NELLCOR

HOME USE GUIDE

NPB-290

Pulse Oximeter

Important: Read this manual before using the monitor.

If you need help, call the 24-hour hot line of the home care dealer listed here:

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

IMPORTANT INFORMATION

INTRODUCTION

This manual is for the home caregiver—the person who provides care for a patient being monitored in the home by the NPB-290 pulse oximetry monitor. As the home caregiver, it is important that you read *this entire* manual *before* you use the monitor.

You can find instructions for using the monitor and important safety information in this manual. If you do not understand any part of this information, ask your clinician to explain it to you.

In this manual, the term *clinician* means the trained healthcare professional who is helping you use the monitor in your home. This person may be a doctor or nurse who is treating your patient, or some other trained health care professional.

IF YOU NEED HELP

Contact your clinician if you have any questions or concerns about using the NPB-290 monitor. In addition to being a trained healthcare professional, your clinician will assist you with any questions you have about the monitor and its use.

If you need emergency help, call the 24-hour hot line of your home care dealer. Keep the dealer's business card with this manual. That card shows the hot line number.

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TERMS AND SYMBOLS

OVERVIEW

This section defines terms (special words and phrases) that are used in this manual. It also lists symbols that you will see on the monitor, and tells you what those symbols mean.

Refer to this section if there are any terms used that you do not understand. The following "Definitions of Terms" should help you understand the meanings of all the terms used.

If there are any terms or definitions that you do not understand contact your clinician and ask him or her to explain them to you.

DEFINITIONS OF TERMS

Alarm	A warning given by the monitor when an alarm condition occurs. It is usually a sound that can vary in tone and speed. Flashing numbers and lights also indicate an alarm.
Alarm Condition	A situation that causes the monitor to alarm. Examples of alarm conditions might be loss-of-pulse, or the blood oxygen level falling below the alarm limit setting, or the battery becoming too low to operate the monitor.

Alarm Limits	The highest and lowest %SpO2 and Pulse Rate value limits that are set in the monitor. If the patient's oxygen saturation level or pulse rate goes above the highest limit or below the lowest limit set in the monitor, an alarm occurs.
Beats per minute (bpm)	The number of times per minute that the patient's heart beats.
Blip Bar	A display on the front of the monitor with ten green lights that show the strength of the patient's pulse (see "Pulse Amplitude").
Clinician	A trained healthcare professional who is helping with the use of the monitor in the home. The clinician may be a doctor or nurse who is treating your patient, or some other trained healthcare professional.
Hemoglobin	The part of the blood that carries oxygen.
Indicators	Lights on the front of the monitor that indicate certain conditions when they are lit. This manual lists all indicators and what it means when each one lights.
Loss-of-Pulse	The condition when the monitor no longer detects a pulse. This condition causes an alarm to sound and the Pulse Search Indicator to flash.

Monitor	The term used in this manual for the NPB-290 pulse oximeter.
Monitoring	The time when the monitor is detecting a pulse, and routinely displaying the pulse rate and oxygen saturation level.
Oxygen Saturation	A measure of the amount of oxygen actually carried in the blood compared to the amount that the blood *could* carry. Shown on the monitor as "%SpO2".
Port	A place on the monitor where you plug in a sensor or cable.
Power-On Self-Test (POST)	A test performed by the monitor to check its internal systems. It is performed automatically each time the monitor is turned on.
Pulse Amplitude	The strength of the pulse as shown in the vertical Pulse Amplitude Display (the Blip Bar). The pulse strength is indicated by the number of segments in the display that light.
Pulse "Beep"	The sound made by the monitor indicating each pulse beat.
Pulse Oximetry	A method of determining if the blood has adequate oxygen saturation levels.
Pulse Oximetry Cable	The cable that connects the sensor to the monitor.

Pulse Search	The time when the monitor is looking for a pulse. The display flashes the saturation and pulse data, and the Pulse Search Indicator lights.
Sensor	The part of the pulse oximetry system that is attached to the patient. The sensor sends and receives light.
Sensor Site	The place on the patient where the sensor is attached. This is usually a finger or toe. Each sensor has certain sites where the sensor may be used. Each sensor's Directions for Use lists the correct sites for that sensor.
%SpO2	A measurement of oxygen saturation provided by a pulse oximeter (monitor).
Values	The numbers that appear in the %SpO2 and Pulse Rate Displays as the patient is being monitored.

EXPLANATION OF SYMBOLS

This section describes symbols that appear on the monitor and lists where you will find them. Symbols are located near buttons that you push, indicators that light up, or both.

The names for buttons and indicators are used frequently in this manual. Take a few minutes to become familiar with these buttons and indicators and their symbols.

Front Panel Buttons

The front of the NPB-290 monitor contains six buttons that you will use to operate the monitor.

The Power On/Off Button. This is used to turn the monitor on or off.

The Alarm Silence Button. Used to silence the alarm (it will stay off for a set period of time; the amount of time is called the Alarm Silence Duration).

The Adjust Up Button. Used to increase alarm limit values and pulse beep volume. It can also be used to make selections from an options menu that appears on the display.

The Adjust Down Button. Used to decrease alarm limit values and pulse beep volume. It can also be used to make selections from an options menu that appears on the display.

The Upper Alarm Limit Button. Used to view upper alarm limits and to select menu options.

The Lower Alarm Limit Button. Used to view lower alarm limits and to select menu options.

Front Panel Indicators (Lights)

In addition to buttons, the front panel of the monitor contains four indicators (lights). Each light has a symbol near it that describes the reason for the light.

-  The AC Power Indicator. When this light comes on, it means that the monitor is connected to an AC (wall) outlet. It also means that the battery inside the monitor is charging.

- The Low Battery Indicator. When you are operating the monitor on its internal battery (that is, when the power cord is not connected to a wall outlet), and there are 15 minutes or less battery time left, this light comes on and an alarm sounds to warn you that the battery is going to expire soon.

  This gives you enough time to plug the monitor into AC power (a wall outlet), so you may continue monitoring the patient on AC power while the battery recharges.

The Alarm Silence Indicator. This light comes on when the Alarm Silence Button is pressed to temporarily silence the alarm.

The Pulse Search Indicator. This indicator lights and remains lit when the monitor is "searching" for the patient's pulse. If the monitor stops detecting a pulse, this indicator flashes.

- The Motion Indicator. This indicator lights and remains lit when the monitor detects enough movement or motion that could affect the monitor's readings.

Front Panel Displays

The monitor's front panel has a dark "display screen" area that contains two displays and one indicator:

The %SpO2 Display. Located on the far left of the display screen. It shows the patient's oxygen saturation level as a percent. This number is updated with each pulse beat.

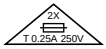
The Pulse Amplitude Indicator. Located in the center of the display screen. Also called the "Blip Bar," this column of lights gives you a visual display of the patient's pulse strength.

As the pulse becomes stronger, more segments (green lights) light with each pulse beat; as the pulse weakens, fewer segments light.

The digital Pulse Rate Display. Located on the far right of the display screen. It shows the patient's pulse rate in beats per minute. This number is updated with each pulse beat.

Other NPB-290 Symbols

See instructions for use



Fuse replacement

Date of manufacture

Data interface

Equipotential Terminal

Type BF Applied Part— Not Defibrillator-Proof

SAFETY INFORMATION

Warnings
Cautions

This section lists general warnings and cautions for your safety and that of the patient.

