Configuration settings may be lost as a result.

Buttons associated with the battery

There are no buttons associated with the battery.

Windows associated with the battery

There are no windows associated with the battery.

Indicators associated with the battery

When the monitor is on, the DC charger is not attached, and the battery is sufficiently charged, the ***BATTERY OK*** indicator is backlit green. Unless specified otherwise, at all other times this indicator is turned off.

When the ***BATTERY LOW*** alarm is active as a low-priority alarm, the ***BATTERY LOW*** indicator is backlit amber and does not flash. When the ***BATTERY LOW*** alarm is active as a high-priority alarm, the ***BATTERY LOW*** indicator flashes amber according to the alarm duty cycle for high-priority alarms.

The ***CHARGING*** indicator is backlit green whenever DC charger is attached to the monitor. Unless specified otherwise, at all other times this indicator is turned off.

NOTE

Refer to "Battery alarms" on page 14-5 for more information.

First use

To condition a new sealed lead acid battery and optimize its performance, plug in the monitor; the internal battery pack then charges automatically. Before the monitor is used for the first time, the battery should be charged in the monitor for at least 8 hours. With external DC power connected, the green ***CHARGING*** indicator will light to indicate that the battery is charging. Prior to first use and after 8 hours of charging, be sure the ***BATTERY OK*** indicator is backlit green when the charger is not connected and the monitor is on.

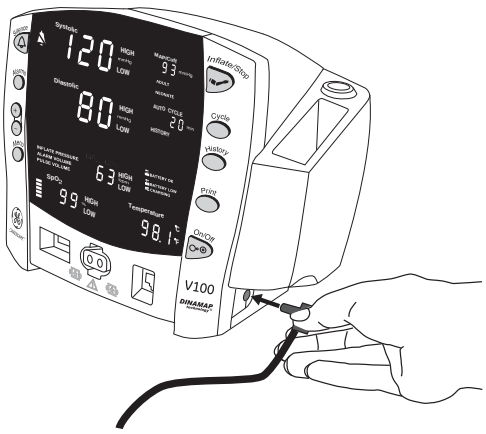
Battery charging

Prior to each use, inspect the power supply cord to ensure proper connection and condition.

NOTE

Repeated failure to fully recharge the battery will, over time, lead to a significant reduction in the battery's capacity.

With external DC power connected, the green ***CHARGING*** indicator will light to indicate that the battery is charging. This indicator remains active whether the unit is on or off. An audible "two beep" sounds whenever the DC charger is connected/disconnected.



Battery charging will take place as long as the monitor remains connected to an external DC power source.

- Charge battery pack for 8 hours before first use or after prolonged periods of storage.
- If the monitor is idle for extended periods, it should be fully charged at least once a month to ensure optimum performance. If the monitor is to be stored for longer than one month, first charge the battery and then remove it and store it separately from the monitor.
- The battery pack should be charged before use, because a charged battery loses charge when left in storage. Sealed lead acid batteries can discharge to less than 80% of charge within 60 days of storage. Charging is done automatically by the monitor when the external DC power is connected.
- The battery pack should be charged at room temperature 16°C to 30°C (59°F to 86°F).
- You can charge or top-off the battery pack at any time. You should not wait until the battery is fully discharged.
- To prolong the life of the battery, keep the monitor connected to a DC power supply whenever possible. Do not allow the battery to become completely discharged.
- A fully charged battery will power the monitor for approximately 5-11 hours, depending upon configuration and usage.
- To ensure full charge cycles, replace only with a recommended battery.

Disposal of batteries

Refer to Appendix C, "Maintenance" for details on disposal of batteries for the monitor and the Exergen temporal scanner.

Storage, care, and replacement of batteries

Refer to Appendix C, "Maintenance" for details on storage, care, and replacement of batteries for the monitor and the Exergen temporal scanner.

Battery alarms

Battery low

When about 45 minutes of battery charge remains:

The low-priority ***BATTERY LOW*** alarm is issued.

- The ***BATTERY LOW*** indicator illuminates.
- This alarm can be acknowledged and cleared by pressing the **Silence** button.
- The ***BATTERY LOW*** alarm will re-alarm every 10 minutes after it's been acknowledged.
- If the alarm is not acknowledged, the alarm is re-issued every 8 seconds.
- The monitor continues to operate normally.

When about 5 minutes of battery charge remains:

The low-priority ***BATTERY LOW*** alarm escalates to a high-priority ***BATTERY LOW*** alarm.

- The ***BATTERY LOW*** indicator flashes.
- Any NIBP determination in progress at the time of the alarm escalation is allowed to finish.
- Any Stat mode cycle that was initiated before the alarm escalation is allowed to finish.
- The user is not able to initiate:
  - any new NIBP determinations of any type
  - any printouts

NOTE

At this time, it is highly recommended to plug the monitor into external DC power.

When 5 minutes of battery charge expires:

After 5 minutes of high-priority ***BATTERY LOW*** alarm, the monitor enters a battery low shutdown.

- No error code is displayed.
- The ***BATTERY LOW*** indicator flashes.
- The monitor alarms for 2.5 minutes then shuts down completely.

NOTE

You must plug the monitor into DC power before resuming monitoring.

After plugging the monitor into DC power:

- The ***BATTERY LOW*** indicator (when the monitor is on) and ***CHARGING*** indicator illuminate.
- The ***BATTERY LOW*** indicator turns off when the battery level reaches a sufficient charge level to operate without the **BATTERY LOW** alarm active.

E13 BATTERY LOW

At any time while the high-priority ***BATTERY LOW*** alarm is active, certain actions can trigger the '***E13***' ***BATTERY LOW*** alarm: any attempt to start an NIBP determination or a printout. This alarm is giving you additional warning that the battery charge is critically low.

NOTE

At this time, it is highly recommended to plug the monitor into external DC power.

- The '***E13***' error code appears in the **min** window.
- The ***BATTERY LOW*** indicator flashes.
- This alarm can be acknowledged by pressing the **Silence** button.
- The user is not able to initiate:
  - any new NIBP determinations of any type
  - any printouts

Battery specifications

Specifications	
Capacity	6V; 3.3 Ahr sealed lead acid battery
Battery life	Up to 11.5 hours with a usage scenario of: NIBP determinations every 15 minutes without SpO2 technology and temperature function active. 5 hours with a usage scenario of: auto NIBP every 5 minutes with adult cuff, printout after every determination, SpO_2 parameter active at 60 bpm, temperature parameter active in monitor mode.
Charge time	Approx. 5 hours from full discharge when the monitor is off Approx. 8 hours when the monitor on

Troubleshooting

This section discusses potential difficulties and suggestions for resolving them. If the difficulty persists, contact a qualified service person or your local GE representative.

The service manual, which is for use by qualified service personnel, provides additional troubleshooting information.

PROBLEM: The battery does not work or does not last very long.

CAUSE:

- Has the battery been charged?
- Has the battery been in storage or a nonuse condition for a few months?
- Is the battery installed properly?
- Was the battery over discharged when it was last used?

SOLUTION:

- New batteries must be charged before use. Refer to "Battery charging" on page 14-3.
- Upon first use or when battery has been removed from prolonged storage, you need to charge and discharge your battery up to three times before optimum performance is obtained.

PROBLEM: The battery only charged for a short period of time before indicating full charge.

CAUSE:

- Are you charging the battery for the first time?

SOLUTION:

- The ***BATTERY OK*** indicator remains lit as long as there is greater than 45 minutes of battery life. The indicator may light before the battery is fully charged. Charge the battery for the entire period (refer to "Battery specifications" on page 14-6) and then verify that the ***BATTERY OK*** indicator lights.

PROBLEM: The battery will not charge.

CAUSE:

- Are you trying to charge the battery in unusually cold or hot temperatures?

SOLUTION:

- Charging the battery should be done at a basic room temperature of 16°C (59°F) to 30°C (86°F). Slowly bring the battery to the basic room temperature before charging. Batteries can be fully charged only when their internal temperatures are between 15°C (57°F) and 40°C (109°F).

PROBLEM: The ***BATTERY LOW*** indicator remains lit or flashing.

CAUSE:

- The battery is unable to recharge.

SOLUTION:

- The battery needs to be recalibrated or is defective. To recalibrate, simply recharge the battery by plugging the external DC charger into the monitor. The recharge time may vary depending upon the current battery charge status.

A Connections

Host port connector

CAUTION
Auxiliary equipment connected to the CARESCAPE V100 vital signs monitor will result in the formation of an electromedical system and thus, must comply with the requirements of IEC 60601-1-1. All host port signals are *non-isolated* and should be connected to equipment conforming to IEC-60601-1 or configured to comply with IEC 60601-1-1 *only*.

Where isolation of data communication is required, use one of the following:

- ILC-1926 Isolated Line Converter (GE part number 001926) along with the Host Comm Cable Assemblies (GE part numbers 683235 and 683242).
- USB Cable Kit (GE part number 2040229-001).

If external alarm control is required, the Isolated Remote Alarm Cable (GE part number 487208CR) should *always* be used.

When a high-priority alarm condition is displayed on the monitor, the remote alarm signal becomes active within 0.5 seconds. The active state of the alarm signal is an open circuit. In the inactive state the alarm signal is connected to ground. Refer to the Information Sheet included with the Isolated Remote Alarm Cable for operational details.

