"DIGITAL OXIMETRY"

User's Manual

Handheld Pulse Oximeter
Model 513

January 29, 1999

Catalog No. 9300-23-00

CE
0086

About this manual

This manual is written for clinical personnel using the Novametrix Handheld Pulse Oximeter, Model 513, and the oximeter sensors and accessories intended for use with the monitor.

Model 513 Technical Description

Per requirements of IEC 601-1, the Model 513 is classified as class II equipment, internally powered, with type BF applied part, and an enclosure protection rating of IPX0. The Model 513 is Year 2000 compliant.

Transport/Storage: -10 to +55° C (14-131° F), 10-95% R.H. non-condensing
Operating Conditions: 10 to +40° C (50 to 104° F), 10-90% R.H. non-condensing

The Handheld Pulse Oximeter, Model 513, contains no user serviceable parts. Refer servicing to qualified service personnel. A technical Service Manual (9300-90) is available for use by technical personnel.

Manufacturing Quality & Safety

The Novametrix Medical Systems Inc. manufacturing facility is certified to both ISO 9001 and EN46001 (MDD93/42/EEC Annex II). Novametrix' products bear the "CE 0086" mark. The product is certified by Underwriter's Laboratories (UL) to bear the UL mark; and tested by TÜV Rheinland to IEC 601-1/EN60601-1.

Declaration of Conformity with European Union Directive

The Authorized Representative for Novametrix equipment is:

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Manual Revision History

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General Description

The Novametrix Model 513 is an easy-to-operate handheld pulse oximeter. It determines functional oxygen saturation (SpO_2) and pulse rate values and displays them to the user on a bright easy-to see display. A bargraph, indicative of the plethysmogram signal, is also displayed. The monitor is powered from two "AA" batteries. An optional external power adapter is available. A built-in infrared communications port allows the Model 513 to communicate through an optional infrared adapter with a printer or computer.

Indications for Use

The Model 513 Handheld Pulse Oximeter is indicated for use by technically skilled clinical personnel for the monitoring of oxygen saturation and pulse rate in patient areas including adult, pediatric and neonatal.

Principles of Operation

The Model 513 measures oxygen saturation and pulse rate with sensors that contain red and infrared light sources—light emitting diodes, or LEDs. Since oxygen saturated blood absorbs different amounts of light at each wavelength (red and infrared) as compared to unsaturated blood, the amount of light absorbed by the blood in each pulse can be used to calculate oxygen saturation.

The light energy from red (660 nm) and infrared (940 nm) LEDs is beamed through a sample cell—a pulsating vascular bed, the patient's finger or toe for example. The remaining light energy not absorbed by the sample cell reaches a light receptor, called a photodiode, on the opposing side of the sensor. The data received at the photodiode is sent back to the monitor where it is split into its red and infrared components, digitized, processed by a microprocessor chip, and finally displayed as a numerical value for oxygen saturation. The moment to moment changes in this signal are reflected on the bargraph display.

The Model 513 is calibrated to display "functional" saturation. This differs from the "fractional" saturation value displayed by most co-oximeters. Functional saturation represents the amount of oxyhemoglobin as a percentage of the hemoglobin that can be oxygenated. Dysfunctional hemoglobins, (COHb and METHb) are not included in the measurement of functional saturation.

- Functional Saturation = $HbO_2/100-(COHb+METHb)$; HbO_2 is fractional hemoglobin, COHb is carboxyhemoglobin, and METHb is methemoglobin.

Pulse Rate is calculated by measuring the time interval between the peaks of the infrared light waveform. The inverse of this measurement is displayed as pulse rate.

Patient Safety

For maximum patient and operator safety, the following are recommended:

- Care should be exercised to assure continued peripheral perfusion distal to the SpO_2 sensor site after application.
- Do *NOT* attach an SpO_2 sensor distal to a blood pressure cuff. Valid data *CANNOT* be processed when the cuff is inflated. Attach the sensor to the limb opposite to the site used for the blood pressure cuff.
- Keep the Model 513 and its accessories clean. Do not operate the Model 513 when it is wet due to spills or condensation.

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- Where electromagnetic devices (i.e., electrocautery) are used, patient monitoring may be interrupted due to electromagnetic interference. Electromagnetic fields up to 3 V/m will not adversely affect system performance.
- The Model 513 contains no user serviceable parts. Refer servicing to qualified service personnel. A technical Service Manual (9300-90) is available for use by technical personnel.

Warnings

WARNING:
Indicates a potentially harmful condition that can lead to personal injury.

- **Explosion Hazard:** Do NOT use the Model 513 in the presence of flammable anesthetics. Use of this instrument in such an environment may present an explosion hazard.
- **Electrical Shock Hazard:** Always turn the Model 513 off before cleaning it. Do NOT use a damaged sensor or one with exposed electrical contacts. Do not use with a damaged external power source. Refer servicing to qualified service personnel.
- **Failure of Operation:** If the monitor fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- **Patient Safety:** Care should be exercised to assure continued peripheral perfusion distal to the SpO_2 sensor site after application.
- Do not position the sensor cable in any manner that may cause entanglement or strangulation.

Cautions

CAUTION:
Indicates a condition that may lead to equipment damage or malfunction.

- Do not operate the Model 513 when it is wet due to spills or condensation.
- Do not operate the product if it appears to have been dropped or damaged.
- Never sterilize or immerse the monitor in liquids.
- Do not sterilize or immerse sensors except as directed in this manual.
- No tension should be applied to any sensor cable.
- Caution: Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.
- Operate at temperatures between 10 to +40° C (50 to 104° F), 10-95% R.H. non-condensing.
- Avoid storing the monitor at temperatures less than -10° C or greater than +55° C (<14° F or >131° F) 10-95% R.H. non-condensing

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Notes

NOTE
Indicates points of particular interest or emphasis and intended to provide for more efficient or convenient operation.

- Use only Novametrix approved sensors and accessories with the Model 513.
- This product and its accessories which have patient contact are free of latex.
- The Model 513 is Year 2000 compliant.
- **Data Validity:** As with all pulse oximeters, inaccurate SpO_2 and Pulse Rate values may be caused by;
  - Incorrect application or use of a sensor
  - Significant levels of dysfunctional hemoglobin; carboxyhemoglobin or methemoglobin
  - Significant levels of indocyanine green, methylene blue, or other intravascular dyes
  - Exposure to excessive illumination such as surgical lamps—especially ones with a xenon light source, or direct sunlight
  - Excessive patient movement
  - Venous pulsations
  - Electrosurgical interference

Symbols

Symbol	Description
	**Patient Isolation** Identifies patient isolation connection as type BF.
	**Attention** Consult manual for detailed information.