WARNINGS

WARNING: MOST IMPORTANT: Before using the monitor, read all of this manual.

WARNING: The monitor is only a warning device. You must ACT, as directed by your clinician, when an alarm occurs. The monitor cannot act for you.

WARNING: The monitor and sensor are prescription devices. Use only on the patient for whom prescribed and as directed by your clinician.

WARNING: Make sure you can hear the monitor's alarm from all rooms in the house, and when you are using noisy household appliances such as a vacuum cleaner, dishwasher, clothes dryer, television, or radio. Failure to ensure that the alarm volume is appropriate for the environment may place the patient in danger. If you need the volume adjusted, immediately contact the clinician for help.

WARNING: Do NOT use a monitor you suspect may not be working correctly. Contact your clinician to have the monitor tested or replaced.

WARNING: Do NOT use a monitor or sensor that appears to be damaged.

WARNING: Do NOT connect the power cord to an electrical outlet controlled by a wall switch because power to the monitor may be accidentally turned off.

WARNING: Do NOT remove the cover of the monitor because this will create an electric shock hazard.

WARNING: Carefully route all wires and cables away from the patient to avoid having them get tangled around the patient's head or neck.

WARNING: Check all specially set alarm limits each time the monitor is used. All alarm settings return to the standard settings every time you turn off the monitor and then turn it on again.

WARNING: Always use Nellcor sensors with the monitor. Use of any other sensor may cause the monitor to not work correctly.

WARNING: Excessive light such as sunlight or fluorescent light may cause incorrect measurements. If used in the presence of bright light, cover the sensor with a dark cloth to block the extra light.

WARNING: Always remove the sensor from the patient and completely disconnect the patient from the monitor before bathing the patient.

WARNING: Use extra care in handling a monitor with a broken display screen. Chemicals from the screen can be toxic if swallowed.

CAUTIONS

Caution: Before applying a sensor, read the sensor Directions for Use.

Caution: Do NOT wrap sensors too tightly or use extra tape at the sensor site. Incorrect application of the sensor can cause tissue damage and false readings on the monitor.

Caution: Check the sensor site as recommended by the sensor Directions for Use to ensure that the sensor is in the correct position and that it sticks properly to the patient. If redness, swelling, or other problems appear at the sensor site, move the sensor to another site.

Caution: Do NOT use abrasive or harsh cleaners on the monitor or the sensors.

Caution: Do not spray, pour, or spill any liquid on the monitor, sensor, or cables. Clean the monitor and cables by following the cleaning instructions given later in this manual.

Caution: Do not sterilize the sensor by steam or any other method or solution. Clean a reusable sensor by following the cleaning instructions given in the sensor Directions for Use.

PURPOSE OF THE MONITOR

PURPOSE OF THE NPB-290 MONITOR

The NPB-290 monitor can be used for patients of all ages, from infants to adults. It continuously measures pulse rate and oxygen saturation in the blood. When either of these goes below or above an alarm limit setting, the monitor warns you by sounding an alarm, lighting an indicator light, or flashing a number.

ROLE OF YOUR CLINICIAN

Your clinician is a trained healthcare professional who will:

- Order a monitor for use in your home
- Train you to use the monitor
- Set up the monitor for you
- Select a sensor for use with the monitor
- Show you how to respond to alarms
- Show you how to set the alarm limits
- Answer your questions about the monitor
- Ensure that the monitor is working correctly
- Follow up with you on a regular basis to make sure the monitor is meeting your needs

HOW THE MONITOR WORKS

OVERVIEW OF PULSE OXIMETRY

A pulse oximeter—like the Nellcor NPB-290 monitor you are about to use—is a device that uses pulse oximetry to measure oxygen saturation in the blood. Oxygen saturation is a measure of the amount of oxygen in your blood.

Pulse oximetry requires three parts:

- A monitor (the NPB-290 pulse oximeter)
- A cable
- A sensor

Your clinician will provide you with a sensor that is appropriate for your patient.

Figure 1 shows the monitor with a sensor being connected to it.

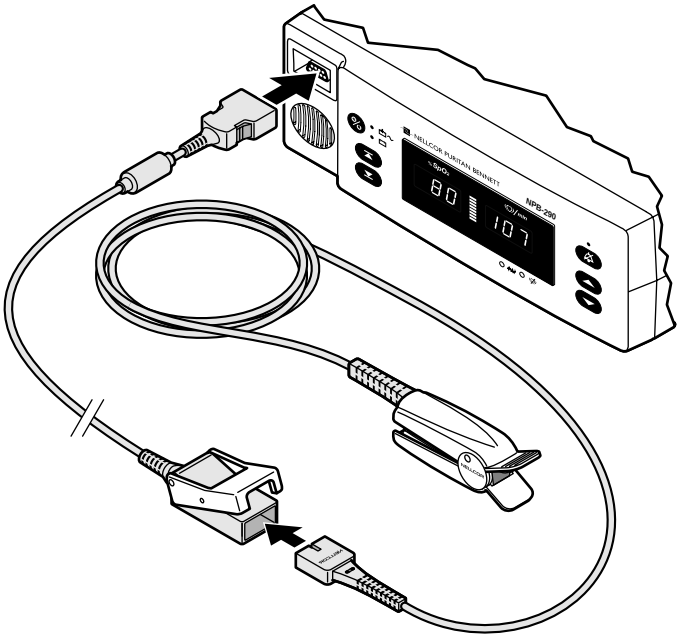


Figure 1: NPB-290 Monitor and Sensor

The sensor is the small device that is attached to the patient at a site that has a lot of blood flow near the skin surface, such as a finger or toe. Figure 2 shows a sensor placed on a finger.

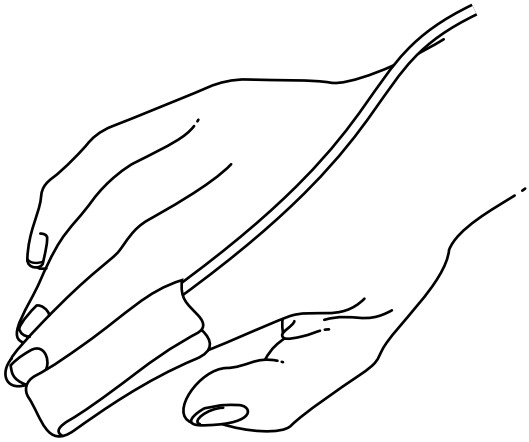


Figure 2: Sensor Attached to a Finger

The sensor emits (shines) two kinds of light: *red* light that you can see and *infrared* light that you cannot see. The light can pass into the body through skin, nail, tissue, and blood. When it passes through blood, hemoglobin—the part of the blood that carries oxygen—absorbs some of the light.

Figure 3 shows a sensor placed on a finger, with light passing through it.