NOTE
When using the Isolated Remote Alarm Cable, the visual and audible alarms of the monitor should still be considered the primary alarm delivery method. The remote alarm connection should be considered a secondary method.

B Accessories

NIBP accessories

Part	Part description	Part number
NIBP, Cuff, Soft Cuff, Child	SOFT-CUF, Child, 2 TB, Mated Submin, Green/White 12 - 19 cm	2451
NIBP, Cuff, Soft Cuff, Sm Adult	SOFT-CUF, Small Adult, 2 TB, Mated Submin, Lt. Blue/White 17 - 25 cm	2452
NIBP, Cuff, Soft Cuff, Adult	SOFT-CUF, Adult, 2 TB, Mated Submin, Navy/White 23 - 33 cm	2453
NIBP, Cuff, Soft Cuff, Adult Long	SOFT-CUF, Adult Long, 2 TB, Mated Submin, Navy/White 23 - 33 cm	2454
NIBP, Cuff, Soft Cuff, Lg Adult	SOFT-CUF, Large Adult, 2 TB, Mated Submin, Rose/White 31 - 40 cm	2455
NIBP, Cuff, Soft Cuff, Lg Adult Long	SOFT-CUF, Large Adult Long, 2 TB, Mated Submin, Rose/White 31 - 40 cm	2456
NIBP, Cuff, Soft Cuff, Thigh	SOFT-CUF, Thigh, 2 TB, Mated Submin, Brown/White 38 - 50 cm	2457
NIBP, Cuff, Soft Cuff, Infant	SOFT-CUF, Infant, 2 TB, Submin, Orange/White 8 - 13 cm	2401
NIBP, Cuff, Soft Cuff, Child	SOFT-CUF, Child, 2 TB, Submin, Green/White 12 - 19 cm	2402
NIBP, Cuff, Soft Cuff, Child Long	SOFT-CUF, Child Long, 2 TB, Submin, Green/White 12 - 19 cm	2400
NIBP, Cuff, Soft Cuff, Sm Adult	SOFT-CUF, Small Adult, 2 TB, Submin, Lt. Blue/White 17 - 25 cm	2403
NIBP, Cuff, Soft Cuff, Sm Adult Long	SOFT-CUF, Small Adult Long, 2 TB, Submin, Lt. Blue/White 17 - 25 cm	2407
NIBP, Cuff, Soft Cuff, Adult	SOFT-CUF, Adult, 2 TB, Submin, Navy/White 23 - 33 cm	2404
NIBP, Cuff, Soft Cuff, Adult Long	SOFT-CUF, Adult Long, 2 TB, Submin, Navy/White 23 - 33 cm	2116
NIBP, Cuff, Soft Cuff, Lg Adult	SOFT-CUF, Large Adult, 2 TB, Submin, Rose/White 31 - 40 cm	2405
NIBP, Cuff, Soft Cuff, Lg Adult Long	SOFT-CUF, Large Adult Long, 2 TB, Submin, Rose/White 31 - 40 cm	2117
NIBP, Cuff, Soft Cuff, Thigh	SOFT-CUF, Thigh, 2 TB, Submin, Brown/White 38 - 50 cm	2406
NIBP, Cuff, Soft Cuff, Infant	SOFT-CUF, Infant, 2 TB, Screw, Orange/White 8 - 13 cm	2500
NIBP, Cuff, Soft Cuff, Child	SOFT-CUF, Child, 2 TB, Screw, Green/White 12 - 19 cm	2501
NIBP, Cuff, Soft Cuff, Child Long	SOFT-CUF, Child Long, 2 TB, Screw, Green/White 12 - 19 cm	2506
NIBP, Cuff, Soft Cuff, Sm Adult	SOFT-CUF, Small Adult, 2 TB, Screw, Lt. Blue/White 17 - 25 cm	2502
NIBP, Cuff, Soft Cuff, Sm Adult Long	SOFT-CUF, Small Adult Long, 2 TB, Screw, Lt. Blue/White 17 - 25 cm	2507
NIBP, Cuff, Soft Cuff, Adult	SOFT-CUF, Adult, 2 TB, Screw, Navy/White 23 - 33 cm	2503
NIBP, Cuff, Soft Cuff, Adult Long	SOFT-CUF, Adult Long, 2 TB, Screw, Navy/White 23 - 33 cm	2604

Part	Part description	Part number
NIBP, Cuff, Soft Cuff, Lg Adult	SOFT-CUF, Large Adult, 2 TB, Screw, Rose/White 31 - 40 cm	2504
NIBP, Cuff, Soft Cuff, Lg Adult Long	SOFT-CUF, Large Adult Long, 2 TB, Screw, Rose/White 31 - 40 cm	2644
NIBP, Cuff, Soft Cuff, Thigh	SOFT-CUF, Thigh, 2 TB, Screw, Brown/White 38 - 50 cm	2505
NIBP, Cuff, Soft Cuff, Various	SOFT-CUF, Assortment, 2 TB, Submin: 1 Infant, 1 Child, Various limb circum: 2 Small Adult, 2 Adult, 1 Adult Long, 2 Large Adult, 1 Thigh	2298
NIBP, Cuff, Soft Cuff, Various	SOFT-CUF, Assortment Pack: 2 TB, Screw, 1 Infant, 1 Child, 2 Small Adult, 2 Adult, 1 Adult Long, 2 Large Adult, 1 Thigh	002695
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal #1, 2 TB, Male Slip, Orange/White 3 - 6 cm	2521
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal #2, 2 TB, Male Slip, Lt. Blue/White 4 - 8 cm	2422
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal #3, 2 TB, Male Slip, Green/White 6 - 11 cm	2523
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal #4, 2 TB, Male Slip, Navy/White 7 - 13 cm	2524
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal #5, 2 TB, Male Slip, Rose/White 8 - 15 cm	2525
NIBP, Cuff, Soft Cuff, Neonate	SOFT-CUF, Neonatal Assortment, 2 TB, Male Slip: Various limb circum: 2 Neonatal #1, 3 Neonatal #2, 5 Neonatal #3, 5 Neonatal #4, 5 Neonatal #5	2694
NIBP, Cuff, Classic Cuff, Child	CLASSIC-CUF, Child, 2 TB, Mated Submin, Green/White 12 - 19 cm	2171
NIBP, Cuff, Classic Cuff, Sm Adult	CLASSIC-CUF, Small Adult, 2 TB, Mated Submin, Lt. Blue/White 17 - 25 cm	2172
NIBP, Cuff, Classic Cuff, Adult	CLASSIC-CUF, Adult, 2 TB, Mated Submin, Navy/White 23 - 33 cm	2173
NIBP, Cuff, Classic Cuff, Adult Long	CLASSIC-CUF, Adult Long, 2 TB, Mated Submin, Navy/White 23 - 33 cm	2174
NIBP, Cuff, Classic Cuff, Lg Adult	CLASSIC-CUF, Large Adult, 2 TB, Mated Submin, Rose/White 31 - 40 cm	2175
NIBP, Cuff, Classic Cuff, Lg Adult Long	CLASSIC-CUF, Large Adult Long, 2 TB, Mated Submin, Rose/White 31 - 40 cm	2176
NIBP, Cuff, Classic Cuff, Thigh	CLASSIC-CUF, Thigh, 2 TB, Mated Submin, Brown/White 38 - 50 cm	2177
NIBP, Cuff, Classic Cuff, Infant	CLASSIC-CUF, Infant, 2 TB, Submin, Orange/White 8 - 13 cm	2354
NIBP, Cuff, Classic Cuff, Child	CLASSIC-CUF, Child, 2 TB, Submin, Green/White 12 - 19 cm	2355
NIBP, Cuff, Classic Cuff, Sm Adult	CLASSIC-CUF, Small Adult, 2 TB, Submin, Lt. Blue/White 17 - 25 cm	2356
NIBP, Cuff, Classic Cuff, Adult	CLASSIC-CUF, Adult, 2 TB, Submin, Navy/White 23 - 33 cm	2357
NIBP, Cuff, Classic Cuff, Adult Long	CLASSIC-CUF, Adult Long, 2 TB, Submin, Navy/White 23 - 33 cm	2352

