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Operator's Manual

920M™ PLUS

Handheld Pulse Oximeter

English/Español

The information in this manual has been carefully checked and is believed to be accurate. In the interest of ongoing product development, Respironics reserves the right to make changes and improvements to this manual and the products it describes at any time, without notice or obligation.

CAUTION: Federal law (USA) restricts this device to sale by or on the order of a physician.

CAUTION: Read this entire manual carefully before using the 920M PLUS Pulse Oximeter.

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Guide to Symbols

Front Panel Symbols

- %SpO₂** Percent Oxygen Saturation
-  Pulse Rate
-  Pulse Quality (tricolor LED)
-  Low Battery

Front Panel Switches

-  On/Standby
-  Advance

Other Symbols





-  ATTENTION: See Instructions for Use
-  Not for Continuous Monitoring
(No Alarm for SpO₂)
-  Type BF Applied Part
(Patient isolation from electrical shock)
-  UL Mark for Canada and the United States
with respect to electric shock, fire, and
mechanical hazards only in accordance with
UL 2601-1 and CAN/CSA C22.1 No. 601.1
- SN** Serial Number
(located under the battery cover)

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Precautions for Use


Contraindications

- Do not use the 920M PLUS in an MRI environment.
- Do not use the 920M PLUS in situations where alarms are required. The device has no alarms.

Warnings

- Explosion hazard: Do not use the 920M PLUS in an explosive atmosphere.
- The 920M PLUS is intended only as an adjunct in patient assessment. It must be used in conjunction with other methods of assessing clinical signs and symptoms.
- Use only Respironics compatible sensors, which are manufactured to meet the accuracy specifications for Respironics pulse oximeters. Using other manufacturers' sensors may cause improper pulse oximeter performance.
- As with all medical equipment, carefully route patient cabling to reduce the possibility of patient entanglement or strangulation.
- Check the pulse oximeter sensor application site *frequently* to determine the positioning of the sensor and the circulation and skin sensitivity of the patient. Each patient's sensitivity to Respironics sensors may vary depending on medical status or skin condition.
- Do not use adhesive tape strips if the patient exhibits an allergic reaction.
- Do not stretch the adhesive tape while applying the pulse oximeter sensor. This may cause inaccurate readings or skin blisters.
- General operation of the 920M PLUS might be affected by the use of an electrosurgical unit (ESU).
- Do not use a damaged sensor.

Cautions

- Federal law (USA) restricts this device to sale by or on the order of a physician.
- Before use, carefully read the package insert provided with the sensors.
- The 920M PLUS is intended for spot-checking or monitoring by an attending healthcare professional. Because the 920M PLUS has no SpO₂ alarms, international labeling requirements (EN 865) dictate it be labeled *not for continuous monitoring*, as indicated by the  symbol.
- The 920M PLUS Pulse Oximeter is not an apnea monitor.
- Verify that all visible indicators illuminate during the startup (initialization) sequence. If any indicator is not lit, do not use the 920M PLUS. Contact Respironics Customer Support for repair or replacement.

Cautions

- The 920M PLUS Pulse Oximeter must be able to measure the pulse properly to obtain an accurate SpO₂ measurement. Verify that nothing is hindering the pulse measurement before relying on the SpO₂ measurement.
- Some nail polish colors (particularly dark shades) or artificial nails may reduce light transmission and affect SpO₂ accuracy. Remove any nail polish or artificial nails before using the 920M PLUS.
- The 920M PLUS may not work on all patients. If you are unable to achieve stable readings, discontinue use.
- The 920M PLUS may misinterpret motion as good pulse quality. Minimize patient motion as much as possible.
- The 920M PLUS Pulse Oximeter is designed to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobin may affect the accuracy of the measurement.
- Cardiogreen and other intravascular dyes, depending on the concentration, may affect the accuracy of the SpO₂ measurement.
- Ear Clip sensors are not recommended for pediatric or neonatal use; their accuracy of these sensors has not been established.
- Do not immerse the 920M PLUS or Respironics sensors in liquid.
- Do not use caustic or abrasive cleaning agents on the device or sensors.
- The 920M PLUS Pulse Oximeter is a precision electronic instrument and must be repaired by trained Respironics-designated personnel only.
- Do not use different types of batteries at the same time, and do not mix fully charged and partially charged batteries at the same time.
- Do not remove any covers (except the battery cover) when replacing batteries. There are no user-serviceable parts inside other than the replaceable batteries.
- Follow local ordinances and recycling instructions regarding disposal or recycling of the device and device components, including batteries.
- Batteries may leak or explode if used or disposed of improperly.
- Remove the batteries to avoid the risk of leakage if the 920M PLUS is going to be stored for more than one month.
- This equipment complies with International Standard EN 60601-1-2:1993 for electromagnetic compatibility for medical electrical equipment and/or systems. This standard is designed to provide reasonable protection against harmful interference in a typical medical installation. However, because of the proliferation of radio-frequency transmitting equipment and other sources of electrical noise in healthcare and other environments (for example cellular phones, mobile two-way radios, electrical appliances), it is possible that high levels of such interference due to close proximity or strength of a source may result in disruption of performance of this device.