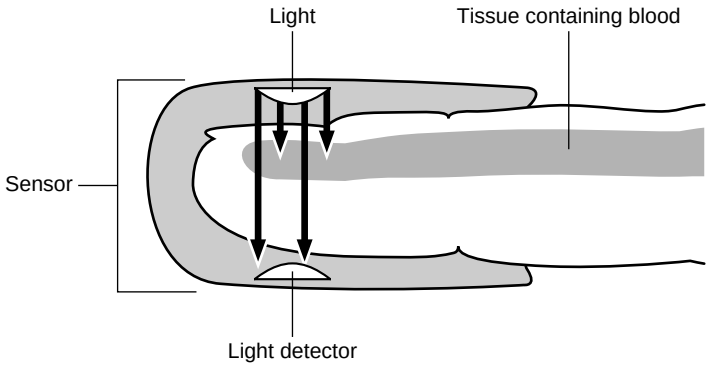


Figure 3: Sensor Light Emissions

The amount of oxygen in the blood determines how much light the blood can absorb. Blood that has a high amount of oxygen in it absorbs more infrared light. Blood with a lesser amount of oxygen in it absorbs more red light.

The sensor detects the light that passes through the body. Based on the amount of light received, the sensor measures the amount of red and infrared light that was not absorbed.

The monitor calculates oxygen saturation based on the amount of light that was not absorbed. This type of oxygen saturation measurement by a pulse oximeter is known as SpO_2.

The monitor displays the SpO_2 measurement as a percentage (%SpO_2).

The monitor also detects and measures the patient's pulse rate. It displays the rate as the number of beats per minute (bpm). At the same time, the monitor displays the *strength* of the pulse in the vertical Pulse Amplitude Display (or, Blip Bar). If the pulse is strong, the number of segments that light in the display increases. If the pulse is weak, fewer segments light in the Blip Bar.

WHAT TO EXPECT FROM THE MONITOR

The monitor continuously measures and displays oxygen saturation (%SpO_2) at each pulse beat. It also displays the pulse rate (the number of beats per minute). The Blip Bar, also known as the Pulse Amplitude Indicator, displays pulse amplitude, or *strength* of the pulse.

Figure 4 shows where SpO2 (1), pulse amplitude (2), and pulse rate (3) displays are located on the monitor.

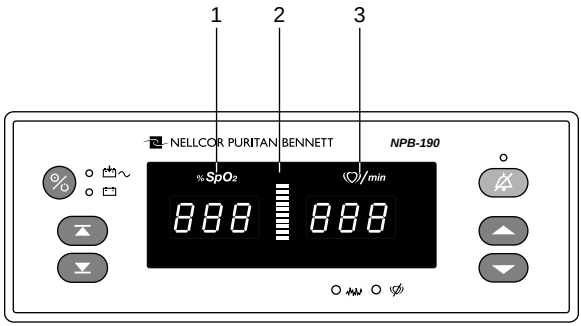


Figure 4: %SpO2 and Pulse Rate Displays, and Pulse Amplitude (Blip) Bar

The monitor compares the oxygen saturation measurement and the pulse rate to the alarm limit settings in the monitor. If pulse rate or oxygen saturation go above or below the alarm limit settings, the monitor sounds an alarm and the numbers in the display flash on and off. (The alarm will not sound, however, if the alarm function has been turned off.)

The monitor is a warning device. It cannot prevent the oxygen saturation level of your patient from falling below a safe level. It cannot prevent your patient's pulse rate from reaching an unsafe level.

The monitor can, however, warn you of situations that may be life-threatening to your patient. Therefore, you must make sure that you can hear the alarms at all times and that you respond to alarms immediately and as directed by your clinician.

SETUP

Your clinician may provide and set up the monitor and appropriate sensor for you. However, if you receive a monitor in its factory packaging, follow the instructions in this section to set it up yourself.

UNPACKING AND INSPECTION

Carefully unpack the monitor and check to make sure you have the following parts:

1 **NPB-290 Portable Pulse Oximeter.** The monitor. The name Nellcor Puritan Bennett NPB-290 is on the front of it.

1 **Nellcor pulse oximetry cable, Model MC-10 or SCP-10.** This cable links the sensor to the monitor.

1 **Nellcor sensor or assortment pack.** This package contains one or more adhesive bandage-type sensors with directions for use. Your clinician will select the sensor that will best suit the patient and explain its proper use. The sensor is connected to the oximetry cable which is then connected to the monitor.

1 **Nellcor Hospital-Grade Power Cord.** A thick, gray cord with a three-pronged plug on one end.

1 **Home Use Guide, Nellcor NPB-290 Pulse Oximeter.** This manual.

1 **Packing List**.

Caution: Contact your clinician if the NPB-290 shipping carton is damaged. Do NOT use a damaged monitor or one from a damaged carton.

If any part is missing, do not attempt to use the monitor. Instead, contact your clinician immediately.

PARTS OF THE MONITOR

The figures in this section show the front and rear panels of the monitor. All controls and displays are described in detail in the *Using the Monitor* section of this manual.

Figure 5 shows the front panel (face) of the monitor. Note that the numbers shown in Figure 5 are only labels for the figure—they are there to help you identify locations of displays and indicators on the front of the monitor. You do not see these numbers when you turn on the monitor.

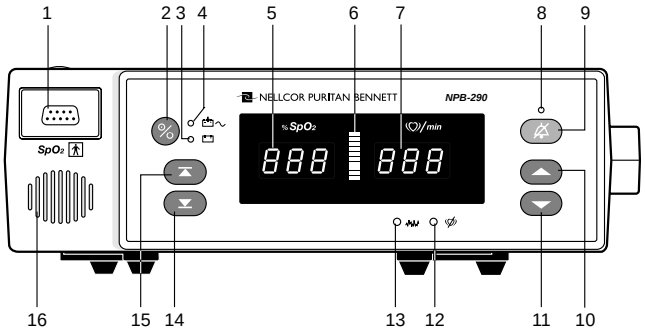


Figure 5: NPB-290 Front Panel

1 SpO_2 Sensor Port
2 Power On/Off Button
3 Low Battery Indicator
4 AC Power/Battery Charging Indicator
5 %SpO_2 Display
6 Pulse Amplitude Indicator
7 Pulse Rate Display
8 Alarm Silence Indicator
9 Alarm Silence Button
10 Adjust Up Button
11 Adjust Down Button
12 Pulse Search Indicator
13 Motion Indicator
14 Lower Alarm Limit Button
15 Upper Alarm Limit Button
16 Speaker

Figure 6 shows the rear panel (back) of the monitor.

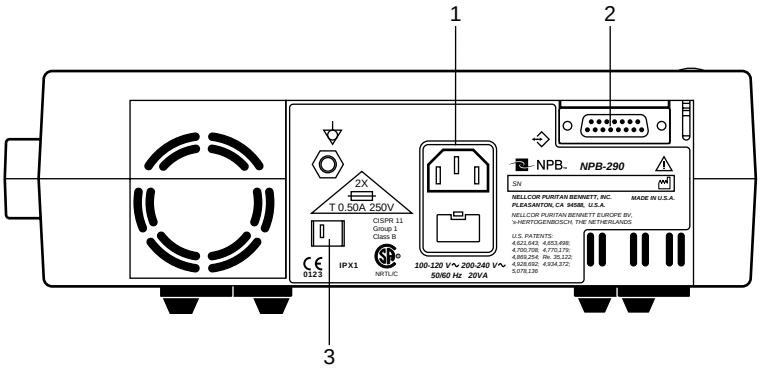


Figure 6: NPB-290 Rear Panel

1 AC Connector Port

2 Serial Interface Connector Port

3 Voltage Selector Switch

The back of the monitor has the AC connector that the power cord plugs into. This connector is shown in Figure 6 as number "1".