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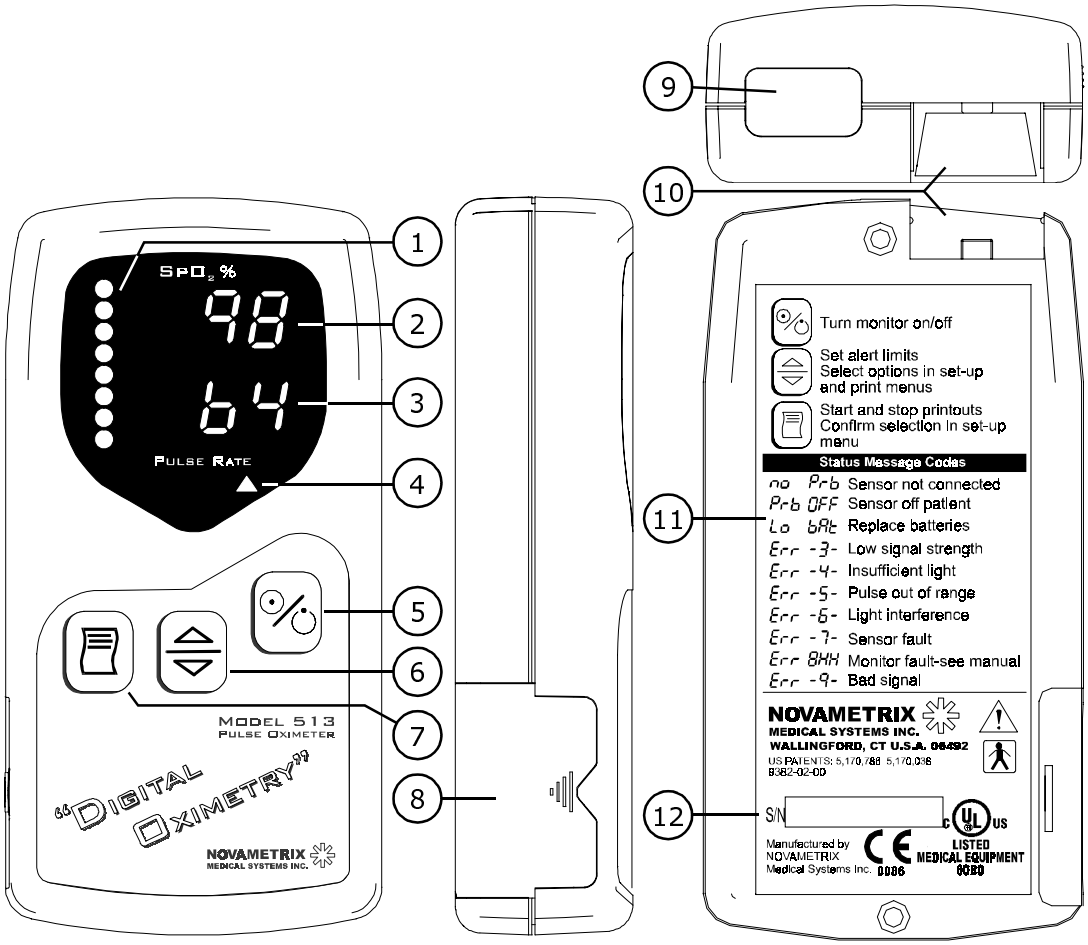
Preparation for Use

Getting Acquainted

The Model 513 Handheld Pulse Oximeter Monitor is shown below.

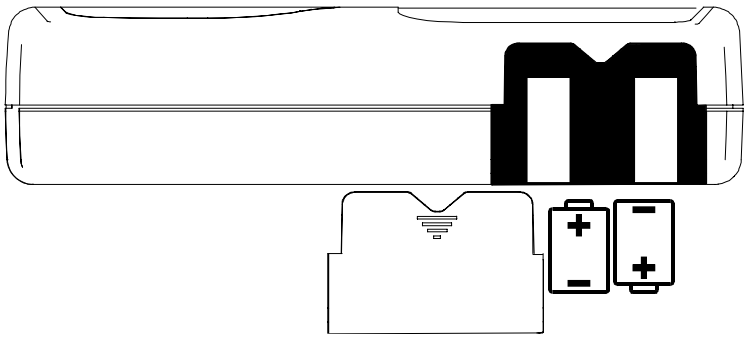


1	**Activity Bar** indicates pulsatile activity (plethysmogram signal).	7	**Print Key** Start/stop printouts. Confirm selections in setup menu.
2	**SpO_2 %** displays oxygen saturation value. Also error and setup messages.	8	**Battery Cover** slides from monitor to access batteries.
3	**Pulse Rate** display value in beats/min. Also error and setup messages.	9	**IR Link** Infrared communications link to external devices.
4	**Alerts Enabled** icon illuminates when alert limits are active.	10	**Sensor Input** Connect only approved Novametrix sensors.
5	**Power Key** turns monitor on/off.	11	**Quick Guide** Basic reference.
6	**Select Key** selects alert limits. Also options in setup and print menus.	12	**Serial Number** and other information.

Power supply options

Batteries. Fresh disposable "AA" alkaline batteries (Panasonic AM3X or equivalent) provide approximately 16 hours of operation. Battery capacity may be reduced in colder temperatures, with excessive power cycling or alerting.

To install or remove the batteries;



1. Turn the monitor off and then slide the battery cover from the unit. Remove the old batteries from the battery compartment.
2. Install fresh batteries according to the polarity diagram. Slide the battery compartment cover back into place and turn the monitor on.

Dispose of batteries in accordance with local laws. Do not mix battery types (e.g. disposable and rechargeable AA batteries). The Model 513 may not power up if the batteries are nearly depleted.

> **WARNING:**
> ⚠ Do not recharge or incinerate alkaline batteries. Attempting to do so may cause the batteries to leak or explode.

Power On/Off

To turn the pulse oximeter on, press the POWER key.

Press the power key 

- All displays are briefly illuminated and an audible tone sounds. Next, the model number (SpO_2 display) and software revision level (Pulse Rate display) are briefly indicated.

To turn the pulse oximeter off, press the POWER key.

Auto Power Off

A battery power saving feature allows the pulse oximeter to shut itself off after waiting three and one-half minutes without detecting any pulsatile activity.

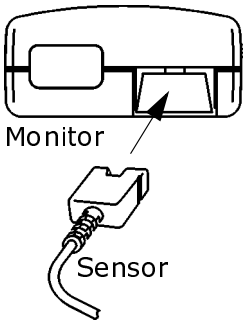
- If three minutes elapse without any detected pulsatile activity, the oximeter emits a two-tone audible signal once each 5 seconds for 30 seconds. If still no pulsatile activity is detected, the pulse oximeter shuts itself off.
- If at any time pulsatile activity is detected, the power off counter is reset.

Refer to "Setup Menu Options" on page 18 to enable (default setting) or disable this feature.

Sensors and Patient Connection

Sensors plug into the receptacle on top of the monitor. Use only Novametrix SuperBright™ Sensors with the Model 513 Pulse Oximeter. Compatible sensors include;

- Reusable Sensors
  - 9168-00 Finger Sensor
  - 9169-00 Y-Sensor™
- Single Patient Use Sensors
  - 6455-00 Pediatric/Adult Foam Wrap Style
  - 6480-00 Neonatal/Pediatric Foam Wrap



Sensor Quick Check

A quick functional check of basic sensor operation.

1. With the sensor connected to the monitor but not applied to the patient, position the sensor heads so they face each other (red light shines on the detector). Is "Prb OFF" displayed?
2. Apply the sensor to your index finger. Are reasonable SpO_2 and pulse rate values displayed?
3. A YES to BOTH #1 and #2 indicates the sensor is operational. Apply the sensor to the patient as instructed.

WARNING

! Before applying to the patient, verify the sensor is physically intact, with no broken/frayed wires or damaged parts. Do not use a broken or damaged sensor or one with wet, contaminated, or corroded connectors.