Indications for Use

The Respironics® 920M™ PLUS Handheld Pulse Oximeter is indicated for measuring and displaying functional oxygen saturation of arterial hemoglobin (SpO₂) and pulse rate for adult, pediatric, and neonatal patients in hospital, ambulatory, home, and EMS (emergency medical service) environments. The 920M PLUS is intended for spot-checking and/or continuous monitoring when attended by a trained healthcare professional.

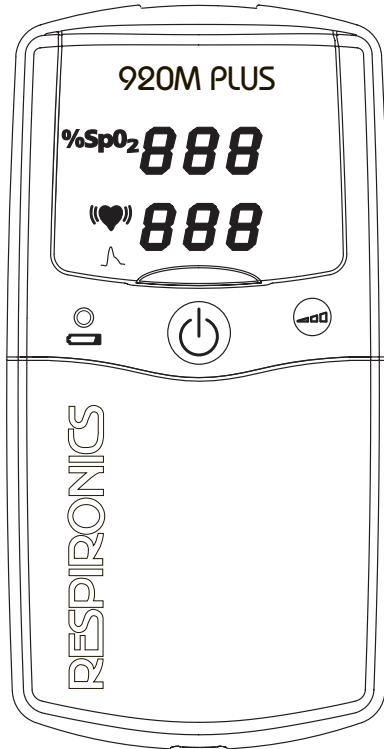


Figure 1. The Model 920M PLUS Pulse Oximeter.

General Description

The 920M PLUS is a digital handheld pulse oximeter that displays numerical values for blood oxygen saturation and pulse rate (Figure 2).

The 920M PLUS operates for approximately 100 hours continuously between alkaline battery replacements, or for 45 hours with the Rechargeable NiMH (Nickel Metal Hydride) Battery Pack (optional). The 920M PLUS requires no routine calibration or maintenance other than replacement of alkaline batteries or recharging the optional battery pack using the Model 920MPC Charger Stand. (Refer to the Model 920MPC Operator's Manual.)

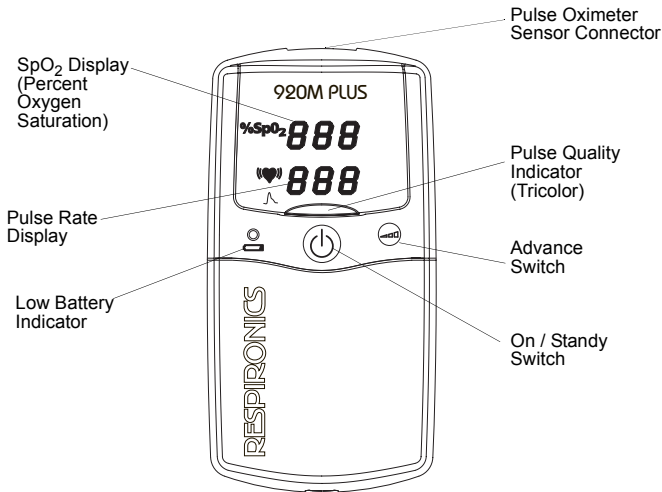


Figure 2. 920M PLUS displays, indicators, and switches.

Oxygen saturation and pulse rate values are displayed by light-emitting diode (LED) digital displays. On each detected pulse, the pulse quality LED blinks. Patient pulse quality signals are graded as good, marginal, or inadequate and are indicated as such by the pulse quality indicator blinking green, yellow, or red, respectively. This simple method gives the user a pulse-by-pulse visual indication of waveform signal quality without requiring the user to perform complex waveform analysis.