Part	Part description	Part number
NIBP, Cuff, Classic Cuff, Lg Adult	CLASSIC-CUF, Large Adult, 2 TB, Submin, Rose/White 31 - 40 cm	2358
NIBP, Cuff, Classic Cuff, Lg Adult Long	CLASSIC-CUF, Large Adult Long, 2 TB, Submin, Rose/White 31 - 40 cm	2353
NIBP, Cuff, Classic Cuff, Thigh	CLASSIC-CUF, Thigh, 2 TB, Submin, Brown/White 38 - 50 cm	2359
NIBP, Cuff, Classic Cuff, Infant	CLASSIC-CUF, Infant, 2 TB, Screw, Orange/White 8 - 13 cm	2618
NIBP, Cuff, Classic Cuff, Child	CLASSIC-CUF, Child, 2 TB, Screw, Green/White 12 - 19 cm	2613
NIBP, Cuff, Classic Cuff, Sm Adult	CLASSIC-CUF, Small Adult, 2 TB, Screw, Lt. Blue/White 17 - 25 cm	2608
NIBP, Cuff, Classic Cuff, Adult	CLASSIC-CUF, Adult, 2 TB, Screw, Navy/White 23 - 33 cm	2603
NIBP, Cuff, Classic Cuff, Adult Long	CLASSIC-CUF, Adult Long, 2 TB, Screw, Navy/White 23 - 33 cm	2647
NIBP, Cuff, Classic Cuff, Lg Adult	CLASSIC-CUF, Large Adult, 2 TB, Screw, Rose/White 31 - 40 cm	2643
NIBP, Cuff, Classic Cuff, Lg Adult Long	CLASSIC-CUF, Large Adult Long, 2 TB, Screw, Rose/White 31 - 40 cm	2649
NIBP, Cuff, Classic Cuff, Thigh	CLASSIC-CUF, Thigh, 2 TB, Screw, Brown/White 38 - 50 cm	2648
NIBP, Cuff, Classic Cuff, Various	CLASSIC-CUF, Assortment, 2 TB, Submin: 1 Infant, 1 Child, Various limb circum: 2 Small Adult, 2 Adult, 1 Adult Long, 2 Large Adult, 1 Thigh	2292
NIBP, Cuff, Classic Cuff, Various	CLASSIC-CUF, Assortment, 2 TB, Screw: 1 Infant, 1 Child, Various limb circum: 2 Small Adult, 2 Adult, 1 Adult Long, 2 Large Adult, 1 Thigh	2692
NIBP, Cuff, Classic Cuff, Infant	CLASSIC-CUF, Infant, 2 TB, Submin, Yellow 8 - 13 cm	2670
NIBP, Cuff, Classic Cuff, Child	CLASSIC-CUF, Child, 2 TB, Submin, Yellow 12 - 19 cm	2671
NIBP, Cuff, Classic Cuff, Sm Adult	CLASSIC-CUF, Small Adult, 2 TB, Submin, Yellow 17 - 25 cm	2672
NIBP, Cuff, Classic Cuff, Adult	CLASSIC-CUF, Adult, 2 TB, Submin, Yellow 23 - 33 cm	2673
NIBP, Cuff, Classic Cuff, Lg Adult	CLASSIC-CUF, Large Adult, 2 TB, Submin, Yellow 31 - 40 cm	2674
NIBP, Cuff, Classic Cuff, Thigh	CLASSIC-CUF, Thigh, 2 TB, Submin, Yellow 38 - 50 cm	2675
NIBP, Cuff, Classic Cuff, Infant	CLASSIC-CUF, Infant, 2 TB, Submin, Yellow 8 - 13 cm	2650
NIBP, Cuff, Classic Cuff, Child	CLASSIC-CUF, Child, 2 TB, Submin, Yellow 12 - 19 cm	2651
NIBP, Cuff, Classic Cuff, Sm Adult	CLASSIC-CUF, Small Adult, 2 TB, Submin, Yellow 17 - 25 cm	2607
NIBP, Cuff, Classic Cuff, Adult	CLASSIC-CUF, Adult, 2 TB, Submin, Yellow 23 - 33 cm	2602
NIBP, Cuff, Classic Cuff, Lg Adult	CLASSIC-CUF, Large Adult, 2 TB, Submin, Yellow 31 - 40 cm	2642
NIBP, Cuff, Classic Cuff, Thigh	CLASSIC-CUF, Thigh, 2 TB, Submin, Yellow 38 - 50 cm	2652

Part	Part description	Part number
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal #1, 2 TB, Male Slip, White 3 - 6 cm	2638
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal #2, 2 TB, Male Slip, White 4 - 8 cm	2633
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal #3, 2 TB, Male Slip, White 6 - 11 cm	2628
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal #4, 2 TB, Male Slip, White 7 - 13 cm	2623
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal #5, 2 TB, Male Slip, White 8 - 15 cm	2619
NIBP, Cuff, Classic Cuff, Neonate	CLASSIC-CUF, Neonatal Assortment, 2 TB, Male Slip, White: Various limb circum: 2 Neonatal #1, 3 Neonatal #2, 5 Neonatal #3, 5 Neonatal #4, 5 Neonatal #5	2693
NIBP, Cuff, Sensa Cuff, Infant	SENSA-CUF, Infant, 2 TB, Mated Submin, Rust 8 - 13 cm	2430
NIBP, Cuff, Sensa Cuff, Child	SENSA-CUF, Child, 2 TB, Mated Submin, Green 12 - 19 cm	2431
NIBP, Cuff, Sensa Cuff, Sm Adult	SENSA-CUF, Small Adult, 2 TB, Mated Submin, Royal Blue 17 - 25 cm	2432
NIBP, Cuff, Sensa Cuff, Sm Adult Long	SENSA-CUF, Small Adult Long, 2 TB, Mated Submin, Royal Blue 17 - 25 cm	2433
NIBP, Cuff, Sensa Cuff, Adult	SENSA-CUF, Adult, 2 TB, Mated Submin, Navy 23 - 33 cm	2434
NIBP, Cuff, Sensa Cuff, Adult Long	SENSA-CUF, Adult Long, 2 TB, Mated Submin, Navy 23 - 33 cm	2435
NIBP, Cuff, Sensa Cuff, Lg Adult	SENSA-CUF, Large Adult, 2 TB, Mated Submin, Wine 31 - 40 cm	2436
NIBP, Cuff, Sensa Cuff, Lg Adult Long	SENSA-CUF, Large Adult Long, 2 TB, Mated Submin, Wine 31 - 40 cm	2437
NIBP, Cuff, Sensa Cuff, Thigh	SENSA-CUF, Thigh, 2 TB, Mated Submin, Brown 38 - 50 cm	2438
NIBP, Cuff, Sensa Cuff, Infant	SENSA-CUF, Infant, 2 TB, Submin, Rust 8 - 13 cm	2482
NIBP, Cuff, Sensa Cuff, Child	SENSA-CUF, Child, 2 TB, Submin, Green 12 - 19 cm	2484
NIBP, Cuff, Sensa Cuff, Sm Adult	SENSA-CUF, Small Adult, 2 TB, Submin, Royal Blue 17 - 25 cm	2486
NIBP, Cuff, Sensa Cuff, Sm Adult Long	SENSA-CUF, Small Adult Long, 2 TB, Submin, Royal Blue 17 - 25 cm	2487
NIBP, Cuff, Sensa Cuff, Adult	SENSA-CUF, Adult, 2 TB, Submin, Navy 23 - 33 cm	2488
NIBP, Cuff, Sensa Cuff, Adult Long	SENSA-CUF, Adult Long, 2 TB, Submin, Navy 23 - 33 cm	2489
NIBP, Cuff, Sensa Cuff, Lg Adult	SENSA-CUF, Large Adult, 2 TB, Submin, Wine 31 - 40 cm	2490
NIBP, Cuff, Sensa Cuff, Lg Adult Long	SENSA-CUF, Large Adult Long, 2 TB, Submin, Wine 31 - 40 cm	2491
NIBP, Cuff, Sensa Cuff, Thigh	SENSA-CUF, Thigh, 2 TB, Submin, Brown 38 - 50 cm	2492

Part	Part description	Part number
NIBP, Cuff, Sensa Cuff, Infant	SENSA-CUF, Infant, 2 TB, Screw, Rust 8 - 13 cm	2458
NIBP, Cuff, Sensa Cuff, Child	SENSA-CUF, Child, 2 TB, Screw, Green 12 - 19 cm	2460
NIBP, Cuff, Sensa Cuff, Sm Adult	SENSA-CUF, Small Adult, 2 TB, Screw, Royal Blue 17 - 25 cm	2462
NIBP, Cuff, Sensa Cuff, Sm Adult Long	SENSA-CUF, Small Adult Long, 2 TB, Screw, Royal Blue 17 - 25 cm	2463
NIBP, Cuff, Sensa Cuff, Adult	SENSA-CUF, Adult, 2 TB, Screw, Navy 23 - 33 cm	2464
NIBP, Cuff, Sensa Cuff, Adult Long	SENSA-CUF, Adult Long, 2 TB, Screw, Navy 23 - 33 cm	2465
NIBP, Cuff, Sensa Cuff, Lg Adult	SENSA-CUF, Large Adult, 2 TB, Screw, Wine 31 - 40 cm	2466
NIBP, Cuff, Sensa Cuff, Lg Adult Long	SENSA-CUF, Large Adult Long, 2 TB, Screw, Wine 31 - 40 cm	2467
NIBP, Cuff, Sensa Cuff, Thigh	SENSA-CUF, Thigh, 2 TB, Screw, Brown 38 - 50 cm	2468
NIBP, Cuff, Sensa Cuff, Various	SENSA-CUF, Assortment Pack: 2 TB, Screw, 1 sm Adult, 1 Adult, 1 Lg Adult	2494
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child, 2 TB, Mated Submin, Green 12 - 19 cm	2751
NIBP, Cuff, Dura Cuff, Sm Adult	DURA-CUF, Small Adult, 2 TB, Mated Submin, Royal Blue 17 - 25 cm	2752
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult, 2 TB, Mated Submin, Navy 23 - 33 cm	2753
NIBP, Cuff, Dura Cuff, Adult Long	DURA-CUF, Adult Long, 2 TB, Mated Submin, Navy 23 - 3 3cm	002756
NIBP, Cuff, Dura Cuff, Lg Adult	DURA-CUF, Large Adult, 2 TB, Mated Submin, Wine 31 - 40 cm	2754
NIBP, Cuff, Dura Cuff, Lg Adult Long	DURA-CUF, Large Adult Long, 2 TB, Mated Submin, Wine 31 - 40 cm	002757
NIBP, Cuff, Dura Cuff, Thigh	DURA-CUF, Thigh, 2 TB, Mated Submin, Brown 38 - 50 cm	2755
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child, 2 TB, Mated Submin, Green 12 - 19 cm	2751E
NIBP, Cuff, Dura Cuff, Sm Adult	DURA-CUF, Small Adult, 2 TB, Mated Submin, Royal Blue 17 - 25 cm	2752E
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult, 2 TB, Mated Submin, Navy 23 - 33 cm	2753E
NIBP, Cuff, Dura Cuff, Adult Long	DURA-CUF, Adult Long, 2 TB, Mated Submin, Navy 23 - 33 cm	002756E
NIBP, Cuff, Dura Cuff, Lg Adult	DURA-CUF, Large Adult, 2 TB, Mated Submin, Wine 31 - 40 cm	2754E
NIBP, Cuff, Dura Cuff, Lg Adult Long	DURA-CUF, Large Adult Long, 2 TB, Mated Submin, Wine 31 - 40 cm	002757E
NIBP, Cuff, Dura Cuff, Thigh	DURA-CUF, Thigh, 2 TB, Mated Submin, Brown 38 - 50 cm	2755E
NIBP, Cuff, Dura Cuff, Infant	DURA-CUF, Infant, 2 TB, Submin, Rust 8 - 13 cm	002200