The back of the monitor also has the serial interface connector port (shown as "2" in Figure 6). It is unlikely that you will ever use this connector port. Do NOT plug anything into this port without specific instructions from your clinician.

The voltage selector switch ("3" in Figure 6), is for use only by your clinician. Do not reset this switch unless your clinician instructs you to do so. This switch must be set to "115" for use in the U.S.

OTHER PARTS OF THE SYSTEM

The NPB-290 monitor uses the following additional parts:

- Hospital-Grade Power Cord
- Sensor

Hospital-Grade Power Cord

WARNING: Do NOT plug the power cord into an electrical outlet controlled by a wall switch because the power may be accidentally turned off.

The hospital-grade power cord (Figure 7) has two connectors (or, "plugs"), one at each end.

One plug connects into the AC connector port located on the back of the monitor. The other plug (the end with three prongs) connects to a properly grounded electrical wall outlet. A properly grounded outlet is one with three slots.

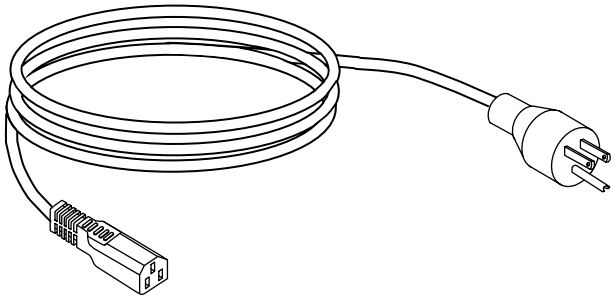


Figure 7: Hospital-Grade Power Cord

Sensor

The sensor is the small device that you attach to the patient to detect the passage of light through the blood. There are many types of sensors.

The section of this manual entitled *Nellcor Sensors* lists all available sensors and gives you information about the use of pulse oximetry sensors as well as important safety information.

WHERE TO PLACE THE MONITOR

Choose a place to set up the monitor according to the following safety guidelines.

Warnings

WARNING: Make sure you can hear the monitor's alarm from all rooms in the house, and when you are using noisy household appliances such as a vacuum cleaner, dishwasher, clothes dryer, television, or radio. Failure to ensure that the alarm volume is appropriate for the environment may place the patient in danger. If you need the volume adjusted, immediately contact the clinician for help.

WARNING: Place the monitor where the sensor can easily reach the patient. Make sure the sensor cable hangs loose, without strain, so that the patient can move freely.

WARNING: Do NOT place the monitor where the controls may be changed, such as in a crib or bed with the patient.

WARNING: Do NOT place the monitor on a carpeted floor. The alarm may be muffled by the carpeting.

WARNING: Do NOT place the monitor in any position that might cause it to fall on the patient.

WARNING: Do NOT place anything in front of the monitor's speaker that could block or decrease the sound of an alarm.

WARNING: Carefully route all medical equipment cables away from the patient's face and neck to avoid strangulation.

WARNING: Do NOT place the monitor on or near electrical equipment such as a television, radio, microwave oven, or an electric heater. These may affect the monitor and cause it to work improperly.

WARNING: Do NOT expose the monitor to extreme moisture such as direct exposure to rain. Extreme moisture can cause the monitor to fail, or to perform inaccurately.

WARNING: Do NOT place the monitor on or near a vaporizer. Moisture in the air may condense on the monitor and cause it to work improperly.

WARNING: Do NOT place a glass or other container of liquid on or near the monitor. Liquids spilled on the monitor may cause it to work improperly.

SETUP INSTRUCTIONS

The monitor may be operated on AC power, that is, with the power cord plugged into a wall outlet, or it can operate on its internal battery for up to 8 hours.

Note: Do not operate the monitor on its internal battery unless you are instructed to do so by your clinician.

If you are going to operate the monitor on battery power, skip steps 2 and 3 below, and refer to the *Using the Monitor* section of this manual for more information.

Follow these steps to set up the monitor:

1. Place the monitor on a flat, sturdy surface such as a table or shelf.

2. Connect the power cord (the end with the rectangular-shaped connector) to the rear of the monitor, as shown in Figure 8.

   Use only the original hospital-grade power cord provided by Mallinckrodt and your clinician.

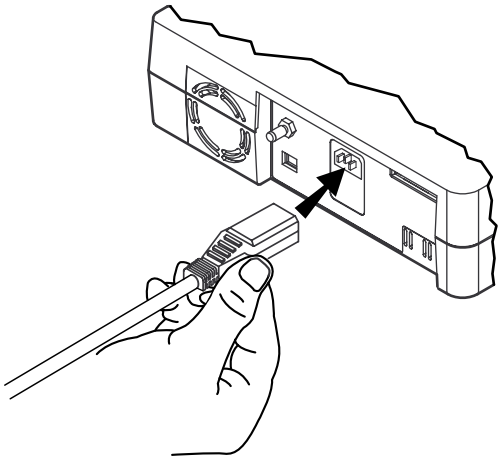


Figure 8: Connecting the Power Cord to the Monitor

WARNING: Do NOT plug the power cord into an electrical outlet controlled by a wall switch because the power may be accidentally turned off.

3. Connect the other end of the power cord (the round connector with three prongs) into an electrical wall outlet. The outlet must be grounded — that is, it must have three slots. Contact your clinician if you do not have a suitable outlet.

After the monitor is set up, the sensor may be connected to the monitor. The following section, entitled *Nellcor Sensors,* explains how to connect a sensor to the monitor and it lists all available sensors that may be used with the NPB-290 monitor.

The *Nellcor Sensors* section also gives you a brief description of the most commonly used types of sensors, and important safety information about the use of sensors.

NELLCOR SENSORS

OVERVIEW

The sensor is the small device that you attach to the monitor and the patient to detect the patient's pulse rate and oxygen saturation in the blood.

SELECTING A SENSOR

Certain factors make some sensors more suitable for one type of patient than another. Your clinician will choose the correct sensor for your patient after considering the following:

- **Weight of the Patient.** Sensors are designed for different patient weights (for example, babies, children, or adults) and for different application sites on the patient, such as a finger, toe, or foot.
- **Duration of Monitoring Time.** Some sensors can remain on the patient for longer periods of time than others. Some sensors are designed for short periods of monitoring or for spot-check measurements.
- **Activity Level of the Patient.** Adhesive sensors attach securely so that they stay in place as the patient moves. Reusable sensors—the type typically used for short periods of monitoring—do not attach as securely as adhesive sensors.

- **Need for Sterility.** A sterile sensor may be required if the patient has an infection or is at risk of developing an infection. Your clinician will tell you when a sterile sensor is needed for your patient.

The sensor that is provided with the NPB-290 monitor has a connector at one end that connects to an MC-10 or SCP-10 sensor extension cable. The MC-10 or SCP-10 cable then connects to the monitor.

Some sensors come with the sensor cable permanently attached, so that the sensor and cable are in one piece. Figure 9 shows an example of an *Oxisensor II* sensor, which comes with a sensor cable permanently attached. It is applied to the patient like an adhesive bandage.