! After applying to the patient, inspect the site often for adequate circulation—at least once every four hours. Do not wrap so tightly that circulation is restricted. Note the patient's physiological condition. For example, burn patients may be more sensitive to heat and pressure and require more frequent site checks.

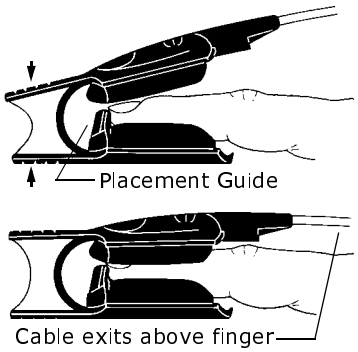
Finger Sensor (9168-00)

The reusable Finger Sensor is intended for adult and appropriately sized pediatric fingers.

To apply: Squeeze the grips. Position the fingertip as shown and release the grips.

To remove: Squeeze the grips. Slide the sensor from the finger and release the grips.

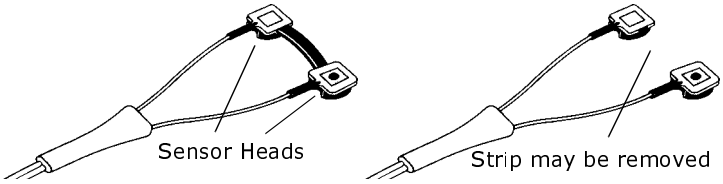
Caution: Overstretching can damage the sensor and affect oximetry readings. Do not force the sensor onto large objects such as bedrails.



Y-Sensor (9169-00)

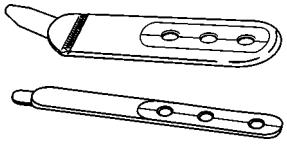
The reusable Y-Sensor is designed for use on all patients from adults to neonates.

Y-Sensor configuration. The Y-Sensor's center strip may be carefully cut away if the distance between the sensor heads needs to be reduced to less than 25mm.

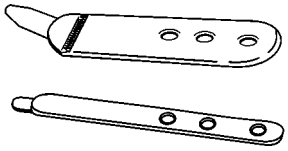


Y-Sensor applicators. The flexible and versatile Y-Sensor is applied to the patient using a variety of adhesive and non-adhesive applicators.

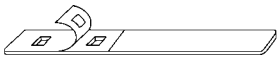
Treat applicators (except ear-clip) in accordance with hospital protocol for single-patient use. Refer to instructions packaged with the various applicators.



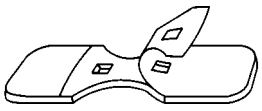
- 6929-00. Adhesive Foam Wraps, Large
  — Adult, pediatric or neonatal use.
- 6968-00. Adhesive Foam Wraps, Small
  — Neonatal or appropriately sized pediatric patient.



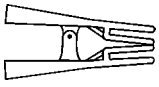
- 8836-00. Non-Adhesive Foam Wrap, Large
  — Adult, pediatric or neonatal use.
- 8943-00. Non-Adhesive Foam Wrap, Small
  — Neonatal or appropriately sized pediatric patient use.



- 8828-00. 20mm Wrap Style Y-Strip Tape (blue)
  — Neonatal foot or hand, pediatric toe or finger.
- 8829-00. 25mm Wrap Style Y-Strip Tape (green)
  — Neonatal foot or hand.

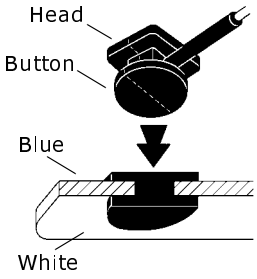


- 8831-00. 20mm Finger Style Y-Strip Tape (blue)
  — Appropriately sized pediatric or adult fingers.
- 8832-00. 25mm Finger Style Y-Strip Tape (green)
  — Adult fingers.



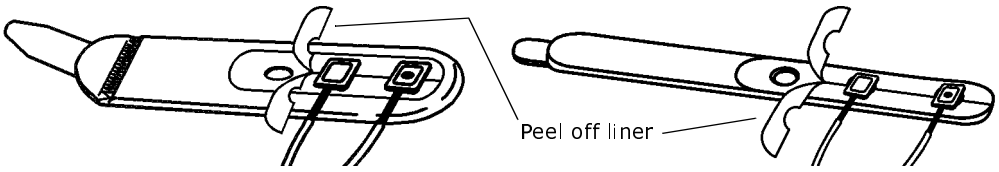
- 6131-00. Ear Clip
  — Adult or pediatric use.

Using Foam Wraps.



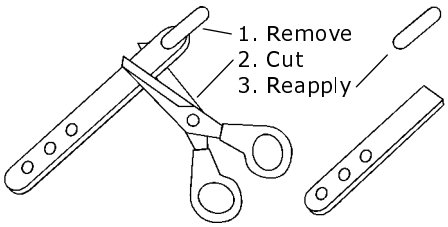
1. Press each sensor "button" through the blue side of the foam wrap.
   - Place the head with the red LED closest to the edge, and the other in either remaining hole (removing the Y-Sensor's center strip as required).
2. If using an adhesive foam tape, remove both sides of the paper liner.

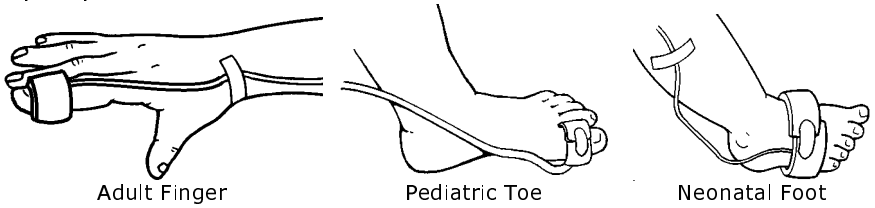
- You can also remove the liners prior to buttoning the sensor into the foam wrap if desired.



3. With the blue foam towards the patient, wrap around the site. Ensure the sensor heads are opposite each other through the tissue. Secure in place with the white plastic tab.
   - The tab on the Small foam wrap is removable, allowing shortening for a better fit. Reapply the tab to secure the wrap in place.

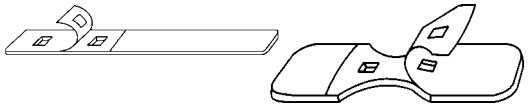
Small foam wrap



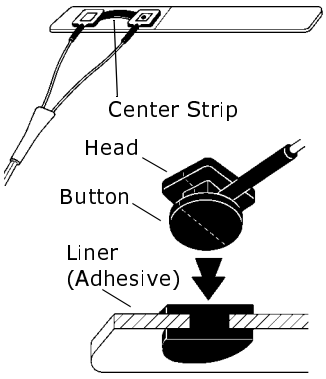


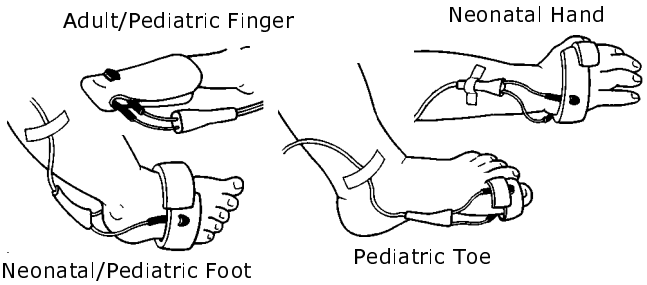
Using Y-Strip Tapes.