The 920M PLUS features pulse oximeter sensors for a wide range of patient monitoring. Each sensor is designed for a specific site application and specific patient size and weight range. Refer to specific sensor instructional inserts for more detailed information about sensor use.

Because the 920M PLUS Handheld Pulse Oximeter has no patient alarms, frequent observation of SpO₂ and pulse rate displays is required.

A sensor disconnect or malfunction is indicated by a lack of good pulse quality blinking and/or a dash to the left of the SpO₂ value on the LED display. When adequate pulse signals are not received, the SpO₂ and/or pulse rate numerical values will be replaced by dashes. Low and critically low battery conditions will be indicated by the low battery LED.

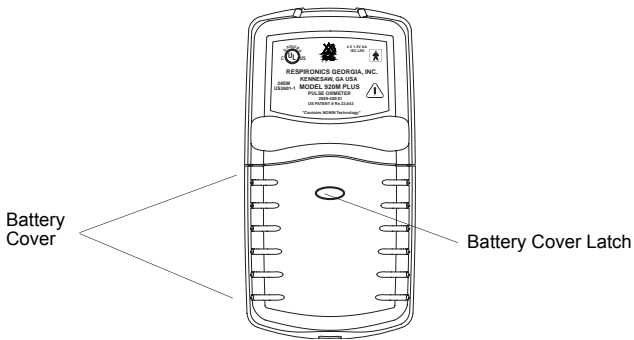


Figure 3. Rear view of the 920M PLUS.

The 920M PLUS system includes the following items:

- 1 Model 920M PLUS Handheld Pulse Oximeter
- 1 Operator's Manual
- 1 Respironics Pulse Oximeter Sensor
- 4 AA-Size Alkaline Batteries

Confirm that the items listed are packed with the 920M PLUS system. If any item on this list is missing or damaged, contact your distributor. Contact the carrier immediately if the shipping carton is damaged.

Basic Operation

Installing and Using the Batteries

The 920M PLUS Handheld Pulse Oximeter can be powered by 4 AA-size alkaline batteries (which will typically provide 100 hours of continuous operation), or by the optional Rechargeable NiMH Battery Pack. (See “Accessories” on page 22.) *Respironics does not recommend the use of any other battery types.*

When the batteries are low, the low battery indicator (a yellow LED) will be steadily illuminated. (See Figure 2 on page 4.) Replace the batteries as soon as possible. When the batteries are critically low, the low battery indicator will flash and the pulse oximeter will not operate. The digital displays will go blank, and the pulse quality indicator will blink yellow or red, but not green. Replace the batteries immediately.

1. Press the battery cover latch (see Figure 3 on page 5), and remove the battery cover on the bottom of the 920M PLUS.
2. Insert four new AA-size alkaline batteries or a Rechargeable NiMH Battery Pack. Be sure to insert the batteries in the correct position, as indicated by the polarity markings (+ and -) inside the battery compartment. Refer to Figure 4 on page 8 for an illustration of correct battery orientation. *Proper battery positioning is essential for correct operation.*
3. Replace the battery cover and turn on the 920M PLUS. If the unit does not turn on, see “Troubleshooting Guide” on page 24.

Important Notes about Battery Use

Four AA alkaline batteries provide the 920M PLUS with approximately 100 hours of continuous operation, while the Rechargeable NiMH Battery Pack provides the 920M PLUS with approximately 45 hours of continuous operation.

Clock/calendar settings can significantly affect battery storage life.

Batteries drain during storage, but they drain much more quickly when the unit's clock/calendar functions are set. Refer to "Calendar and Clock Settings" on page 14 for more information.

With AA Batteries

- If the clock/calendar is *not* set when the unit is stored, alkaline batteries will need replacement in 10-12 months *if the unit has not been used*.
- If the clock/calendar is *set* when the unit is stored, alkaline batteries will require replacement in about 6 weeks *if the unit has not been used*.
- Using the oximeter will shorten the required replacement time.

With Rechargeable NiMH Battery Pack

- If the clock/calendar is *not* set when the unit is stored, the Rechargeable NiMH Battery Pack will need recharging at least every 2 months *if the unit has not been used*.
- If the clock/calendar is *set* when the unit is stored, the Rechargeable NiMH Battery Pack will need recharging at least every 3 weeks *if the unit has not been used*.
- Using the oximeter will shorten the required recharging time.