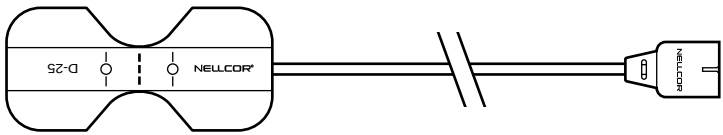


Figure 9: *Oxisensor II* Sensor with Attached Cable

Figure 10 shows another kind of sensor that can be used with the monitor. It is a *Durasensor* sensor that is contained in a plastic casing, and attaches to the patient without adhesives.

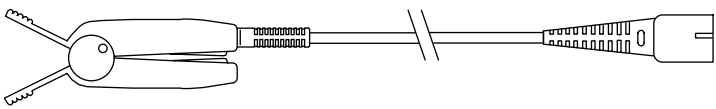


Figure 10: *Durasensor* Sensor with Attached Cable

An *OxiCliq* sensor can also be used with the monitor. It is similar to an *Oxisensor II* sensor in that it is a bandage-type sensor. But unlike an *Oxisensor II* sensor, the *OxiCliq* sensor does *not* have an attached cable.

Instead, the *OxiCliq* sensor must be connected to a special, separate sensor cable before it can be used (see Figure 11). Your clinician will furnish you with such a sensor and cable, and instruct you on how to attach it, if this type of sensor is to be used with your patient.

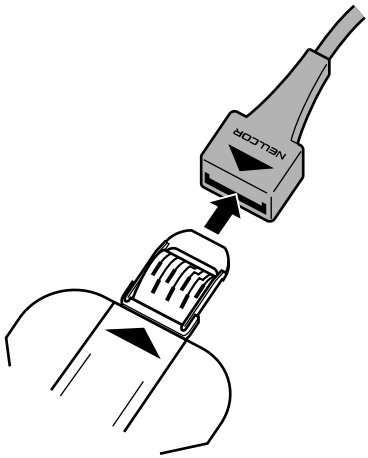


Figure 11: *OxiCliq* Sensor and Sensor Cable Connection

The following table (Table 1) lists *Nellcor* sensors that can be used with the NPB-290 monitor. It also includes sensor model numbers and names, and their target patient weight ranges.

In this table, you will see two symbols. The > symbol means more than; the < symbol means less than.

For example, Table 1 shows that the *Oxisensor II* Model N-25 sensor is for use on patients who weigh less than (<) 6.6 pounds, or greater than (>) 88 pounds.

Table 1: Selected *Nellcor* Sensors

Sensor	Model	Patient Weight In Pounds (lb) and Kilograms (kg)
OXISENSOR® II (sterile, single use)	N -25	< 6.6 or > 88 lb (< 3 or > 40 kg)
	I-20	6.6 to 44 lb (3 to 20 kg)
	D-20	22 to 110.2 lb (10 to 50 kg)
	D-25(L)	>66 lb (> 30 kg)
OXICLIQ® (sterile, single use)	AI	> 66 lb (> 30 kg)
	P	22 to 110.2 lb (10 to 50 kg)
	N	< 6.6 or > 88 lb (< 3 or > 40 kg)
	I	6.6 to 44 lb (3 to 20 kg)
DURA-Y® (nonsterile, reusable)	D-YS	> 2.2 lb (> 1 kg)
For use with the Dura-Y sensor:		
Ear Clip (reusable, non-sterile	D-YSE	> 66 lb (> 30 kg)
Pedi-Check™ pediatric spot-check clip (reusable, non - sterile)	D-YSPD	< 6.6 or > 88 lb (< 3 or > 40 kg)

Table 1: Selected *Nellcor* Sensors (continued)

Sensor	Model	Patient Weight In Pounds (lb) and Kilograms (kg)
DURASENSOR® (nonsterile, reusable)	DS-100A	> 88 lb (> 40 kg)
Oxiband® (reusable with disposable, nonsterile adhesive)	OXI-A/N	< 6.6 or > 88 lb (< 3 or > 40 kg)
	OXI-P/I	< 6.6 or > 88 lb (< 3 or > 40 kg)

SAFETY GUIDELINES

Always use sensors according to the following safety guidelines.

Warnings

WARNING: Use only *Nellcor* sensors with the monitor. Use of any other sensor may cause the monitor to work incorrectly.

WARNING: Before applying a sensor, carefully read the sensor Directions for Use.

WARNING: Do NOT use a sensor that appears to be damaged.

WARNING: Do NOT wrap sensors too tightly or use extra tape at the sensor site. Incorrect application of the sensor can cause tissue damage and false readings on the monitor.

WARNING: Check the sensor site frequently, as recommended by the sensor Directions for Use, to check that the sensor is in the correct place and sticks to the patient. If redness, swelling, or other problems appear at the sensor site, move the sensor to another site.

WARNING: Excessive light such as sunlight or fluorescent light may cause incorrect measurements. If used in the presence of bright light, cover the sensor with a cloth to block the extra light.

WARNING: Always remove the sensor before bathing the patient.

WARNING: Do NOT put any part of the sensor completely in water or any other liquid.

WARNING: Do NOT sterilize the sensor by steam or any other method or solution. Clean the sensor by following the instructions in the sensor Directions for Use.

CONNECTING A SENSOR TO THE MONITOR

Your clinician will select a sensor that is appropriate for use with your patient. After the monitor is set up (see the *Setup* section of this manual), you will be ready to connect that sensor to the monitor.

To connect the sensor to the NPB-290 monitor, follow these steps:

1. Plug the connector end of the sensor into the MC-10 or SCP-10 sensor extension cable as shown in Figure 12. Lower the plastic sensor lock over the sensor connector until you hear a click.

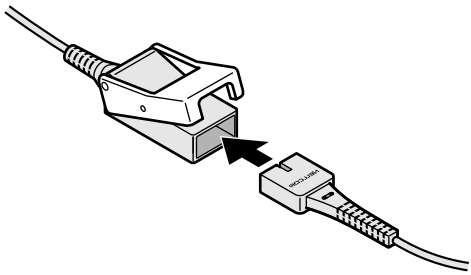


Figure 12: Connecting a Sensor to the MC-10 or SCP-10 Cable

2. Next, plug the other end of the MC-10 or SCP-10 cable into the front of the NPB-290 as shown in Figure 13.

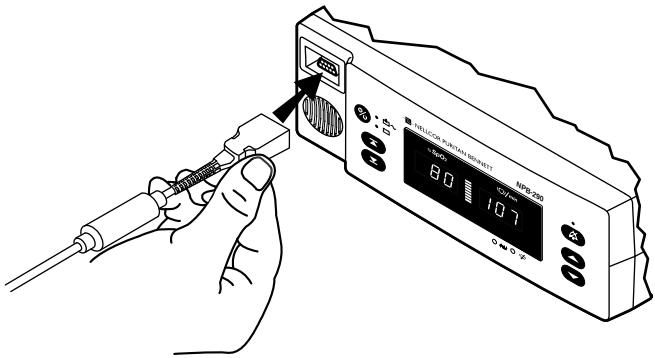


Figure 13: Connecting the MC-10 or SCP-10 to the Monitor

WARNING: Use only the Nellcor extension cable provided to you by your clinician. Use only one extension cable to increase the length of the sensor. Use of more than one extension cable may affect performance.

ATTACHING A SENSOR TO THE PATIENT

Apply the sensor to the patient as instructed by your clinician. The sensor Directions for Use also provides instructions for applying the particular sensor that was chosen for your patient.