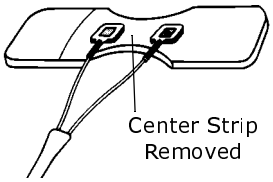
1. Remove the release liner with the holes.



2. Press each sensor "button" through the adhesive side of the tape. (Remove the Y-Sensor's center strip if required.)
3. Remove the remaining release liner. Apply the sensor/tape to the patient. Ensure the sensor heads are opposite each other.

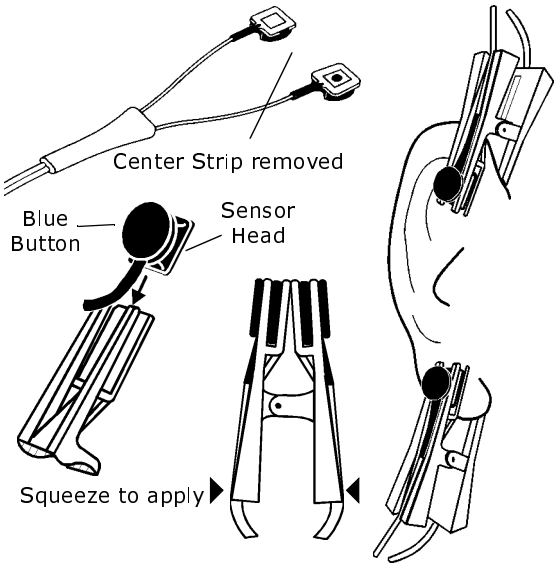






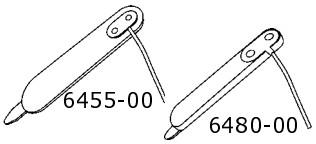
Using the Ear Clip.

1. Remove the center strip from the Y-Sensor.
2. Slide each Y-Sensor head into an Ear Clip receptacle with the blue button facing outwards.
3. Open the clip by squeezing its ends and apply it to the ear.
   - It may be necessary to rub the ear with your fingers in order to increase circulation prior to applying the sensor.
   - Adhesive Dots (8700-00) are included with the ear clip to help hold the clip to the ear.



Single Patient Use Sensors (6455-00 and 6480-00)

These Single Patient Use Sensors are for use on appropriately sized patients.



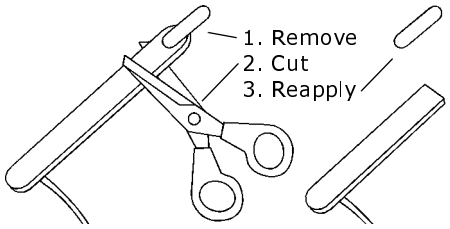
- 6455-00. Pediatric/Adult, Foam Wrap Style — Adult or appropriately sized pediatric patients.
- 6480-00. Neonatal/Pediatric, Foam Wrap Style — Neonatal or appropriately sized pediatric patients.

CAUTION:

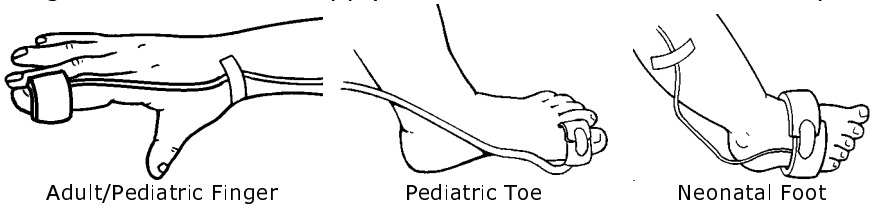
! Single Patient Use SpO_2 sensors can be reapplied to a single patient as needed, but should not be used across multiple patients. Single Patient Use sensors should not be cleaned or disinfected. System performance may be compromised as a result. Replace sensor instead.

1. Select the appropriate size sensor based on the patient type.
2. With the blue foam towards the patient, wrap around the site. Ensure the sensor heads are opposite each other through the tissue. Secure in place with the white plastic tab.

Neonatal/Pediatric

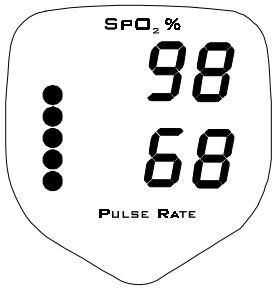


- Double-sided adhesive dots, included with the sensor, can be applied over the LED and detector components to help hold the sensor to the site.
- The tab on the Neonatal/Pediatric sensor is removable, allowing shortening for a better fit. Reapply the tab to secure the sensor in place.



Patient Monitoring

Patient Monitoring

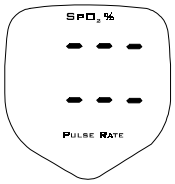


Once the pulse oximeter is powered on and a sensor is connected to the oximeter and properly applied to the patient, numerical SpO_2 and Pulse Rate values appear on the pulse oximeter's display.

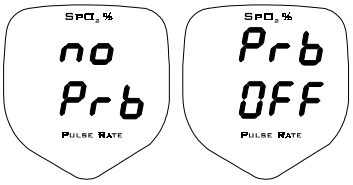
A "pulse activity bar", derived from the pulsatile signal, is also displayed. The activity bar should reflect the patient's pulse. Erratic or non-rhythmic pulse bar activity may indicate a poorly positioned or applied sensor, or may be indicative of excess patient movement at the sensor site. Check the sensor site and if necessary, attempt to reduce patient movement. The oximeter automatically adjusts the length of the bar to optimize its display.

Display Messages

The SpO_2 and pulse rate displays are also used to present system messages:

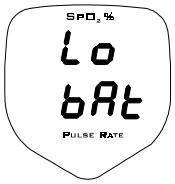


Searching for pulsatile data
When the sensor is first applied to the patient, dashes (---) are displayed for a few seconds until enough pulsatile data is collected to calculate and display SpO_2 and pulse rate values. Prolonged insufficient, erratic, or non-rhythmic pulsatile activity (in excess of 45 seconds) is indicated to the user by displaying dashes rather than continuing to display "old" and possibly no longer valid values. SpO_2 and pulse rate values will resume when "valid" pulsatile data is again detected by the sensor. (If the condition exists for greater than 90 seconds "Err -9-" is displayed instead; see below.)

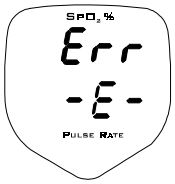


Probe Off (Prb OFF)
Sensor is connected to the pulse oximeter, but not applied to the patient.

No Probe Connected (no Prb)
Sensor is not connected to the pulse oximeter.



Low Battery (Lo bat)
Briefly displayed once each minute (with triple beep tone) when less than 30 minutes of battery capacity remains, and once each 5 seconds (with triple beep tone) when less than 15 minutes of power remain.

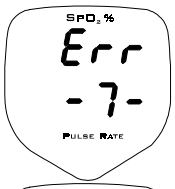


Error Conditions while Monitoring
where "E" is a numerical value as explained below. These monitoring conditions, typically transitory in nature, are automatically reset once the condition is corrected.