Recharging Batteries (NiMH Battery Pack Only)

- Completely recharging the NiMH battery pack requires approximately 90 minutes when the unit is completely discharged.
- The expected useful life of the Rechargeable NiMH battery pack is 500 charge/discharge cycles, or approximately 10 years, whichever is first. The battery pack must be charged at least once each year to maintain optimal battery life.
- AA alkaline batteries cannot be recharged in the charging stand.

Note: After removing batteries from the 920M PLUS, you will have approximately 2 minutes to replace them before losing data stored in memory and the clock and calendar settings. Replace the batteries immediately to avoid the loss of stored data.

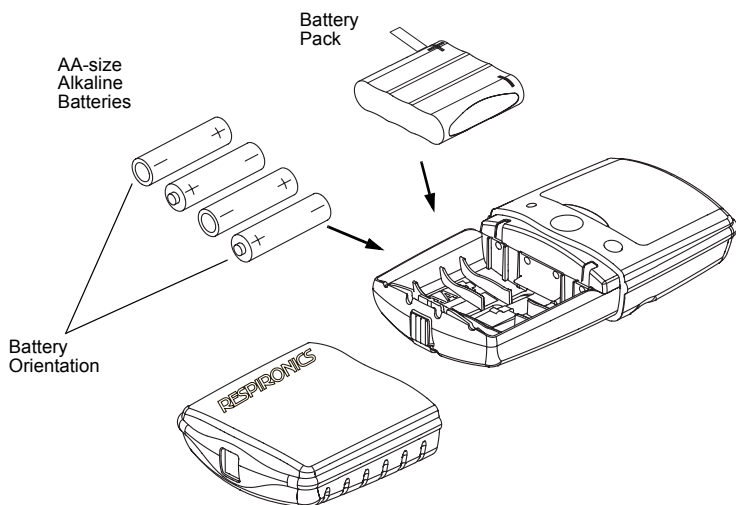


Figure 4. Installing batteries in the 920M PLUS.

Connecting the Sensor

Connect the pulse oximeter sensor to the top of the 920M PLUS as shown in Figure 5. Ensure that the sensor is firmly plugged in. Refer to the specific sensor package insert for pulse oximeter sensor positioning information.

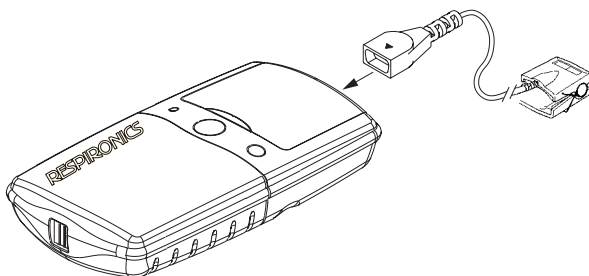


Figure 5. Connecting a sensor to the 920M PLUS.

Power On/Standby

Turn on the 920M PLUS by pressing and releasing the On/Standby switch Φ . Turn off the unit by pressing and holding this switch for about 2 seconds. Refer to Figure 2 on page 4 for a detailed illustration of the switches and indicators. Refer to “Detailed Operation” on page 11 for detailed information about entering setup mode and on general operation of the 920M PLUS.

Power On Self-Test

When the 920M PLUS is powered on for normal operation by pressing and releasing the On/Standby switch Φ , the unit will cycle through a startup (or initialization) sequence before displaying valid data values.

During a startup, always check for any missing indicators or LED display segments. If any indicator is not lit, do not use the 920M PLUS. Contact Respironics Customer Support for repair or replacement.

At normal startup (when not entering the setup mode), with fresh batteries, the 920M PLUS will cycle through the following sequence:

- $\overline{888}$
 $\overline{888}$ will appear briefly in the SpO₂ and pulse rate displays
- the yellow low battery indicator will turn on steadily for a few seconds
- the pulse quality indicator will turn on red for 1 second, then green for 1 second, and then begin to blink
- the clock time currently set in the memory (in hours and minutes, $\overline{04}$
 $\overline{41}$ for example) appears briefly in the displays
- the software revision number (the letter “r” followed by a 3-digit number, $\overline{018}$ for example) appears briefly in the displays
- $\overline{\quad}$ (two dashes) will appear in the displays until a valid pulse signal is detected