Part	Part description	Part number
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child, 2 TB, Submin, Green 12 - 19 cm	002201
NIBP, Cuff, Dura Cuff, Sm Adult	DURA-CUF, Small Adult, 2 TB, Submin, Royal Blue 17 - 25 cm	002202
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult, 2 TB, Submin, Navy 23 - 33 cm	002203
NIBP, Cuff, Dura Cuff, Adult Long	DURA-CUF, Adult Long, 2 TB, Submin, Navy 23 - 33 cm	002206
NIBP, Cuff, Dura Cuff, Lg Adult	DURA-CUF, Large Adult, 2 TB, Submin, Wine 31 - 40 cm	002204
NIBP, Cuff, Dura Cuff, Lg Adult Long	DURA-CUF, Large Adult Long, 2 TB, Submin, Wine 31 - 40 cm	002207
NIBP, Cuff, Dura Cuff, Thigh	DURA-CUF, Thigh, 2 TB, Submin, Brown 38 - 50 cm	002205
NIBP, Cuff, Dura Cuff, Infant	DURA-CUF, Infant, 2 TB, Screw, Rust 8 - 13 cm	002783
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child, 2 TB, Screw, Green 12 - 19 cm	002781
NIBP, Cuff, Dura Cuff, Child Long	DURA-CUF, Child Long, 2 TB, Screw, Green 12 - 19 cm	2785
NIBP, Cuff, Dura Cuff, Sm Adult	DURA-CUF, Small Adult, 2 TB, Screw, Royal Blue 17 - 25 cm	002779
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult with Hanger, 2 TB, Screw, Navy 23 - 33 cm	002771
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult, 2 TB, Screw, Navy 23 - 33 cm	002774
NIBP, Cuff, Dura Cuff, Adult Long	DURA-CUF, Adult Long, 2 TB, Screw, Navy 23 - 33 cm	002772
NIBP, Cuff, Dura Cuff, Lg Adult	DURA-CUF, Large Adult, 2 TB, Screw, Wine 31 - 40 cm	002791
NIBP, Cuff, Dura Cuff, Lg Adult Long	DURA-CUF, Large Adult Long, 2 TB, Screw, Wine 31 - 40 cm	002784
NIBP, Cuff, Dura Cuff, Thigh	DURA-CUF, Thigh, 2 TB, Screw, Brown 38 - 50 cm	002796
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child Assortment, 2 TB, Submin: 2 Infant, 3 Child, 1 Small Adult, Various limb circum	2296
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult Assortment, 2 TB, Submin: 1 Small Adult, 2 Adult, 1 Adult Long, 1 Large Adult, 1 Large Adult Long, Various limb circum	2297
NIBP, Cuff, Dura Cuff, Various	DURA-CUF, Assortment, 2 TB, Submin: 1 Infant, 1 Child, 1 Small Adult, 1 Adult, 1 Large Adult, 1 Thigh, Various limb circum	2299
NIBP, Cuff, Dura Cuff, Various	DURA-CUF, Assortment, 2 TB, Screw: 1 Infant, 1 Child, 1 Small Adult, 1 Adult, 1 Large Adult, 1 Thigh, Various limb circum	002699
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child Assortment, 2 TB, Screw: 2 Infant, 3 Child, 1 Small Adult, Various limb circum	002697
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult Assortment, 2 TB, Screw: 1 Small Adult, 2 Adult, 1 Adult Long, 1 Large Adult, 1 Large Adult Long, Various limb circum	002698
NIBP, Cuff, Dura Cuff, Infant	DURA-CUF, Infant, 2 TB, Submin, Rust 8 - 13 cm	002200E
NIBP, Cuff, Dura Cuff, Child	DURA-CUF, Child, 2 TB, Submin, Green 12 - 19 cm	002201E

Part	Part description	Part number
NIBP, Cuff, Dura Cuff, Sm Adult	DURA-CUF, Small Adult, 2 TB, Submin, Royal Blue 17 - 25 cm	002202E
NIBP, Cuff, Dura Cuff, Adult	DURA-CUF, Adult, 2 TB, Submin, Navy 23 - 33 cm	002203E
NIBP, Cuff, Dura Cuff, Adult Long	DURA-CUF, Adult Long, 2 TB, Submin, Navy 23 - 33 cm	002206E
NIBP, Cuff, Dura Cuff, Lg Adult	DURA-CUF, Large Adult, 2 TB, Submin, Wine 31 - 40 cm	002204E
NIBP, Cuff, Dura Cuff, Lg Adult Long	DURA-CUF, Large Adult Long, 2 TB, Submin, Wine 31 - 40 cm	002207E
NIBP, Cuff, Dura Cuff, Thigh	DURA-CUF, Thigh, 2 TB, Submin, Brown 38 - 50 cm	002205E
NIBP, Adult, 1 2ft	Air hose adult/ped 12 ft, gray	107365
NIBP, Neonate, 12 ft	Air hose, neonatal 12 ft, light blue	107368
NIBP, Adult, 24 ft	Air hose adult/ped 24 ft, gray	107366

SpO_2 - Ohmeda accessories

Part	Part description	Part number
SpO_2 - Cable Assy - 3 m	OxyTip+ Interconnect cable, Ohmeda, 3 m	OXY-ES3
SpO_2 - Sensor	Finger Sensor with UN connector, 1 m	OXY-F-UN
SpO_2 - Sensor	Wrap Sensor with UN connector, 1 m	OXY-W-UN
SpO_2 - Sensor	Ear Sensor with UN connector, 1 m	OXY-E-UN
SpO_2 - Sensor	Sensitive Skin Sensor with UN connector, 4 m	OXY-SE-3
SpO_2 - Sensor	Adult/Pediatric Adhesive Sensor - 25/box	OXY-AP-25
SpO_2 - Sensor	Adult/Pediatric Adhesive Sensor - 10/box	OXY-AP-10
SpO_2 - Sensor	AllFit Adhesive Sensor, 0.9 m - 10/box	OXY-AF-10
SpO_2 - Sensor	Integrated finger sensor, 4 m	OXY-F4-GE
SpO_2 - Sensor	Integrated ear sensor	OXY-E4-GE
SpO_2 - Sensor	OxyTip+ Integrated Finger Care connector 2 m	OXY-F2-GE
SpO_2 - Sensor	OxyTip+ Integrated Ear Care connector 2 m	OXY-E2-GE
SpO_2 - Accessory	OxyTip+ wide replacement tape, adhesive	OXY-RTW
SpO_2 - Accessory	Foam wrap replacement, large, weight range $\geq$ 3 kg	OXY-RWL
SpO_2 - Accessory	Foam wrap replacement, medium, weight range $\geq$ 3 kg	OXY-RWM

Part	Part description	Part number
SpO_2 - Accessory	Foam wrap replacement, small, weight range < 3 kg	OXY-RWS
SpO_2 - Accessory	OxyTip+ replacement tape, AllFit Sensor, Bears - 100/box	OXY-RTB
SpO_2 - Accessory	OxyTip+ replacement tape, AllFit Sensor, Blue - 100/box	OXY-RT
SpO_2 - Accessory	Infant Foam Sandal, use with OxyTip+ Sensitive Skin sensor - 3/box	OXY-SND