CLEANING AND REUSE OF SENSORS

Follow all instructions given in the sensor Directions for Use. The Directions for Use describes how to clean, discard, or reuse each sensor.

TURNING ON THE MONITOR

WARNING: The monitor and sensor are prescription devices. Use only on the patient for whom prescribed and as directed by your clinician.

HOW TO TURN ON THE MONITOR

Before turning on the monitor, be sure you have set up the monitor correctly. That is, it must be set up according to the instructions given in the *Setup* section of this manual.

Also be sure that you have properly connected a sensor to the monitor and to the patient. The sensor must be connected according to the instructions given in the *Nellcor Sensors* section of this manual.

To turn on the monitor, press the On/Off Button. It is the round, blue button located on the front of the monitor, in the upper left corner.

WHAT YOU CAN EXPECT

Displays, Indicators, and Blip Bar Lights

When you turn on the monitor you will see:

- All indicators will light briefly.
- All numbers are displayed in red, then they change to green.
- All parts of the Pulse Amplitude Display light. While these lights are on, check to be sure all displays, indicators, and all segments of the Blip Bar light.

WARNING: If you see that a display or indicator light does not light up, do not use the monitor. Call your clinician immediately.

Note: The Battery Charging Indicator light *does not* come on if the monitor is operating on battery power.

This indicator light only comes on when the monitor is plugged into an electrical wall outlet. This is true even if the battery is fully charged. This is because the battery is always being recharged whenever the monitor is used on AC power.

The displays and indicator lights come on very quickly and are lit for only a short time. Therefore, you may want to turn the monitor on and off a few times until you become familiar with the displays and lights.

Displaying the Software Version

After the displays, indicators, and Blip Bar lights go out, the monitor will quickly display two sets of numbers, one set at a time. The numbers show the version of software in the monitor.

- The first set of numbers will begin with a number "1" in the far left display.
- The second set of numbers will begin with a number "2" in the far left display.

It is normal for the monitor to display these numbers. The numbers provide information that your clinician may need from time to time. These numbers have nothing to do with monitoring your patient, and it is unlikely you will ever need to refer to them.

The Power-On Self-Test

As soon as you turn on the monitor, all of its displays, indicators, and Blip Bar segments light. At the same time, the monitor begins what is called a "Power-On Self-Test."

Each time the monitor is turned on, it conducts this self-test of its internal systems to be sure everything is in working order before you monitor your patient. The test takes only a few seconds.

If the monitor passes the test, the monitor sounds a 1-second tone to let you know that it is okay to use. The monitor's software version is also displayed (the two sets of numbers discussed earlier).

WARNING: If you do not hear the Power-On Self-Test "pass" tone, do NOT try to use the monitor. Call your clinician.

If the monitor detects a problem during the test, a low priority alarm sounds and an error message (error code) is displayed.

Error codes are displayed with EEE in the %SpO2 Display, and with a numbers in the Pulse Rate Display. For example, you might see "EEE 1" displayed.

If you see an error code, turn the monitor off and on again. If the error code is shown again:

- Write down the error code number.
- Turn off the monitor.
- Call your clinician to report the error code.

The NPB-290 sometimes performs self-tests that you cannot see. It does this routinely, while the monitor is working. You will only know that these tests are being run if there is a problem with the monitor. In that case, you will see an error code displayed. Error codes are discussed in the *Troubleshooting and Maintenance* section of this manual.

WHAT THE DISPLAY SHOWS

If the self-test succeeds, you will hear a single 1-second tone, followed by one of three displays.

- **If a sensor is properly attached to the monitor and to your patient:**

  The NPB-290 will begin monitoring. You will see segments of the Blip Bar flash and hear a beeping sound as the monitor detects each heart beat. You will also see numbers in the %SpO2 and Pulse Rate Displays, as the patient is being monitored.

- **If a sensor is properly attached to the monitor, but not to the patient:**

  The monitor will search for a pulse. You will see zeroes displayed, and the Pulse Search Indicator will light.

- **If no sensor is attached to the monitor:**

  The monitor will not search for a pulse. Dashes will appear in each of the displays.

USING THE MONITOR

WARNING: The monitor and sensor are prescription devices. Use only on the patient for whom prescribed. Follow the directions of your clinician.

OVERVIEW

This section describes what you can expect to see and hear from the monitor during normal operation. It also tells you:

- What to expect when the monitor stops detecting a pulse beat
- How to use the monitor on battery power
- What to do if you need to store the monitor for a long period of time.

NON-ALARM SOUNDS

There are sounds you will hear from the monitor other than alarm sounds:

Power-On Self-Test Pass	A 1-second tone that lets you know when the monitor has successfully completed its power-on self-test. This sound is only heard when you first turn on the monitor.

Valid Button Press	A single tone that you hear each time you press a correct button. It lets you know that the button-press was accepted by the monitor.
Invalid Button Press	A single low-pitched tone that you hear if you press an incorrect button. It lets you know that the button-press was *not* accepted by the monitor.
Pulse Beep	A beep tone that sounds with each measured pulse or heartbeat detected from the patient. You can silence this sound or adjust its volume.

ADJUSTING PULSE BEEP VOLUME

When the monitor is detecting the patient's pulse rate, it sounds a beep with each heartbeat. This beep, called the "pulse beep," can be turned off (silenced), or its volume can be adjusted up (louder) or down (softer).

To adjust or silence the pulse beep, press and hold the Adjust Up or Adjust Down Button (located on the right side of the front panel) until you reach the sound level you wish.

This adjusted volume level will remain in effect until you change it or until you turn off the monitor. When you turn the monitor off, and then back on again, the pulse beep volume will return to its original level.

MONITORING

During routine monitoring, you see and hear the following:

- The monitor displays the patient's SpO_2 and pulse rate levels.
- The monitor beeps with each pulse.
- The Blip Bar segments light, showing you the patient's pulse amplitude (pulse strength) with each "beep" that you hear.
- If the monitor is plugged into a wall outlet, the Battery Charging Indicator is lit.

Pulse Search

At Initial Power-Up

When the monitor is first turned on and the self-test is successfully completed, the monitor begins searching for the patient's pulse.

Finding the patient's pulse usually takes only a few seconds. While the monitor is searching for the pulse, you see the following:

- The Pulse Search Indicator is lit.
- The monitor displays zeroes in the %SpO_2 and Pulse Rate Displays.

As soon as the monitor detects the patient's pulse, the NPB-290 begins routine monitoring.

After Taking Measurements

After the NPB-290 has been taking measurements and then can no longer detect a pulse rate, the monitor enters Pulse Search.

Note: When the monitor no longer detects a pulse rate, check the patient as you have been instructed by your clinician.

If the monitor enters Pulse Search, it could mean that the patient has no pulse or that the monitor cannot locate a pulse. The monitor may not be able to locate the pulse because the sensor has moved and is no longer in the correct position for monitoring.

Pulse Search is a normal function of the monitor. In Pulse Search, the monitor tries to again locate the pulse.

Here is what you see and hear during Pulse Search:

- The Pulse Search Indicator is lit.
- The last %SpO2 and pulse rate values flash on the display screen.
- If no pulse is detected within a few seconds, the monitor sounds a high-pitched alarm to let you know it could not display a pulse, and it displays zeroes. (See the *Alarms* section of this manual for a description of alarms.)