Note: *When entering setup mode at power on (for memory clear, calendar, or clock settings), the 920M PLUS will cycle through a startup sequence similar to the above, with the following exceptions: 1) The pulse quality indicator will first turn on red for 1 second, then green for 1 second, but will then turn off and not blink until after exiting setup mode; 2) the software revision number will not appear; and 3) the two dashes will appear only after exiting setup mode.*

Monitoring

Verify that the pulse oximeter sensor is properly positioned (on a finger, for example). Ensure that the pulse oximeter is sensing adequate pulse quality by:

- verifying that the pulse quality indicator is blinking green *and*
- verifying that the pulse rate and SpO₂ displays are showing readings *and*
- verifying that the pulse quality indicator blinking is correlated to the pulse rate for at least 10 seconds

If the pulse quality indicator light is blinking red or yellow or is blinking erratically, reposition the pulse oximeter sensor or try a different sensor.

If a finger, toe, etc., is not properly inserted into the pulse oximeter sensor, or no pulse oximeter sensor is attached to the pulse oximeter after startup (a few seconds after powering on), both the SpO₂ and pulse rate displays will display a single dash until a valid pulse signal is detected.

Cleaning the 920M PLUS Pulse Oximeter



Clean the 920M PLUS Pulse Oximeter separately from the sensors. For instructions on cleaning pulse oximeter sensors, refer to the respective pulse oximeter sensor package inserts.

Clean the 920M PLUS with a soft cloth dampened with isopropyl alcohol. Do not pour or spray any liquids onto the 920M PLUS, and do not allow any liquid to enter any openings in the device. Allow the 920M PLUS to dry thoroughly before reusing.


CAUTION: Do not immerse the 920M PLUS in liquid, and do not use caustic or abrasive cleaning agents on the 920M PLUS.

Detailed Operation

Switches and Functions

All functions of the 920M PLUS are controlled by the On/Standby  and advance  switches found on the front of the unit. Refer to Figure 2 on page 4 for an illustration of the switches and indicators.



Power

Turn on the 920M PLUS by pressing and releasing the On/Standby switch  on the front of the unit. Turn off the unit by pressing and holding this switch for about 2 seconds. Refer to “Power On Self-Test” on page 9 for important information about starting up the 920M PLUS.

In order to conserve battery life, the 920M PLUS will automatically power off after 10 minutes of inactivity. Inactivity is indicated by dashes on the displays and may be caused by the following conditions:






- the sensor is not connected to the pulse oximeter
- the sensor is not attached to the patient
- the patient pulse signal is inadequate

Setup Mode

Setup mode is used to set 1) the memory clear function, 2) the calendar and clock, and 3) the memory playback function. (To initiate the memory playback, refer to “Memory Playback” on page 18.) In setup mode, the advance switch  and the On/Standby switch  are used to make the selections.

Note: *Setting the month to “00” disables the calendar and clock functions and helps conserve battery life.*

Entering Setup Mode

1. With the unit off, press and hold the advance switch  while pressing and then releasing the On/Standby switch .
2. Release the advance switch when  is displayed on the SpO₂ and pulse rate displays. The clock time currently set in the memory,  for example, appears briefly in the displays, and then  appears.

Making Selections in Setup Mode

1. Upon entering setup mode, the displays will show \overline{CLR} . (Memory clear and the default value “no”, the first setting.) Press and release the advance switch (or press and hold to quickly scroll) to change the value for this setting.

Note: *The menu starts at the current value stored in memory for the setting. The menu will cycle through the range of values for that setting.*

2. When the desired value appears, press and release the On/Standby switch to store the value and advance to the next sequential setting (year, month, etc.).
3. Continue this process until all settings are chosen.

When the setting sequence has been completed, the 920M PLUS exits the setup mode and then displays $\overline{\quad}$ (two dashes). The unit is then ready to begin normal operation.

Memory Clear, Calendar, and Clock Settings

Setting	Appears in SpO ₂ Display:	Range of Values Appears in Pulse Rate Display:	Default Value
Memory Clear ^a	\overline{CLR}	\overline{YES} or \overline{NO}	no
Delete (confirm clear)	\overline{DEL}	\overline{YES} or \overline{NO}	no
Year	\overline{Y}	00 - 99	00
Month	\overline{MM}	00 - 12	00
Day	\overline{D}	01 - 31	00
Hour	\overline{H}	00 - 23	00
Minute	\overline{MM}	00 - 59	00
(Not available) ^b	\overline{PRN}	00-15	00

^a Choosing “yes” for both the \overline{CLR} and \overline{DEL} settings (the memory clear function) will clear the memory and exit setup mode.