- **Err -3-** Low signal strength. Pulse strength as detected by the sensor is too small for proper pulse oximeter operation. Check patient status and/or reposition sensor.
- **Err -4-** Insufficient light. Sensor placed on a site too thick (or opaque) for adequate light transmission. Reposition sensor.

- **Err -5-** Pulse out of range. Pulse must be 30-250 beats/min inclusive.
- **Err -6-** Light interference. Ambient light sources (sunlight, warming lights, etc.) are interfering with sensor operation. Shield sensor from these light sources.
- **Err -9-** Bad signal. Pulse oximeter is receiving prolonged insufficient, erratic, or non-rhythmic pulsatile activity (in excess of 90 seconds). Error is accompanied by an audible alert tone. Condition may be caused by excessive motion, cardiac arrhythmia or other situations leading to poor signal. Check patient status and/or reposition sensor. SpO_2 and pulse rate values will resume, and audible alert tone is silenced, when "valid" pulsatile data is again detected by the sensor.

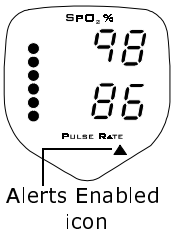
Sensor fault condition
Remove the sensor from use and contact qualified service personnel.



Monitor fault condition
where "HH" is a numerical value. Remove the pulse oximeter from use. Record the number shown in the Pulse Rate display and contact qualified service personnel.

SpO_2 and Pulse Rate Limit Alerts

The Model 513 provides limit alerts for both SpO_2 and Pulse Rate. The triangular alert icon illuminates whenever alerts are enabled. When the pulse oximeter is first turned on, the previous alert limit settings are automatically restored. (Use of Pulse Rate limits is optional. See "Setup Menu Options" on page 18.)



The user can choose to select individual limit values manually or to have the oximeter automatically assign limit values based on current patient values. Upper and lower limits cannot be set to within 5 digits of each other.

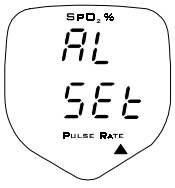
Automatic Alert Limits (Auto-Limits)

Alert limits can be automatically bracketed around the patient's SpO_2 and pulse rate values. When invoked, the Auto-Limits feature sets SpO_2 limits to 5 digits above/below and Pulse Rate limits (if enabled) to 25% above/below the current patient values (SpO_2 100-50, Pulse Rate 250-30).

To set alert limit settings automatically;

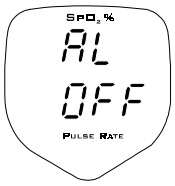
Press & Hold. Auto-Limits Set or Off

- With patient SpO_2 and pulse rate data displayed, press and hold the **SELECT** key until "AL SEt" is briefly displayed, the triangular Alerts Enabled icon (▲) illuminates and a double-beep tone sounds. Release the **SELECT** key. The alert limit settings are briefly displayed.



To reset (turn off) all alert limits settings automatically;

- Press and hold the **SELECT** key until "AL OFF" is briefly displayed, the triangular Alerts Enabled icon (▲) turns off and a triple-beep tone sounds. Release the **SELECT** key.

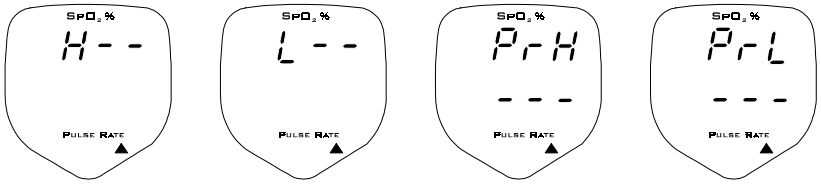


View or Manually Set Alert Limits

To view or manually select alert limit setting;

View Alert Limits 

1. Press and release the **SELECT** key to view the current limit settings. Each time **SELECT** is pressed, the next available limit setting is displayed.
   - Dashes (--) indicate a disabled limit, otherwise the limit value is displayed.



SpO_2 High | SpO_2 Low | Pulse Rate High | Pulse Rate Low

Only if enabled in Setup Menu

Change Alert Limits 

2. Change a displayed limit value by pressing the **PRINT** key. Each time **PRINT** is pressed, the limit is changed by one. Hold the key depressed to scroll through all possible values (SpO_2 100-50, Pulse Rate 250-30).
3. The pulse oximeter returns to normal operation using the current settings if no key is pressed for 3 seconds.

Responding to Alert Conditions

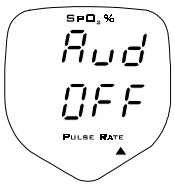
If any alert limit has been set to anything other than dashes (---), then alerts are enabled and any violation of a limit setting causes the affected SpO_2 or Pulse Rate display value to flash and an audible alert to sound.

An audible alert will also be triggered—only when alerts are enabled—by conditions including Probe Off Patient, No Probe Connected, Sensor or Monitor fault, and Bad Signal timeout.

To silence the audible alert;

Press to silence alert 

1. Press the **SELECT** key. The audible alert tone is silenced and will not sound again until another separate alert condition occurs. The message "Aud OFF" (audio off) is briefly displayed.



   - The violated parameter display continues to flash until; it returns within limits; the limits are widened to incorporate the violated value; the limits are disabled; or, conditions such as Probe Off Patient (no Prb) are corrected.

Data Storage & Communications

The Model 513 automatically stores SpO_2 and pulse rate information to its trend memory. Trend memory capacity is 24 hours. The contents of the trend memory can be transmitted, via a built-in infrared communications port, to select printers or to a personal computer.

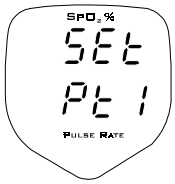
Data Storage and Trend Memory

SpO_2 and pulse rate information is automatically stored to the monitor's trend memory. Trend memory capacity is 24 hours—as additional data is collected, the oldest data is overwritten to insure the most recent 24 hours of data is preserved. Data is stored once each 8 seconds and represents the lowest SpO_2 value and the average Pulse Rate value recorded over the period.

Trend memory is preserved even if the monitor is turned off and on, or as long as depleted batteries are replaced within 24 hours. Trend memory is erased only by specific user interaction; from the Setup Menu (See "Setup Menu Options" on page 18 for details.) or through the *NovaCARD for Windows* personal computer software program and/or NovaCOMM protocol.

Selecting an Output Device

The Model 513 can communicate through its built-in infrared port to three devices; directly to the Hewlett-Packard HP 82240B Infrared Printer, or using the optional Infrared Reader Module (9342-00), to the Seiko DPU-414 Thermal Printer or to a personal computer.



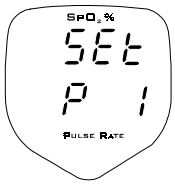
Select an output device

- To select a communications output device, refer to "Setup Menu Options" on page 18.
- To connect to a communications output device, refer to "Configuring an Output Device" on page 16.

Selecting an Output Mode

The Model 513 can send data to a printer in any of four modes (P1-P4), and to a computer in just one mode (PC).

To select a data output mode;



Select a data output mode

Press & hold selects menu 

1. Press and hold the **PRINT** key until the Set Data Mode display appears. The selected mode is identified on the display.
   - The Set Data Mode menu cannot be accessed if the monitor is currently printing to a printer or downloading to a computer. Set the mode to Off before accessing the Set Data Mode menu.