OPERATING THE MONITOR ON BATTERY POWER

Do not operate the monitor on its internal battery unless your clinician has instructed you to do so. The battery should always remain fully charged and available for use in case it is needed.

During a Power Failure

WARNING: If a power failure should occur, continue to use the monitor, but contact your clinician right away.

If you have a power failure in your home, the monitor will automatically get its power from its battery. It will continue monitoring your patient for approximately 8 hours.

Note: Each time the battery is used, the "life" of the battery is decreased a little.

For example, a fresh, unused battery will operate for approximately 12 hours, but that same battery will provide less monitoring time each time it is recharged and reused.

You may continue to use the monitor on battery power during a power failure. However, you should contact your clinician right away.

Your clinician should give you instructions regarding what to do if the power failure lasts longer than the length of time the battery can power the monitor. Options could include moving the patient to another location, or providing you with a handheld monitor.

It is important to contact your clinician as soon as a power failure occurs.

What You See and Hear

When the monitor converts from AC power to battery power during monitoring, it will simply continue routine monitoring. You will still hear the pulse beep and see values displayed.

The monitor lets you know that it is running on battery power by turning off the AC Power Indicator. This light is only ON when the monitor is connected to an active AC power source (an active wall outlet).

This light going out is the only indication you will have that the monitor is running on its battery. That is one reason why it is so important to check all indicator lights when you first turn on the monitor.

Low Battery Indicator

The Low Battery Indicator lights when about 15 minutes of monitoring time remains on the battery. At the same time, a low priority alarm sounds. Low priority alarms are discussed in the *Alarms* section of this manual.

Discharged Battery

The monitor will not operate if the battery completely discharges (if it is "dead"). Instead, the error "EEE04" is displayed. This is true even after the monitor is again connected to AC power.

Should this occur, plug the monitor into an active AC power wall outlet and let the battery recharge. It will take about 30 minutes to recharge the battery so that you can again monitor your patient.

With the monitor plugged into an AC power wall outlet, it will take about 18 hours to *fully* recharge the battery if the monitor is operating. If the monitor is not operating, the battery will take about 14 hours to recharge.

STORING THE MONITOR

If the monitor needs to be stored for a long period of time (2 months or longer), the battery must be removed from the monitor. Do NOT try to do this yourself. Contact your clinician.

Because the monitor should only be stored with its battery for up to 2 months, it is important, when returning the monitor to your clinician, that you let him or her know if you have not used the monitor for some time.

AUTOMATIC SHUT-OFF

The monitor will automatically shut off, if all of the following conditions are in effect FOR 15 MINUTES:

- The monitor is running on its internal battery, and
- no alarms are sounding (except for a low-battery alarm or non-correctable error), and
- no buttons have been pressed, and
- no pulse has been detected (for example, when the sensor is not connected).

ALARMS

OVERVIEW

Alarms are used to alert you when the patient's oxygen saturation level (%SpO2) or pulse rate go beyond a set limit. When these occur, the numbers in the displays flash and an alarm sounds.

WARNING: This manual tells you how to respond to the monitor when it alarms. It does NOT tell you how to respond to the patient when the monitor alarms. Your clinician will tell you how to respond to your patient in an alarm situation.

Different types of alarms can also sound for other reasons, such as:

- The sensor is disconnected from the sensor cable
- The sensor cable is disconnected from the monitor
- The monitor's self-test fails
- The monitor detected a pulse, but lost it
- The battery becomes low on power
- The internal parts of the monitor fail

This section of the manual describes types of alarms and what they mean.

TYPES OF ALARMS

There are three basic types of alarms:

High Priority Alarm	This alarm makes a high-pitched, fast, pulsing sound. A high priority alarm sounds during loss-of-pulse.
Medium Priority Alarm	This alarm makes a medium-pitched, pulsing tone. A medium priority alarm sounds when an SpO2 or pulse rate is above or below its set limit.
Low Priority Alarm	This alarm makes a low-pitched, slow, pulsing tone. A low priority alarm sounds if the monitor is running on battery power and the battery is low, or if the sensor has disconnected from the monitor, or if there is an internal monitor failure.

Note: There is no high- or low-limit or pulse search alarm if the monitor is turned on before the sensor is applied to the patient. Limit and pulse search alarms sound *only after* a pulse has been detected.

While alarms are sounding, you still hear beeps each time you press a button (the correct and incorrect button-press tones described earlier), and you can still hear the pulse beeps that indicate a pulse.

ALARM CONDITIONS

Following are some situations that cause the monitor to sound an alarm, and a description of what you see and hear:

- **Loss of Pulse:**

  The monitor cannot find a pulse or detect motion. You hear and see:

  – A high priority alarm

  – Flashing Pulse Search Indicator

  – %SpO_2 and pulse rate flashes zeroes (“0”)

  You should ***immediately check the patient*** and respond to this alarm as you have been instructed by your clinician.

- **Alarm Limit Violation:**

  The monitor detects a condition that goes beyond an alarm limit setting. You see and hear:

  – A medium priority alarm

  – Flashing displays

  You should ***immediately check the patient*** and respond to this alarm as you have been instructed by your clinician.

- **Low Battery:**

  You are operating the monitor on its internal battery, and the battery has approximately 15 minutes of operation remaining. You hear and see:

  – A low priority alarm

  – Slowly flashing Battery Low Indicator

  You should plug the power cord into a properly grounded electrical outlet that has three slots. The battery will begin recharging. Continue monitoring on AC (wall outlet) power.

- **Sensor Disconnect:**

  The oximetry sensor cable has become disconnected from the monitor, or the sensor has become disconnected from the cable, or both have occurred. You hear and see:

  – A low priority alarm

  – Dashes in displays

  You should check the sensor cable connection to the monitor and the sensor connection to the MC-10 or SCP-10 cable. Reconnect any parts that are loose or disconnected. You may wish to temporarily silence the alarm while you are doing this by pressing the Alarm Silence Button.

ADJUSTING ALARM LIMITS

WARNING: Do NOT adjust alarm limits unless your clinician has instructed you to do so.

Alarm limits for SpO_2 and pulse rate are set in the monitor. As long as the patient's oxygen saturation level and pulse rate stay within the alarm limits, regular monitoring continues.

However, if a limit is violated, that is, if either the oxygen saturation level or pulse rate exceeds the highest limit or falls below the lowest limit set in the monitor, an alarm will sound.

Your clinician will instruct you on what to do if an alarm sounds.

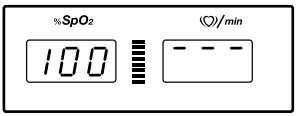
Your clinician will also tell you if you should change the alarm limits for your particular patient. Do NOT change any alarm limit unless your clinician has specifically told you to.

The following information explains how to change, or *adjust,* alarm limits temporarily.

Any changes you make will be in effect only while the monitor remains ON. When you turn the monitor off and then back on again, the alarm limits will return to what they were originally.

Adjusting SpO2 Upper Alarm Limit

To adjust the upper alarm limit for oxygen saturation (%SpO2), first look at the current upper alarm limit. To do this, press the Upper Alarm Limit Button. You will see a display that looks similar to this:

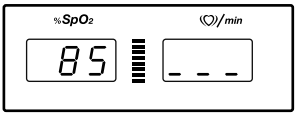


The upper alarm limit for oxygen saturation will appear in the %SpO2 Display. You will know that this is an *upper* limit by the three dashes that appear next to the number in the *upper* part of the other display.