^b \overline{PRN} settings 00 to 15 are not used at this time. Setting these values will not affect the operation of the 920M PLUS.

Clearing Memory

Upon entering setup mode, “**CLr**” will appear in the SpO₂ display, indicating the memory clear function. (Refer to “Setup Mode” on page 11.) This function allows you to delete all data currently stored in memory. Refer to Figure 6 below for a diagram describing the memory clear settings.

To Choose Memory Clear Settings:

1. “**CLr**” may be set to “**no**” or “**YES**”.

If “**no**” is entered in response to “**CLr**” (indicating that you do not want to clear the memory), the setup mode will continue directly to the calendar and clock settings. (Refer to “Calendar and Clock Settings” on page 14.)

If “**YES**” is entered in response to “**CLr**”, then “**dEL**” will next appear in the SpO₂ display, again with a choice of “**no**” or “**YES**”. This redundant prompting gives you a second opportunity to avoid clearing the memory.

Make the “**CLr**” selection. Use the advance switch to scroll through the values. Use the On/Standby switch to accept a value and move to the next setting.

2. If “**no**” is entered in response to “**dEL**”, the setup mode continues to the calendar and clock settings.

If “**YES**” is entered in response to “**dEL**”, (confirming that you do want to clear the memory), then “**dnE CLr**” will briefly appear in the displays indicating that the memory is cleared. The 920M PLUS will then exit setup mode and is ready to begin normal operation.

Make the “**dEL**” selection.

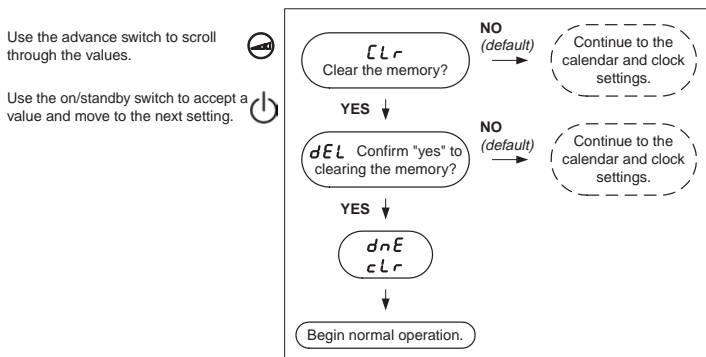


Figure 6. Choosing memory clear settings.

Calendar and Clock Settings

Note: Setting the month to “00” disables the calendar and clock functions and helps conserve battery life.

Refer to Figure 7 below for a diagram describing the calendar and clock settings.

Choosing Calendar and Clock Settings:

1. After selecting “no” in the memory clear settings, “y” will appear in the SpO₂ display, indicating the calendar year setting.
2. Make the year, month, day, hour, and minute selections. Use the advance switch to scroll through the values. Use the On/Standby switch to accept a value and move to the next setting.
3. After selecting the minutes, “Prn” will appear in the SpO₂ display. However, *the “Prn” setting is not used at this time.*
Press and release the On/Standby switch to exit setup mode.

When the setting sequence has been completed, the 920M PLUS displays - - (two dashes). The unit is then ready to begin normal operation.

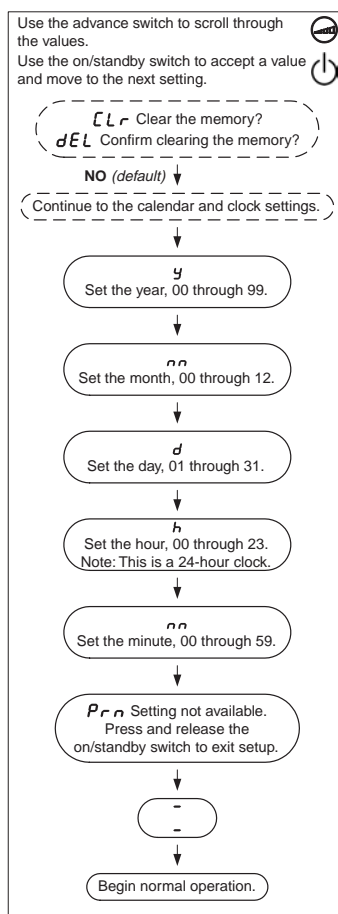


Figure 7. Choosing calendar and clock settings.