Change 

2. Repeatedly press the **SELECT** key to sequence through the available modes.
   - P1 - Real Time Text Printout.
   - P2 - Stored Text Printout.
   - P3 - Real Time Graphics Printout.
   - P4 - Stored Graphics Printout.
   - PC - NovaCOMM to personal computer.

Confirm 

3. Press and release the **PRINT** key to confirm the current mode and to exit the menu.

Start & Stop Printouts and PC Communications

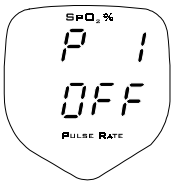
To start or stop a printout or communications with a PC;

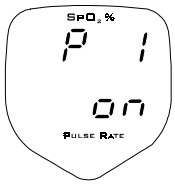
View 

Change 

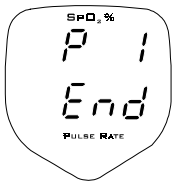
Confirm 

1. Press the **PRINT** key. The display shows the selected output mode (P1-P4 or PC) on the top line, and its current status (Off/On) on the bottom line.
   - P1 - Real Time Text Printout.
   - P2 - Stored Text Printout.
   - P3 - Real Time Graphics Printout.
   - P4 - Stored Graphics Printout.
   - PC - NovaCOMM to personal computer.





2. Press the **SELECT** key to change the status as desired.
3. Press the **PRINT** key to confirm and activate the new setting.
   - A double beep tone indicates "On" was selected.
   - A triple beep tone and an "End" display indicates "Off" was selected and communications are being ended.



Print Formats

The various print formats are discussed below.

- In all cases, the SpO_2 and Pulse Rate information represents the average value over the applicable time frame.
- Some modes use the term "session". A new "session" begins when the oximeter is turned on and ends when it is turned off. Data from each session is separated on the printout to help prevent data from multiple patients (or monitoring sessions) to be mixed together. There is no limit on the number of sessions, except that trend memory capacity is limited to 24 hours. Erasing trend memory (see "Setup Menu Options" on page 18) resets the session counter to 1.

Header Information

Each print mode begins with header information identifying the oximeter and the time and date of printing. Areas to include the patient's name, notes and the FiO2 setting are also included. (This header has been removed from the remaining print samples.)

```
NOVAMETRIX ®     513
MEDICAL SYSTEMS INC.    OXIMETER
PRINTED AT: 09:29:49 28/JAN/99

PATIENT NAME _____________________
FIO2_____NOTES_____________________
_____________________________________
```

Real Time Text Printout

The P1 print mode provides a real time continuous text-based printout. Every 32 seconds, the SpO_2 and Pulse Rate values are printed along with the time (the date was previously printed as part of the header).

```
Real Time Print - Start
  TIME          %SpO2    Pulse Rate
09:29:57         98%         88
09:30:29         98%         84
09:31:01         98%         90
09:31:33         98%         83
09:32:05         98%         83
09:32:37         98%         82

Real Time Print - Stop
```

Stored Text Printout

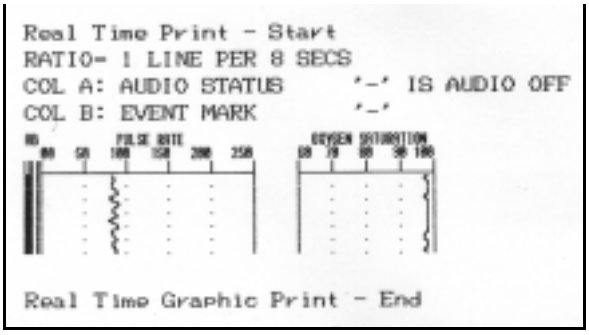
The P2 print mode provides a text-based history of the data stored in the monitor (up to the 24 hour capacity of the trend memory). Every 2 minutes (actually 128 seconds) the SpO_2 and Pulse Rate values are printed along with the time. The starting time and date for each session is also printed. Multiple sessions are possible.

```
Session 1
Stored Text Print - Start
Start Time: 08:28:10 01/JAN/00
  TIME          %SpO2    Pulse Rate
08:30:18         97%         97
08:32:26         96%         89
08:34:34         96%         86
08:36:42         96%         83
08:38:50         94%         116
08:40:58         96%         99

  Stored Text Print - End
```

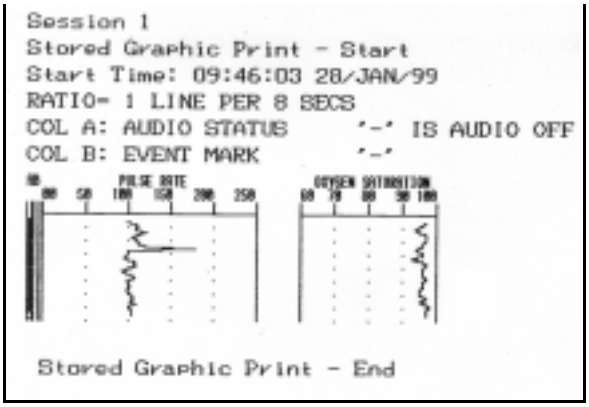
Real Time Graphics Printout

The P3 print mode provides a real time continuous graphics-based printout. Each point on the graph represents the average of 8 seconds of data. Column "A" is marked if the data for that "dot" was collected while the audio was silenced. Column "B" is unused. The starting time and date are printed as part of the header information.



Stored Graphic Printout

The P4 print mode provides a graphics-based history of the data stored in the monitor (up to the 24 hour capacity of the trend memory). Each point on the graph represents the average of 8 seconds of data. Column "A" is marked if the data for that "dot" was collected while the audio was silenced. Column "B" is unused. The starting time and date for each session is also printed. Multiple sessions are possible.



Configuring an Output Device

The Model 513 can communicate through its built-in infrared port directly to the Hewlett-Packard HP 82240B Infrared Printer, or using the optional Novametrix Infrared Reader Module, to the Seiko DPU-414 Thermal Printer or to a personal computer. This section explains how to configure these devices for use with the Model 513.

Personal Computer (NovaCOMM)

The Model 513 can communicate with a personal computer only through use of the optional Novametrix Infrared Reader Module (9342-00). IBM® compatible PCs can take advantage of the NovaCARD for Windows software application to view, print, and analyze the trend data stored in the Model 513. (For other computer types, consult the Model 513 Service Manual for NovaCOMM data protocol information.)

To communicate with a personal computer;

1. Select the computer as the output device (PC). See "Setup Menu Options" on page 18.
2. Connect the Novametrix Infrared Reader Module to an available serial port on the PC and turn the PC on.
3. Place the oximeter and reader module within 24 inches (60 cm) of each other, and such that the IR windows face each other.
4. Initiate communications at the Model 513. See"Selecting an Output Mode" on page 13 and "Start & Stop Printouts and PC Communications" on page 14.
5. From the computer, interrogate the Model 513 using the *NovaCARD for Windows* program or by other means.

Hewlett-Packard HP 82240B Infrared Printer

No special configuration is required to allow the Hewlett-Packard HP 82240B Infrared Printer to communicate with the Model 513. Refer to the documentation supplied with the printer for further information.