SpO_2 - Nellcor accessories

Part	Part description	Part number
SpO_2 Cable Assy 3 m	Cable Assy SpO_2 Nellcor OxiMax 3 m - Smart	2021406-001
SpO_2 Cable Assy 3 m	Cable Assy SpO_2 Nellcor OxiMax 1.2 m - Smart	2021406-002
SpO_2 Pulse Oximeter Cable	Cable Pulse Oximeter DOC-10 Nellcor	2008773-001
SpO_2 - Sensor	Max -A Adult Finger Adhesive Sensor - 24/box	70124027
SpO_2 - Sensor	Max -AL Adult Long Finger Adhesive Sensor - 24/box	2028117-001
SpO_2 - Sensor	Max-P Pediatric Finger Adhesive Sensor - 24/box	70124022
SpO_2 - Sensor	Max-N Neonate Foot Adhesive Sensor - 24/box	70124032
SpO_2 - Sensor	Max-I Infant, Adhesive, Sensor - 24/box	70124026
SpO_2 - Sensor	Max-R, Adhesive, Nasal - 24/box	407705-005
SpO_2 - Sensor	OXIBAND (OXI-P/I) Pediatric/Infant Sensor	414248-001
SpO_2 - Sensor	OXIBAND (OXI-A/N) Adult/Neonate Sensor	414248-002
SpO_2 - Sensor	OXIBAND (OXI-A/N) Adult/Neonate Sensor	70124035 (EMEA)
SpO_2 - Sensor	Nellcor Multisite Sensor D-YS Reusable	70124033
SpO_2 - Sensor	Nellcor DuraSensor DS-100A	70124021
SpO_2 - Sensor	Nellcor DuraSensor DS-100A	407705-006 (US)
SpO_2 - Accessory	Nellcor Ear-Clip D-YSE Sensor for 70124033	70124034
SpO_2 - Accessory	Nellcor Tape ADH-A/N, use with 70124035	2016130-001
SpO_2 - Accessory	Nellcor Tape ADH-P/I, use with Oxi-P/I Sensors	2016131-001

SpO_2 - Masimo accessories

Part	Part description	Part number
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor, LNOP Adt. Adult - 20/box	2010458-001
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor, LNOP Pdt. Pediatric - 20/box	2010459-001
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor, LNOP NeoPT. Neonatal - 20/box	2010461-001
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor Bridge, LNOP Neo. Neonatal - 20/box	2010460-001
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor, LNOP-Neo-L. Neonatal - 20/box	2017089-001
SpO_2 - Sensor	Masimo LNOP Disposable Adhesive Sensor, LNOP NeoPT-L. Neonatal - 20/box	2017090-001
SpO_2 - Sensor	Masimo LNOP Adtx Disposable Adhesive Sensor Transparent Tape LNOP, Adult - 20/box	2027269-001
SpO_2 - Sensor	Masimo LNOP Pdtx Disposable Adhesive Sensor Transparent Tape LNOP, Pediatric - 20/box	2027270-001
SpO_2 - Sensor	Masimo LNOP Disposable LNOP Disposable LNOP Hi Fi Sensor Neonatal/Adult - 20/box	2027272-001
SpO_2 - Sensor	Masimo LNOP Disposable LNOP Disposable LNOP Hi Fi Sensor Infant/Pediatric - 20/box	2027271-001
SpO_2 - Sensor	Masimo LNOP Disposable LNOP Disposable LNOP Blue Infant Thumb/Toe Sensor - 20/box	2027273-001
SpO_2 - Sensor	Masimo LNOP Reusable Finger Sensor LNOP/DCIP Pediatric	2002799-001
SpO_2 - Sensor	Masimo LNOP Reusable Finger Sensor LNOP/DCI Adult, LNOP/DCI	2002800-001
SpO_2 - Sensor	Masimo LNOP Reusable Multisite Sensor LNOP-YI	2010463-001
SpO_2 - Sensor	Masimo LNOP Reusable Tip-Clip Ear Sensor LKNOP TC-I	2027274-001
SpO_2 - Sensor	Masimo LNOP Reusable Finger Sensor Adult DC-195	2009745-001
SpO_2 - Sensor	Masimo LNCS DCI Reusable Adult Sensor	2027258-001
SpO_2 - Sensor	Masimo LNCS DCIP Reusable Pediatric Sensor	2027259-001
SpO_2 - Sensor	Masimo LNCS TC-I TipClip Reusable Ear Sensor	2027261-001
SpO_2 - Sensor	Masimo LNCS Adult, Transparent Adhesive Sensor - 20/box	2027253-001

Part	Part description	Part number
SpO_2 - Sensor	Masimo LNCS Pdtx Pediatric Adhesive Sensor - 20/box	2027254-001
SpO_2 - Sensor	Masimo LNCS Inf-L Infant Adhesive Sensor - 20/box	2027255-001
SpO_2 - Sensor	Masimo LNCS Neo-L Neonatal Adhesive Sensor - 20/box	2027256-001
SpO_2 - Sensor	Masimo LNCS NeoPt-L Neonatal PT Adhesive Sensor - 20/box	2027257-001
SpO_2 - Cable - 2.4 m	Cable Pulse Oximeter Masimo PC08 2.4 m	2009743-001
SpO_2 - Cable - 3.6 m	Cable Masimo PC12 3.6 m (12 ft)	2009744-001
SpO_2 - Cable Assy - 2.4 m	Masimo LNOP, SpO_2 2.4 m	2017002-003
SpO_2 - Cable Assy - 3.6 m	Masimo LNOP, SpO_2 3.6 m	2017002-001
SpO_2 - Cable Assy - 3 m	Masimo LNC-10, SpO_2 3 m	2027263-002
SpO_2 - Accessory	Masimo Replacement Posey Wrap, LNOP-NeoPt-L, Neonatal - 12/box	2010466-001
SpO_2 - Accessory	Masimo Tape Bag for LNOP-NEO - 100/box	2010467-001
SpO_2 - Accessory	Masimo Tape Cleanshield Multisite, LNOP-YI - 100/box	2010468-001
SpO_2 - Accessory	Masimo Disposable Standard Multisite Wrap, Adult/Ped/ Neonatal Adhesive Attachment Wraps, use with LNOP-YI Multisite Reusable Sensor - 100/box	2010469-001
SpO_2 - Accessory	Masimo Tape Standard Petite Wrap, LNOP-YI - 100/box	2010470-001
SpO_2 - Accessory	Masimo Adhesive Tape for LNOP-YI - 12/box	2010471-001

Temperature accessories - Alaris

Part	Part description	Part number
Alaris Temperature, Oral Probe	Sensor Turbo Temp Temperature, Long, White Cord (Blue)	2008774-001
Alaris Temperature, Rectal Probe	Sensor Turbo Temp Temperature, Long Rectal, White Cord (Red)	2008775-001
Alaris Temperature, Oral Probe	Sensor Tri-Site Temperature, Long, White Cord (Blue)	2041178-001
Alaris Temperature, Rectal Probe	Sensor Tri-Site Temperature, Long Rectal, White Cord (Red)	2041179-001
Alaris Probe Covers	Probe covers - case	088015

Temperature accessories - Exergen

Part	Part description	Part number
Exergen Temporal Scanner, Fahrenheit - arterial	Exergen TAT-5000 temporal scanner with cable interface to the V100, reporting in °F calibrated to arterial reference	2044860-001
Exergen Temporal Scanner, Celsius - arterial	Exergen TAT-5000 temporal scanner with cable interface to the V100, reporting in °C calibrated to arterial reference	2044860-002
Exergen Temporal Scanner, Celsius - oral	Exergen TAT-5000 temporal scanner with cable interface to the V100, reporting in °C calibrated to an oral reference	2044860-003
Exergen Temporal Scanner, Fahrenheit - oral	Exergen TAT-5000 temporal scanner with cable interface to the V100, reporting in °F calibrated to an oral reference	2044860-004
Exergen Scanner Disposable Caps	Protective covers - rigid plastic covers probe cone, 1000/ box	EX134203
Exergen Scanner Disposable Caps	Protective covers - rigid plastic covers probe cone, 5000/ box	EX134205
Exergen Scanner Disposable Sheath	Disposable tubular protective sheath, 250/box	EX129462
Cable - Exergen	Cable, Exergen TAT-5000 to V100 interface	2044860-005
Calibration - Exergen, Fahrenheit - arterial	Exergen calibration verification kit for °F calibrated to an arterial reference	EX129003
Exergen Scanner Holder	Exergen TAT-5000 holder and installation instructions	2051186-001

Power accessories

Part	Part description	Part number
Battery - CARESCAPE V100 vital signs monitor	FRU CARESCAPE V100 vital signs monitor battery (X1 Batt)	2037103-016
12W Power Supply	Power supply, Input 100-240VAC 50/60 Hz 0.5A; Output 12VDC 1.0A	2018859-001
12W Power Supply (Japan)	Power supply, Input 100-240VAC 50/60 Hz 0.5A; Output 12VDC 1.0A	2018859-004
Power Cord (Japan)	Power supply cord, Japan ST-ST PSE 10A 250V 12 FT	405535-014
Power Cord (US)	Power supply cord, hospital grade 10A 125V 12FT	405535-002
Power Cord (continental Europe and Korea)	Power supply cord, continental Europe 10A 250V 2.5M	401855-101
Power Cord (UK)	Power supply cord, British 10A 250V 2.5M	401855-102

Part	Part description	Part number
Power Cord (Italy)	Power supply cord, Italian 10A 250V 2.5M	401855-103
Power Cord (Australia)	Power supply cord, Australian 10A 250V 2.5M	401855-110
Power Cord (India)	Power supply cord, Indian 10A 250V 2.5M	401855-108