Displays and Indicators

SpO₂ Display

The SpO₂ display is the upper numeric display. (Identified by the %SpO₂ symbol; see Figure 2 on page 4.) This 3-digit light-emitting diode (LED) display shows the current oxygen saturation percentage.

Pulse Rate Display

The pulse rate display is the lower numeric display. (Identified by the ♥ symbol; see Figure 2 on page 4.) This 3-digit LED display shows the pulse rate in pulses per minute.

Pulse Quality Indicator

The pulse quality indicator, a tricolor LED, blinks once for each detected pulse. (Identified by the \sphericalangle symbol; see Figure 2 on page 4.) The pulse quality indicator changes color to indicate changes in the pulse waveform signal that may affect the SpO₂ data.

The pulse quality indicator may blink one of three colors: green, yellow, or red. These colors are similar to the colors of a stoplight:

- **Green** indicates that the pulse waveform signal is of good quality and the SpO₂ and pulse rate data are accurate.
- **Yellow** indicates that the pulse waveform amplitude is marginal or that the pulse oximeter has detected artifact. Although the SpO₂ and pulse rate data may be acceptable, corrective measures should be considered if the indicator continues to blink yellow frequently. To improve the signal quality, try repositioning the sensor, try a different sensor type, eliminate patient movement, or improve circulation at the site by massaging the area.
- **Red** indicates that the pulse waveform amplitude is inadequate. While the pulse quality indicator is red, SpO₂ and pulse rate values are frozen (not updated). After approximately 20 seconds, the values are replaced with dashes indicating that SpO₂ and pulse rate measurements are not possible.

CAUTION: The 920M PLUS might misinterpret motion as good pulse quality. Minimize patient motion as much as possible.

Low Battery Indicator

When the batteries are low, the low battery indicator, a yellow LED, will be steadily illuminated. (Identified by the \Rightarrow symbol; see Figure 2 on page 4.) Replace the batteries as soon as possible.

When the batteries are critically low, the low battery indicator will flash and the pulse oximeter will not operate. The digital displays will go blank, and the pulse quality indicator will blink yellow or red, but not green. Replace the batteries immediately.

Sensor Fault Indication

If the 920M PLUS determines that a sensor fault exists (a sensor disconnect or dislodgment, or a sensor failure) or if a pulse oximeter sensor signal is no longer detected, a dash (-) appears in the left-most digit of the SpO₂ display. The readings that are displayed will freeze for 10 seconds if the pulse oximeter sensor fault or the inadequate signal continues.

If the sensor fault or the inadequate signal is not corrected, the frozen readings and the left-most dash will be replaced by dashes in the middle digit of **both** the SpO₂ and the pulse rate displays, 10 seconds after the first dash appeared.

When the sensor fault or the inadequate signal is corrected, the SpO₂ and pulse rate displays will return to normal operation.

Communications

Serial Output

The 920M PLUS provides real-time data output capability via the pulse oximeter sensor connector (a 9-pin Sub-D connector). The pulse oximeter sensor connector pin assignments are listed below.

Pulse Oximeter Sensor Connector Pin Assignments

Pin Number	Assignment
1	Battery Voltage
2	Infrared Anode, Red Cathode
3	Infrared Cathode, Red Anode
4	Serial Data, TTL Levels
5	Detector Anode
6	Sensor Type
7	Cable Shield (Ground)
8	Ground
9	Detector Cathode, +5 V

The information from the 920M PLUS in the real-time mode is sent in an ASCII serial format at 9600 baud with 9 data bits, 1 start bit, and 1 stop bit. The data are output at a rate of once per second.

Real-time data may be printed or displayed by devices other than the pulse oximeter. On power up a header is sent identifying the format and the time and date. Thereafter, the data are sent once per second by the 920M PLUS in the following format:

SPO2=XXX HR=YYY

where “XXX” represents the SpO₂ value and “YYY” represents the pulse rate. The SpO₂ and pulse rate will be displayed as “---” if there are no data available for the data reading.

Memory

The 920M PLUS can collect and store up to 72 hours of SpO₂ and pulse rate information. Data retrieval software is available for use with Microsoft[®] Windows[®] 95/98/00 operating systems. Contact your distributor or Respirationics for options.