To use the HP 82240B printer;

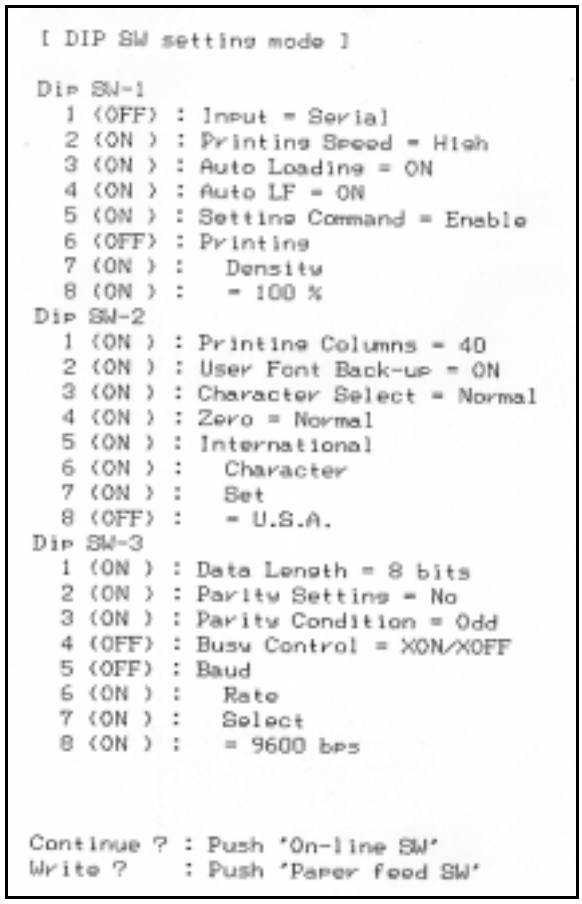
1. Select the printer as the output device (Pt2). See "Setup Menu Options" on page 18.
2. Place the oximeter and printer within 24 inches (60 cm) of each other, and such that the IR windows face each other.
3. Initiate Printing. See"Selecting an Output Mode" on page 13 and "Start & Stop Printouts and PC Communications" on page 14.

Seiko DPU-414 Thermal Printer

The Seiko DPU-414 Thermal Printer (Cat. No. 9140-00) can communicate with the Model 513 only through use of the optional Novametrix Infrared Reader Module (9342-00). Further, the printer must be properly configured to communicate with the Model 513. (Once configured, the printer will retain the settings, even when turned off.)

To configure the Seiko DPU-414 Thermal Printer for use with the Model 513;

1. Press and hold the printer's **ON LINE** button while turning the printer on. Release the **ON LINE** button once it begins to print.
2. Verify the configuration settings match the list at the right of this page.
   - If the settings match, press the paper **FEED** button to set the printer to run mode. The printer is ready for use. Skip to "Configuring an Output Device" on page 16.
   - If the settings do not match, press the **ON LINE** button and "Dip SW-1" is printed. Continue with the next step.
3. With "Dip SW-1" printed, follow this listing to configure the printer. Each button press causes a "switch" setting to print.
   - Press **ON LINE** to set the switch to ON.
   - Press **FEED** to set the switch to OFF.



4. Continue making selections for each switch setting. At the "Dip SW-2" and "Dip SW-3" prompts;
   - Press **ON LINE** to continue making selections.
   - Press **FEED** to end the configuration process.

To use the Seiko DPU-414 printer;

1. Select the printer as the output device (Pt1). See "Setup Menu Options" on page 18.
2. Connect the Novametrix Infrared Reader Module to the printer's SERIAL connector.
3. Turn the printer on and ensure it is on line.
4. Place the oximeter and reader module within 24 inches (60 cm) of each other, and such that the IR windows face each other.
5. Initiate Printing. See"Selecting an Output Mode" on page 13 and "Start & Stop Printouts and PC Communications" on page 14.

Refer to the documentation supplied with the printer for further information.

System Setup Options

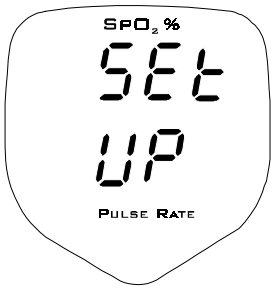
System settings not typically used in everyday patient monitoring, have been gathered into a Setup Menu. Setup Menu selections are "remembered" by the oximeter, and remain in effect until changed by the user, even if powered off and on, or the batteries are removed and replaced.

Accessing the Setup Menu

Press & Hold at Power On

To access the Setup Menu;

1. Start with the pulse oximeter powered off.
2. While holding the **SELECT** key depressed, press the **POWER** key. Then release both keys.
   - The oximeter powers on, performs a self-test, and displays the Setup Menu.



Navigating the Setup Menu

Move to next menu page

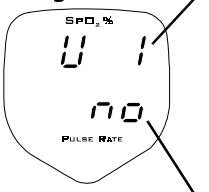
Change this menu page

To navigate within the Setup Menu;

- Move from one menu page to the next by pressing the **SELECT** key. (i.e., from "SEt UP" to "U 1" to "U 2" to "U 3"…)
- Change the setting of the current menu page by pressing the **PRINT** key (i.e., from "nO" to "yES", "01" to "02"…), then confirm (lock-in) your choice by pressing the **SELECT** key to advance to the next menu page.
- Exit the Setup Menu by not pressing any key for several seconds, or by pressing the **PRINT** key when the "SEt UP" message is displayed.

Setup Menu Options

Setup Menu **Page** #1



Current **value** of Setup Menu Page #1

Quick List

1 Erase Memory
2 Pulse Beep
3 Pulse Limits
4 Auto Shut Off
5 Printer Type
6 Year
7 Month
8 Day
9 Hour
10 Minute

The different Setup Menu options are summarized below.

Page	Description	Values	Default
U 1	**Erase Trend Memory** Selecting Yes erases data stored in the 24-hour trend memory—this one time only. On future power on/off cycles, trend memory is not erased.	Yes/No	No
U 2	**Pulse Beep** If enabled (Yes), an audible beep accompanies each detected pulse beat. (A single pitch tone with no volume control.)	Yes/No	No
U 3	**Pulse Limits** If enabled (Yes), pulse rate limits are available. If disabled (No), only SpO_2 alert limits are available.	Yes/No	No
U 4	**Auto Shut-Off** If enabled (Yes) and 3½ minutes elapse without pulsatile activity, the oximeter shuts itself off. See "Auto Power Off" on page 5.	Yes/No	Yes
U 5	**Printer Type** Sets the Infrared port to work with the Seiko DPU-414 Thermal Printer (Pt1), the HP 82240B Infrared Printer (Pt2), or NovaCOMM mode (PC1). (The only modes supported.)	Pt1/ Pt2/ PC1	Pt1

Page	Description	Values	Default
U 6	**Date - Year** Two digits for 1998-2020 inclusive.	98-20	99
U 7	**Date - Month**	1-12	1
U 8	**Date - Day**	1-31	1
U 9	**Time - Hour**	00-23	00
U10	**Time - Minute**	00-59	00

Maintenance

The pulse oximeter performs a diagnostic self-test at powerup that checks the internal electronics. If this self test fails the normal monitoring display will not appear. Remove the oximeter from use and contact qualified service personnel.