Printer accessories

Part	Part description	Part number
Replacement Paper	Printer paper roll - 10/box	089100

Mounting accessories

Part	Part description	Part number
Roll Stand	Rollstand, CARESCAPE, GCX Version	2033297-001
Pole Mount	Pole Mount	2009762-001
Power Supply Mounting Bracket	12W Power supply roll stand bracket	2047870-001
Wall Mount Bracket	GCX wall mount bracket for DP100 - 400 monitors	CR-0008-01
IR adapter cable roll mount bracket	IR adapter cable roll mount bracket	2025344-001

Connectivity accessories

Part	Part description	Part number
ILC1926	Isolated Line Converter	001926
ILC1931	DINALINK ApexPro Adapter	001931
ILC1932	DINALINK ApexPro FH adapter	001932
Cable Assy, use with 001932	Cable assembly to use with 001932	394119-008
Cable Assy, use with 001931	Cable assembly telemetry interface DINALINK	418497-002
Cable Assy, use with 001926, 001931, 001932	Cable assembly, DINAMAP to ILC	683235
Cable Assy	Cable assembly, ILC to PC	683242
Cable Kit, USB	USB cable kit, DINAMAP to PC	2040229-001
Patient ID	Patient ID IR Cable (used with IR adapter kit)	2024500-001

Part	Part description	Part number
Patient ID Kit	IR adapter kit with bracket	2026273-002
Remote Alarm	Remote Alarm Cable	487208CR

C Maintenance

Assistance and parts

There are no user-serviceable parts inside the monitor. Refer all servicing to qualified personnel.

If the product fails to function properly, or if assistance, service or spare parts are required, contact Customer Support. Before contacting Customer Support, it is helpful to attempt to duplicate the problem and to check all accessories to ensure that they are not the cause of the problem. If you are unable to resolve the problem after checking these items, contact GE. Prior to calling, please be prepared to provide:

- product name, model number, and serial number
- a complete description of the problem

If repair parts or service are necessary, you will also be asked to provide:

- the facility's complete name, address, and account number
- a purchase order number if the product needs repair or when you order spare parts
- the facility's GE account number, if possible
- the appropriate part number for spare or replacement parts

Maintenance, calibration, and cleaning

An effective maintenance schedule should be established for your monitoring equipment and reusable supplies. This should include inspection as well as general cleaning on a regular basis. The maintenance schedule must comply with the policies of your institution’s infection control unit and/or biomedical department.

WARNINGS

Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

Calibration equipment should always be kept dry and free of particulate matter. Moisture or foreign substances introduced to the pneumatic system may cause damage to the monitor and/or the accessories, leading to impaired performance and/or inaccurate readings.

NOTES

- Discard single-use accessories after use.
- There are no user-performed maintenance or calibration procedures for Alaris thermometry.
- GE does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

Calibration and leak testing

Full calibration and leak testing are available in the "CARESCAPE V100 Vital Signs Monitor Service Manual."

Cleaning

Cleaning schedule

CAUTION
To prevent cross-contamination, clean exterior surfaces of the monitor, monitor accessories, and reusable sensors on a regular basis in compliance with your institution's infection control unit and/or biomedical department's local policy.

Cleaning the monitor, monitor accessories, and the Exergen temporal scanner

WARNINGS
Never pour or spray water or any cleaning solution on the equipment or permit fluids to run behind switches, into connectors, into the recorder, or into any ventilation openings in the equipment. Do not let fluid "pool" around connection pins.

Use of unapproved cleaning agents can cause case damage resulting in unintended fluid ingress and a potential for compromising electrical safety.

Cleaning the exterior surfaces of the monitor, monitor accessories, or the Exergen temporal scanner

Disconnect the monitor from AC power before cleaning or disinfecting its surface. The exterior surfaces of the monitor, monitor accessories, and temporal scanner may be cleaned with a dampened, lint-free cloth. Wipe off all cleaning solutions with a clean, dry cloth and let air dry for at least 15 minutes. Use one of the following approved solutions:

- Water

- Mild soap
- Household bleach (5.25% sodium hypochlorite). Mix 10:1 with distilled water.
- Sagrotan (dilution 3:100, containing 75 mg tartaric acid per 100ml solution).
- Exergen temporal scanner only: Alcohol-based cleaning agents can be used on the scanner's probe head and metal neck only.

Never use the following cleaning agents on the monitor, monitor accessories, or the Exergen temporal scanner:

- Abrasive cleaners or solvents of any kind
- Acetone
- Ketone
- Betadine
- Alcohol-based cleaning agents. (However, an alcohol-based cleaning agent can be used on the Exergen scanner's probe head and metal neck only.)
- Petroleum-based cleaning agents
- Any type of solution that contains ammonium chloride, conductive solutions, wax or wax compounds
- Sodium salts

NOTE

Never autoclave or steam clean the monitor, cuffs, or accessories.

Cleaning the displays of the monitor or Exergen temporal scanner

To clean the display covers, use a soft, clean cloth dampened with a glass cleaner. Never spray the glass cleaner directly onto the display, and never use alcohol- or petroleum-based products.

Cleaning the sensor lens of the Exergen temporal scanner

Dirt, greasy film, or moisture on the scanner lens will interfere with the accuracy of the temperature reading. Regularly clean the lens with a cotton swab dipped in alcohol and follow the instruction label on the scanner. Only use gentle pressure for cleaning to avoid lens damage. Water can be used to remove any residual film left by the alcohol. Do not use bleach or other cleaning solutions on the sensor lens.

Cleaning the probe head and neck of the Exergen temporal scanner

Use an alcohol-based cleaning agent on the Exergen scanner's probe head and metal neck only.

Cleaning and disinfecting blood pressure cuffs

General

The cuff must be thoroughly cleaned with the specified detergent before reuse. The additional use of household bleach as described below provides at least intermediate-level disinfection.

NOTE

Never autoclave or steam clean the monitor, cuffs, or accessories.

- Apply cuff hose caps before cleaning.
- While this procedure is adequate for cleaning/disinfection, it may not remove all stains.
- Do *not* immerse hoses.
- Do *not* immerse cuffs without prior application of cuff hose caps.

Materials:

- Enzymatic detergent such as ENZOL® enzymatic detergent (US) or Cidezyme® enzymatic detergent (UK)
- Distilled water
- 10% solution of household bleach (5.25% sodium hypochlorite) in distilled water
- Soft cloths and soft-bristled brushes
- Spray bottles

Procedure

1. Prepare the enzymatic detergent according to the manufacturer's instructions and the 10% bleach solution, in separate spray bottles.
2. Spray the detergent liberally on the cuff. If the material is dried on, allow the detergent to set for 1 minute. For soil on the soft part of the closure or the cuff itself, wipe the material off with a soft cloth. For persistent contamination on the soft part of the closure, use a soft-bristled brush to loosen particles. Rinse with copious amounts of distilled water. Repeat until no visible contamination remains. For soil on the hook part of the closure, use a soft-bristled brush to remove the material, and rinse with copious amounts of distilled water. Repeat until no visible contamination remains.
3. Spray the 10% bleach solution on the affected area until the area is saturated. Allow the solution to set for 5 minutes.
4. Wipe away any excess solution and rinse the cuff again with distilled water. Allow 2 hours for drying.

The user has the responsibility to validate any deviations from the recommended method of cleaning and disinfection.

For additional information on infection control procedures, contact GE Technical Support.

Cleaning the exterior surfaces of the Alaris temperature devices

It is good practice to periodically clean the probe's surface by wiping it with a soft cloth dampened with a mild detergent and warm water. Refer to the Housekeeeing, Central Service or Infection Control departments in your facility for further information. You may use the following cleaning solutions:

- Cidex®, Betadine®, or 3% hydrogen peroxide.

NOTE

Betadine may discolor the case. Use a 10% solution of bleach to remove the discoloration. Apply the listed solutions with a dampened sponge, soft brush, or a cloth, then wipe dry with a clean cloth or towel.

CareFusion Corporation does not recommend Ethylene Oxide (EtO) sterilization of the Turbo Temp or Tri-Site temperature probes.

If you currently use a specific cleaning agent or disinfectant, we recommend that you examine its chemical ingredients prior to use on the probe. If you question the effect your specific cleaning agent or disinfectant has on your instrument, contact your local GE Healthcare sales and service office or distributor.

Do not use alcohol, ammonia, or ammonium chloride-based agents as they could damage the plastic exterior of the probe. Do not allow fluids to enter the probe. Fluid leakage into the probe can cause damage. Do not autoclave or immerse the probe as damage will occur.

SpO_2 sensors

Adhesive sensors are sterile and for single use only. For reusable temperature sensors, consult the sensor manufacturer instructions for cleaning, sterilization, or disinfecting methods.

Battery and storage care

NOTE

The expected lifetime of the battery depends on the way in which the monitor is used. If the battery is allowed to discharge to 50%, it should survive approximately 400 charge/discharge cycles. Deeper discharge will reduce battery life expectancy. It is never recommended to fully discharge the battery.

Batteries should always be fully charged before being placed in storage. Even after 6 months of storage, a fully charged battery can retain about 80% of its charge. It is recommended that batteries should not be left in storage more than 6 months without a full recharge. A fully charged battery in good condition will provide sufficient power to operate a monitor for approximately 5 -11 hours, depending upon configuration and use.