To adjust this limit, press either the Adjust Up or Adjust Down Button until you see the limit number that you need.

Adjusting SpO2 Lower Alarm Limit

To adjust the lower alarm limit for oxygen saturation (%SpO2), first look at the current lower alarm limit. To do this, press the Lower Alarm Limit Button. You will see a display that looks similar to this:

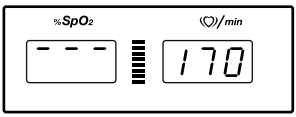


The lower alarm limit for oxygen saturation will appear in the %SpO2 Display. You will know that this is a *lower* limit by the three dashes that appear next to the number in the *lower* part of the other display.

To adjust this limit, press either the Adjust Up or Adjust Down Button until you see the limit number that you need.

Adjusting Pulse Rate Upper Alarm Limit

To adjust the upper alarm limit for Pulse Rate, first look at the current upper alarm limit. To do this, press the Upper Alarm Limit Button *twice*. You will see a display that looks similar to this:

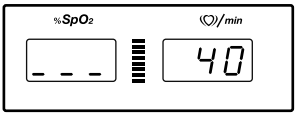


The upper alarm limit for pulse rate will appear in the Pulse Rate Display. You will know that this is an *upper* limit by the three dashes that appear next to the number in the *upper* part of the other display.

To adjust this limit, press either the Adjust Up or Adjust Down Button until you see the limit number that you need.

Adjusting Pulse Rate Lower Alarm Limit

To adjust the lower alarm limit for pulse rate, first look at the current lower alarm limit. To do this, press the Lower Alarm Limit Button *twice*. You will see a display that looks similar to this:



The lower alarm limit for pulse rate will appear in the Pulse Rate Display. You will know that this is a *lower* limit by the three dashes that appear next to the number in the *lower* part of the other display.

To adjust this limit, press either the Adjust Up or Adjust Down Button until you see the limit number that you need.

ALARM LIMITS CHANGED INDICATOR

If any alarm limit has been adjusted, the value that was changed (either SpO2 or Pulse Rate) will appear on the display during monitoring with a decimal point (period) after the number.

This decimal point is there as a reminder to you that the alarm limit has been temporarily changed from what was originally set in the monitor.

ADJUSTING ALARM VOLUME

WARNING: Make sure you can hear the monitor's alarm from all rooms in the house, and when you are using noisy household appliances such as a vacuum cleaner, dishwasher, clothes dryer, television, or radio. Failure to ensure that the alarm volume is appropriate for the environment may place the patient in danger. If you need the volume adjusted, immediately contact the clinician for help.

SILENCING THE ALARM

WARNING: Do NOT silence the alarm unless your clinician has instructed you to do so.

The monitor's alarm can be silenced temporarily. If an alarm sounds during monitoring, follow your clinician's instructions regarding what to do during an alarm condition. If you aren't sure what to do next, *contact your clinician immediately.*

If your clinician instructs you to silence an alarm, follow these steps:

1. Press and release the Alarm Silence Button (the lavender button located on the upper right front of the monitor).

   The Alarm Silence Indicator will light and the alarm will no longer sound.

2. The alarm will remain silent for a period of time that the clinician has set in the monitor.

4. At the end of the Alarm Silence Duration, the alarm will sound again if the alarm condition still exists.

You may turn the alarm back on any time during the Alarm Silence Duration by pressing the Alarm Silence Button again.

TROUBLESHOOTING AND MAINTENANCE

OVERVIEW

This section lists possible problems that might arise during normal use of the monitor, along with possible solutions.

If one of the problems described here occurs and you feel uncertain about your patient's condition, *contact your clinician immediately.*

In general, if the monitor does not appear to be working correctly, contact your clinician.

ERROR CODES

The monitor periodically performs self-tests similar to the Power-On Self-Test that is done when the monitor is first turned on.

These self-tests are done internally and you are not aware of them unless the monitor determines it has a problem somewhere in its internal system. If that happens, the monitor will display an error code — you will see "EEE" followed by a number (for example, "EEE 1").

If such an error code should appear on the display screen during monitoring, turn the monitor off and then on again. If the error code is shown again:

1. Write down the number on the display screen.
2. Turn off the monitor.
3. Call your clinician to report the error code.

PROBLEMS THAT MAY OCCUR

The following information discusses possible problems that could arise during use of the monitor, and suggestions for correcting them.

1. **There is no response to the Power On/Off button.**

    - The monitor is not connected to AC power, AND the battery is either missing or is discharged (dead). Try plugging the monitor into another AC power source (wall outlet); check to see if the wall outlet you were trying to use is controlled by a wall switch (it may have been switched off).
    - If operating on AC power in the U.S., ensure that the voltage selector switch on the rear panel is set to "115".
    - If changing to a known good outlet does not solve the problem, call your clinician.

2. **During the power-on self-test, you notice that one or more display segments or indictors do not light.**

    - Do NOT use the NPB-290. Call your clinician.

3. **The monitor does NOT sound a tone indicating successful completion of the power-on self-test.**

    - The monitor has detected a problem with its internal system. Do not attempt to use the monitor. Call your clinician.

4. The Pulse Search indicator is lit for more than 10 seconds.

- Check the sensor Directions for Use to be sure that the sensor being used is appropriate for your patient (it should be one provided to you by your clinician). Check to see that the sensor is correctly applied. Check the sensor and extension cable connections to be sure they are securely in place. Test the sensor on someone else. Move the sensor to another sensor site (these are listed in each sensor's Directions for Use). Try another sensor or extension cable, if they are available to you. Call your clinician.
- If the patient is moving around a lot, the monitor may have trouble tracking the patient's pulse. Keep the patient still, if possible. Make sure that the sensor is securely applied, and replace it if necessary. Change the sensor to another site (listed in the sensor Directions for Use). Call your clinician.
- The monitor could be too close to some electrical appliances that are in use, such as a cellular phone, two-way radio, television set, or others. Excessive interference from such appliances can prevent the monitor from tracking the pulse. Move such appliances away from the monitor to see if that corrects the problem. Call your clinician.

5. The Pulse Search indicator lights *after* successful measurements have been made.

- ***Check the patient***
- Change the sensor site.
- Because of too much patient movement, the monitor cannot properly track the pulse.
- The sensor may be too tight.

Note: Contact your clinician if you are unable to correct the problem.

6. The monitor may cause static or interference on a nearby radio or television.

- Move or relocate the antenna on the radio or television.
- Move the radio or television away from the monitor.
- Plug the monitor into a different outlet, one NOT used by the radio or television.
- Contact an experienced radio or television technician for advice.

CLEANING THE MONITOR AND SENSOR

WARNING: Do not spray, pour, or spill any liquid on the monitor, sensor, connectors, switches, or openings in the chassis.

To clean the monitor, dampen a cloth with a commercial, gentle cleaner and wipe the top, bottom, and front surfaces lightly. Wipe the cable with a damp cloth.

To clean a sensor, follow the cleaning instructions recommended by your clinician. Cleaning instructions can also be found in the sensor Directions for Use.

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Nellcor

Tyco Healthcare Group LP
Nellcor Puritan Bennett Division
Pleasanton, CA

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