The oximeter should undergo inspection and safety checks on a regular basis or according to institutional protocol. A Service Manual (Catalog No. 9300-90) containing information to assist qualified service personnel is available.

Cleaning and Sterilization

To clean and/or sterilize the oximeter and its accessories;

Pulse Oximeter

- Do not immerse the oximeter. Do not sterilize the oximeter.
- Turn the oximeter off and unplug the external adapter (if used) from the AC power source before cleaning.
- The oximeter can be cleaned and disinfected by wiping with solutions such as a 70% isopropyl alcohol, 2% glutheralhyde, or 10% bleach solution. Then wipe down with a water dampened clean cloth to rinse. Dry before use.

SpO_2 Finger Sensor

- Do not immerse the finger sensor. Do not sterilize the finger sensor.
- The sensor can be cleaned and disinfected by wiping with solutions such as a 70% isopropyl alcohol, 2% glutheralhyde, or 10% bleach solution. Then wipe down with a water dampened clean cloth to rinse. Dry before use.
- Make certain that the finger sensor windows are clean and dry before reuse.
- After cleaning the finger sensor, perform a Quick Check to verify the sensor is functional (See "Sensor Quick Check" on page 6).

SpO_2 Y-Sensor

- The Y-Sensor may be immersed—up to, but not including, the connector, in a 2% glutheralhyde solution, or 10% bleach solution. Refer to manufacturer's instructions and standard hospital protocols to determine recommended times for disinfection and sterilization.
- Rinse thoroughly with water and dry before use. (Do not rinse the connector).
- After cleaning or sterilizing the Y-Sensor, perform a Quick Check to verify the sensor is functional (See "Sensor Quick Check" on page 6).

SpO_2 Tapes and Foam Wraps

- Treat tapes and foam wraps in accordance with hospital protocol for single-patient use items.

Ear Clip

- Clean with a cloth dampened with 70% isopropyl alcohol. After cleaning, thoroughly wipe the ear clip with a clean, water dampened cloth.

Accessories

Cat. No.	Description
Monitor	
9300-00	Model 513, Handheld Pulse Oximeter
9300-23	User's Manual, Model 513
9300-90	Technical Service Manual, Model 513
315134	Transport Pouch
9276-10	Protective Rubber Boot
400038	Alkaline Battery, 1.5 vdc, AA Size (Panasonic AM3X or equiv.)
SuperBright™ Oximeter Sensors	
9169-00	Y-Sensor™ (use with DB-9 Sensors) 90 day warranty
9168-00	Finger Sensor (use with DB-9 Sensors) 1 yr. warranty
6455-00	Single Patient Use Pediatric/Adult Sensor (10 per box)
6455-25	Single Patient Use Pediatric/Adult Sensor (25 per box)
6480-00	Single Patient Use Neonatal/Pediatric Sensor (10 per box)
6480-25	Single Patient Use Neonatal/Pediatric Sensor (25 per box)
8828-00	20mm Wrap Style Y-Strip Taping System (100 per box)
8829-00	25mm Wrap Style Y-Strip Taping System (100 per box
8831-00	20mm Finger Style Y-Strip Taping System (100 per box)
8832-00	25mm Finger Style Y-Strip Taping System (100 per box)
8836-00	Non-Adhesive Foam Wraps - Large (25 per box)
8943-00	Non-Adhesive Foam Wraps - Small (25 per box)
6929-00	Large Adhesive Foam Wrap, (25 per box)
6968-00	Neonatal/Pediatric Adhesive Foam Wrap, (25 per box)
6131-50	Ear Clips (5 per box)
6131-25	Ear Clips (25 per box)
8700-00	Re-Flex Sensor Application Dots
9174-00	Extension Cable, DB-9 to DB-9, 3 feet
9175-00	Extension Cable, DB-9 to OxySnap, 4.5 feet
933-00	Extension Cable, DB-9 to Hypertronic, 8 feet
936-00	Adapter Cable, DB9 to OxySnap, 6 inch
9180-00	Adapter Cable, DB-9 to Hypertronic, 6 inch
Options	
9342-00	Infrared Reader Module
6065-00	*NovaCARD for Windows* Data Archive Software (3½" diskette)
330088	Hewlett-Packard Infrared Printer (HP82240P)
300020	Thermal Printer Paper for Hewlett-Packard Infrared Printer
9140-00	Seiko DPU-414 Thermal Printer (with battery pack)
400052	AC Adapter for Seiko DPU-414 Printer, 120 VAC
400053	AC Adapter for Seiko DPU-414 Printer, 100 VAC
400054	AC Adapter for Seiko DPU-414 Printer, 230 VAC
300017	Printer Paper for Seiko DPU-414 Printer (5 rolls per box)

Specifications

The Novametrix Model 513 Handheld Pulse Oximeter specifications are listed here for informational purposes only, and are subject to change without notice.

Principle of Operation
- Red/Infrared Absorption

SpO_2 (Oxygen Saturation)
- Range:0-100%
- Accuracy:70-100% ±2%, 50-69% ±3%, 0-49% unspecified, ±1 standard deviation
- Resolution:1%
- Averaging:8 seconds

Pulse Rate
- Range: 30-250 bpm
- Accuracy: ±2 bpm
- Resolution: 1 bpm
- Averaging: 8 seconds

General
- Size: 4.25 x 2.25 x 1.0 inches (10.8 x 5.7 x 2.5 cm)
- Weight: 5.7 ounces (162 g) (with batteries)
- Display: Numerics - 7 segment LED's, Pulse Bar - 8 LEDs
- Electrical: Battery - 2 AA alkaline, Capacity - 16 hours
- Operating Conditions: 10 to +40° C (50 to 104° F), 10-90% R.H. non-condensing
- Transport/Storage Conditions: -10 to +55° C (14 to 131° F), 10-95% R.H. non-condensing

Additional Features
- Auto Shut Off: Monitor automatically shuts itself off after 3.5 minutes if no data is being received.
- Low Battery Indicator: Illuminates when approximately 15 minutes of battery life remain.
- Monitor Status Messages: Error codes displayed for various monitoring related conditions.
- Alerts: Automatic and adjustable SpO_2 & Pulse Rate limits.
- Pulse Beep: User selectable on/off.
- Communications: Infrared link allows downloading of up to 24 hours of patient data to a computer or printer.

Warranty

Equipment manufactured or distributed by Novametrix Medical Systems Inc., is fully guaranteed, covering materials and workmanship, for a period of one year from the date of shipment, except for certain disposable products and products with stated guarantees other than one year. Novametrix reserves the right to perform guarantee service(s) at its factory, at an authorized repair station, or at the customer's installation.

Novametrix' obligations under this guarantee are limited to repairs, or at Novametrix' option, replacement of any defective parts of our equipment, except fuses, batteries, and calibration gasses, without charge, if said defects occur during normal service.

Claims for damages during shipment must be filed promptly with the transportation company. All correspondence concerning the equipment must specify both the model name and number, and the serial number as it appears on the equipment.

Improper use, mishandling, tampering with, or operation of the equipment without following specific operating instructions will void this guarantee and release Novametrix from any further guarantee obligations.

Service Department

For factory repair service:
Call toll free: 1-800-243-3444
To Call Direct: (203) 265-7701
Facsimile (203) 284-0753
http://www.novametrix.com
techline@novametrix.com

Caution: Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.