- With the usage scenario of auto NIBP every 5 minutes with adult cuff, printout after every determination, SpO_2 parameter active at 60 bpm, temperature parameter active in monitor mode the average run time is 5 hours.
- With the usage scenario of NIBP determinations every 15 minutes, without SpO2 technology and temperature function active, the run time is up to 11.5 hours.

It is best to keep the battery charged as fully as practical and never store the monitor with the battery in a discharged condition. When the battery will no longer hold a charge, remove and replace it with a GE approved battery. Failure to use a GE approved battery may cause the monitor to shutdown.

NOTE

After replacing batteries, an '***E00***' error code is normal. To clear the '***E00***' error code, press the **Silence** button on the monitor. The user settings and date/time revert to the factory default setting.

Battery charging will take place as long as the monitor remains connected to an external DC power source

WARNING

Keep the monitor connected to an external DC power source when not in use to ensure maximum battery charge.

Extended battery storage

NOTE

When storing the product for extended periods, it is highly recommended to disconnect the battery. Otherwise, the battery may over-discharge, resulting in a significant reduction in battery life.

If it becomes necessary to store the monitor for an extended period of time, first fully charge then remove the main battery. Then store the monitor and the main battery in the original packaging materials.

Replacing the battery

Monitor

DANGERS

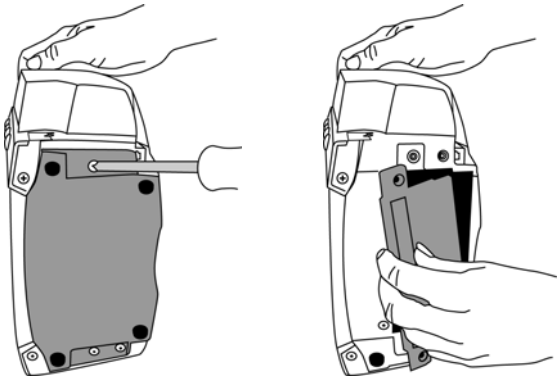
Before replacing the battery, disconnect the monitor from the DC power supply.

ELECTRIC SHOCK — Do not touch the patient and the DC power input connector pins simultaneously.

NOTES

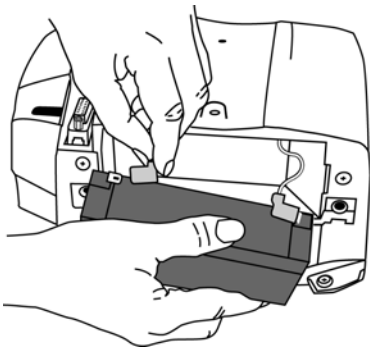
- Record the configuration settings on your monitor before replacing the battery. When the battery is replaced, all user settings are lost and return to default values.
- Replacement batteries may be obtained from GE.

1. Unplug the monitor from the DC power source.
2. Looking at the bottom of the monitor, remove the battery compartment cover by removing the four screws that secure the cover and help card tray.
3. Remove the help card tray and battery door cover.



WARNING
When reconnecting the battery, ensure the battery maintains the correct polarity by connecting the red lead to the positive terminal and the black lead to the negative terminal.

4. Remove the old battery and disconnect the wires. Attach the battery wires to the new battery, ensuring the red terminal (+) is connected to the red wire and the black terminal (-) is connected to the black wire.
5. Insert the battery into the compartment.



6. Then replace the cover, help card tray, and screws. Insert the external DC power converter plug into the external DC power socket and plug into an AC outlet.

NOTE
Error code '***E00***' appears (memory lost) alerting you that the user settings (including alarm limits and inflation pressure) and date/time will go back to default values.

7. Reset the date/time and applicable user settings.

Exergen temporal scanner

NOTE
If the Exergen scanner is not used regularly, remove the battery to prevent possible damage due to chemical leakage.

1. Disconnect the scanner cable from the monitor.
   - Loosen the two thumbscrews from the scanner cable connector.
   - Unplug the scanner cable from the monitor's Host Communication port.

2. Loosen the single screw (**1**) at the bottom, on the back of the scanner, and remove the battery cover (**2**).

3. Disconnect the old battery (**3**) and replace with a new high quality 9-volt alkaline battery (**3**) in the same location.
4. Replace the battery cover (**2**), and tighten the screw.
5. Reconnect the scanner cable to the Host Communication port and tighten the two screws.

Repairs

If your product requires warranty, extended warranty, or non-warranty repair service, contact GE Technical Support or contact your local GE representative.

Estimates for non-warranty repairs are provided at no charge; however, the product must be sent to GE for an estimate. To facilitate prompt service in cases where the product has external chassis or case damage, please advise the representative when you call.

The representative will record all necessary information and will provide a Return Authorization Number. Prior to returning any product for repair, a Return Authorization Number must be obtained.

Packaging material

Retain original packaging materials for future use in storing or shipping the monitor and accessories. This recommendation includes corrugated shippers and foam/corrugated spacers.

If you decide to dispose of these materials, we recommend recycling them.

Packing instructions

If you have to return goods for service, follow these recommended packing instructions:

- Remove all hoses, cables, sensors, and power cords from the monitor before packing.
- Pack only the accessories you are requested to return; place them in a separate bag and insert the bag and the product inside the shipping carton.
- Use the original shipping carton and packing materials, if available.
- Observe the environmental conditions detailed in the Product Overview section of this manual.
- It is recommended that all returned goods be insured. Claims for loss or damage to the product must be initiated by the sender.

If the original shipping carton is not available:

- Place the product in a plastic bag and tie or tape the bag to prevent loose particles or materials from entering openings such as hose ports.
- Use a sturdy corrugated container to ship the product; tape securely to seal the container for shipping.
- Pack with at least 4 inches of padding on all sides of the product.

Disposal of product waste

As you use the monitor, you will accumulate solid wastes that require proper disposal or recycling. These include batteries, patient applied parts, and packaging material. Dispose of these materials according to local or national regulations.

Batteries

The sealed, rechargeable backup battery contains lead and can be recycled. Do not puncture or place the battery in a trash compactor. Do not incinerate the battery or expose it to fire or high temperatures. Dispose of these materials according to local or national regulations.

Dispose any battery in accordance with regional body controlled guideline.

Patient applied parts

Certain patient applied parts, such as those with adhesive (disposable SpO_2 sensors), are intended for single use and should be disposed of properly as medical waste in accordance with regional body controlled guideline.

Other patient applied parts, such as blood pressure cuffs, should be cleaned according to instructions. Inspect reusable applied parts for wear before each use, replace as necessary, and dispose of used product as medical waste in accordance with regional body controlled guideline.

Monitor

At the end of its service life, the product described in this manual, as well as its accessories, must be disposed of in compliance with the guidelines regulating the disposal of such products. If you have questions concerning disposal of the product, please contact GE or its representatives.

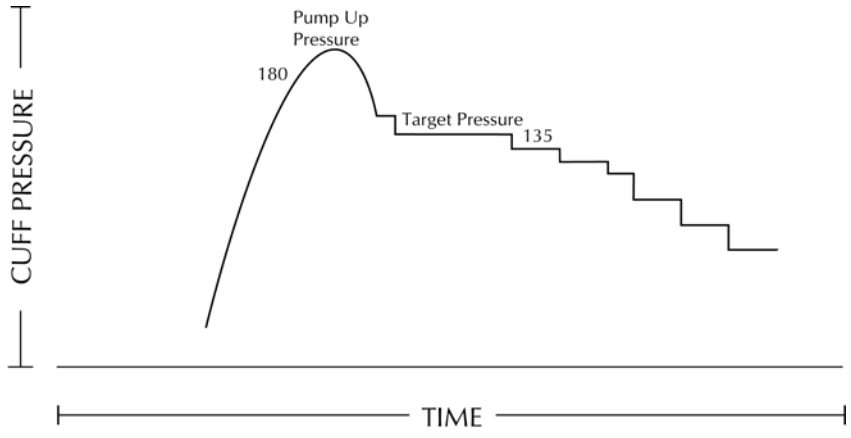
D Principles of Noninvasive Blood Pressure Determination

DINAMAP SuperSTAT algorithm

The oscillometric method of determining NIBP is accomplished by a sensitive transducer which measures cuff pressure and pressure oscillations within the cuff. For the first determination taken on a patient, the algorithm stores the pattern of the patient's oscillation size as a function of the pressure steps. For subsequent manual, auto, or Stat determinations taken within 2 minutes of a previous determination of the same patient, as few as four pressure steps may be necessary to complete the determination process. In auto mode the data is stored for up to 16 minutes. When employing fewer pressure steps, the system uses the stored information from the previous blood pressure determination to decide the best pressure steps to take. The algorithm measures the consistency of pulse size to tell if the oscillations taken at a step are good and if more steps are needed.

The first determination settles at an initial target pressure of 135 mmHg (adult mode) and 100 mmHg (neonate mode), depending on initial target pressure preset. To allow for rapid settling of cuff pressure, the monitor will momentarily inflate to a higher pressure then immediately deflate to the target pressure. After inflating the cuff, the NIBP parameter begins to deflate. The oscillations versus cuff pressure are measured to determine the mean pressure and calculate the systolic and diastolic pressures.

During an NIBP determination, the parameter deflates the cuff one step each time it detects two pulsations of relatively equal amplitude. The time between deflation steps depends on the frequency of these matched pulses (pulse rate of the patient). However, if the monitor is unable to find any pulse within several seconds, it will deflate to the next step. The process of finding two matched pulses at each step provides artifact rejection due to patient movement and greatly enhances the accuracy of the monitor. The figure shows a full determination sequence for an adult patient. In Stat mode, some steps may require only one pulse.

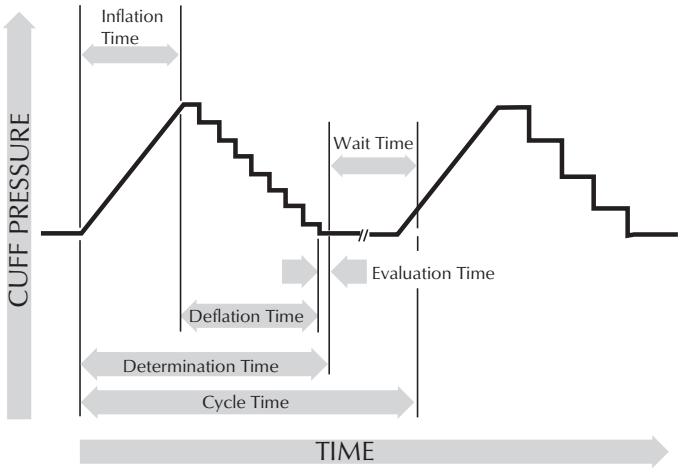


Full NIBP determination sequence for adult (specific pressure values are examples only)

At each step the microprocessor stores cuff pressure, the matched pulse amplitude, and the time between successive pulses. The stepped deflation and matched pulse detection continues until diastolic pressure is determined or total

cuff pressure falls below 8 mmHg. The parameter then deflates the cuff (to zero detected pressure), analyzes the stored data, and updates the screen.

The operating cycle is composed of four parts: inflation time, deflation time, evaluation time, and wait time. Wait time, which varies from mode to mode, is affected by the cycle time (auto mode) or operator intervention (manual mode). The figure shows the basic operating cycle for an NIBP determination.



SuperSTAT NIBP - auto mode

Systolic search

NOTE

Arrhythmias will increase the time required by the NIBP parameter to determine a blood pressure.

If systolic pressure is not found, the SuperSTAT algorithm can search at cuff pressures higher than the initial target pressure. The algorithm will inflate above the initial target pressure to obtain more data in the systolic region. The pressure is limited to the maximum allowed for the selected patient type.

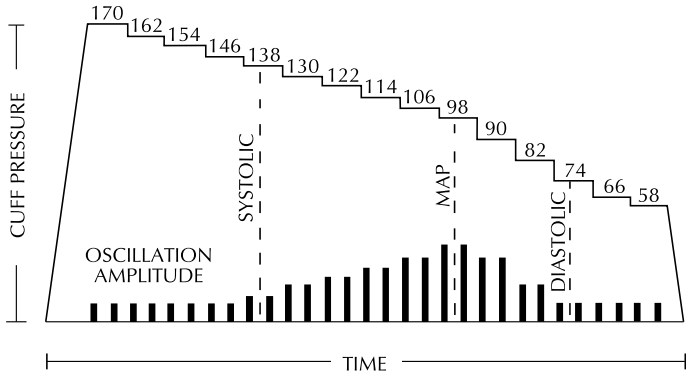
The SuperSTAT algorithm evaluates the data obtained during the determination, and the prior determination if it is available, to determine if additional data is needed to complete the determination. It can then selectively pump to a single cuff pressure to obtain the data it needs and then return to the existing deflation sequence. This search process makes SuperSTAT more efficient.

Accuracy of the SuperSTAT NIBP measurements was validated against the intra-arterial method. Do not use the auscultatory method to verify the accuracy of the SuperSTAT NIBP parameter. The auscultatory method (using the cuff and stethoscope) determines the systolic and diastolic pressures from sounds that occur during cuff deflation. Mean arterial pressure cannot be determined by the auscultation method. The oscillometric method used with all DINAMAP technologies determines systolic, mean and diastolic pressures from the oscillation pattern that occurs in the cuff during deflation.

DINAMAP Classic and auscultatory reference algorithm

The oscillometric method of determining NIBP is accomplished by a sensitive transducer, which measures cuff pressure and minute pressure oscillations within the cuff. The first determination sequence initially pumps up to a cuff pressure of about 160 mmHg for adult/pediatric patients or 110 mmHg for neonates depending on initial target pressure preset. After inflating the cuff, the monitor begins to deflate it and measures systolic pressure, mean arterial pressure, and diastolic pressure. When the diastolic pressure has been determined, the monitor finishes deflating the cuff and updates the screen.

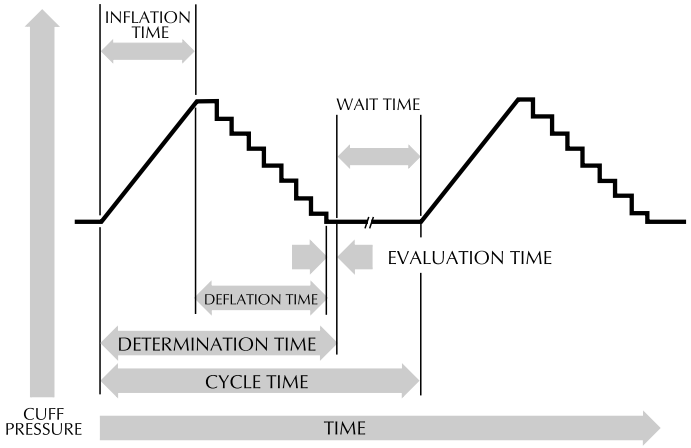
The monitor deflates the cuff one step each time it detects two pulsations of relatively equal amplitude. The time between deflation steps depends on the frequency of these matched pulses (pulse rate of the patient). However, if the monitor is unable to find any pulse within several seconds, it will deflate to the next step. The process of finding two matched pulses at each step provides artifact rejection due to patient movement and greatly enhances the accuracy of the monitor. The figure shows the NIBP determination sequence.



NIBP determination sequence
(specific pressure values are examples only)

At each step the microprocessor stores cuff pressure, the matched pulse amplitude, and the time between successive pulses. The stepped deflation and matched pulse detection continues until diastolic pressure is determined or total cuff pressure falls below 7 mmHg. The monitor then deflates the cuff (to zero detected pressure), analyzes the stored data, and updates the screen.

The operating cycle is composed of four parts: inflation time, deflation time, evaluation time, and wait time. Wait time, which varies from mode to mode, is affected by the cycle time (auto mode) or operator intervention (manual mode). The figure shows the basic operating cycle.



NIBP operating cycle

Systolic search

If systolic pressure is not found, the NIBP parameter can search at cuff pressures higher than the initial target pressure. The parameter will inflate the cuff above the initial target pressure to get more data in the systolic region. The pressure is limited to the maximum allowed for the selected patient type.

In any operating mode, if a patient's systolic pressure exceeds the inflation pressure of the monitor, the monitor will begin normal deflation sequence, detect the absence of a systolic value, stop deflation, reinflate to a higher (than initial) inflation pressure, and resume normal deflation sequence.

In manual mode, if a previous valid systolic pressure is displayed and less than 2 minutes old, and the new systolic pressure oscillations are compared with the previous valid determination and the monitor "thinks" that the systolic was not obtained, the monitor will inflate the cuff to a pressure above the immediately preceding inflation.

Reference used to determine NIBP accuracy

To establish accuracy of an NIBP device, manufacturers have used several different types of references. The reference blood pressures may be obtained by invasive pressure monitoring at the central aortic region or at the radial sites. The reference blood pressures may also be obtained by noninvasive methods like auscultatory method (using cuff and stethoscope).

CAUTION
For neonatal mode, the reference is always the intra-arterial pressure monitoring method.

Monitors with intra-arterial reference (DINAMAP SuperSTAT and Classic technology)

In these monitors, the NIBP is referenced to the invasive blood pressure obtained at the central aortic region.

Monitors with auscultatory reference (DINAMAP auscultatory reference technology)

In these monitors, the reference blood pressure is the auscultatory method for adult and pediatric populations. For neonatal populations, the usual reference is the invasive blood pressure obtained from the umbilical artery.

NOTE
For neonatal determinations the SuperSTAT algorithm is always used.

GE Medical Systems
Information Technologies, Inc.
8200 West Tower Avenue
Milwaukee, WI 53223 USA
Tel: + 1 414 355 5000
1 800 558 5120 (US only)
Fax: + 1 414 355 3790

EC REP

GE Medical Systems
Information Technologies, Inc. GmbH
Munzingerstrasse 5
79111 Freiburg
Germany
Tel: + 49 761 45 43 - 0
Fax: + 49 761 45 43 - 233

Asia Headquarters

GE Medical Systems
Information Technologies, Inc. Asia; GE (China) Co., Ltd.
No1 Huatuo Road,
Zhangjiang Hi-tech Park Pudong
Shanghai, P.R. China 201203
Tel: + 86 21 5257 4650
Fax: + 86 21 5208 2008

GE Medical Systems *Information Technologies*, Inc., a General Electric Company, doing business as GE Healthcare.
www.gehealthcare.com

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