The memory in the 920M PLUS functions much like an “endless loop” tape. When the memory fills up, the unit begins overwriting the oldest data with the new data.

Each time the 920M PLUS is turned on, the current time/date information (if the clock is set properly) is stored in memory to allow quick differentiation of recording sessions. Patient SpO₂ and pulse rate are sampled and stored every 4 seconds.

The oxygen saturation values are stored in 1% increments in the range of 0 to 100%. The stored pulse rate ranges from 18 to 300 pulses per minute. The stored values are in increments of 1 pulse per minute in the interval from 18 to 200 pulses per minute, and increments of 2 pulses per minute in the interval from 201 to 300 pulses per minute.

During data printing, the last data recorded are the first data printed. For example, the last 4 minutes of data recorded would be the first 4 minutes of printout.

Recording Sessions

Each time the 920M PLUS is turned on (except during setup mode) data are automatically collected in memory.



Note: *Only recording sessions greater than 1 minute in length are stored in memory, and memory will be cleared approximately 2 minutes after removing batteries. Replace batteries immediately to avoid losing stored data.*

Memory Playback

Note: *Playing back data in memory does not clear any data from memory.*

Note: *The keypad sequence for starting memory playback is identical to the sequence used for entering setup mode.*

Playing Back Data Stored in 920M PLUS Memory

1. With the unit off, press and hold the advance switch  while pressing and then releasing the On/Standby switch .
2. Release the advance switch when **888** is displayed on the SpO₂ and pulse rate displays. The clock time currently set in the memory (**04** for example) appears briefly in the displays, and then **CLr** appears.
3. Data will be automatically played back from the memory. Data are played back at a rate of 20 minutes of collected data per second. A 72-hour recording session (the maximum memory saved) is played back in approximately 3.5 minutes.
4. After all data are played back, the 920M PLUS should be shut off before collecting new patient data. The patient information is held in memory as long as the batteries are sufficiently charged, so if the memory must be cleared, use the memory clear function.

Specifications

920M PLUS Specifications

Oxygen Saturation Range (SpO₂)	0 to 100%
Pulse Rate Range	18 to 300 Pulses Per Minute
Accuracy	
SpO ₂ (± 1 Standard Deviation)*	70 - 100% ± 2 digits for adults using Finger Clip Sensors 70 - 100% ± 3 digits for adults using Flex, Flexi-Form, or Reflectance Sensors 70 - 100% ± 4 digits using Ear Clip Sensors 70 - 95% ± 3 digits for neonates using infant or neonatal sensors Below 70% is not specified for all sensors
Pulse Rate	$\pm 3\% \pm 1$ digit
Measurement Wavelengths and Output Power	
Red	660 nanometers @ 3 mw nominal
Infrared	910 nanometers @ 3 mw nominal
Indicators	
Pulse Quality Indicator	LED, tricolor
Numeric Displays	3-digit 7-segment LEDs, red
Low Battery Indicator	Dedicated icon, yellow
Temperature	
Operating	-20 to +50°C (-4 to +122°F)
Storage/Transportation	-30 to +50°C (-22 to +122°F)
Humidity	
Operating	10 to 90% noncondensing
Storage/Transportation	10 to 95% noncondensing
Altitude	
Operating Altitude	Up to 12,000 meters (40,000 feet)
Hyperbaric Pressure	Up to 4 atmospheres
Power Requirements	Four 1.5V AA-size alkaline batteries (100 hours typical operation) or NiMH rechargeable battery pack (45 hours typical operation)
Dimensions	13.8 cm H x 7.0 cm W x 3.2 cm D (5.4 in H x 2.8 in W x 1.3 in D)
Weight	210 g (7.4 oz) (with alkaline batteries) 230 g (8.1 oz) (with NiMH rechargeable battery pack)
Classifications per IEC 60601-1/CSA 601.1/UL 2601-1	
Type of Protection	Internally powered (on battery power)
Degree of Protection	Type BF-Applied Part
Mode of Operation	Continuous

* Standard Deviation is a statistical measure: up to 32% of the readings may fall outside these limits.

Service and Support

CAUTION: The 920M PLUS is a precision electronic instrument and must be repaired by trained Respironics personnel only.

Note: Any sign or evidence of opening the system, field service by non-Respironics personnel, tampering, or any kind of misuse or abuse of the system shall void the warranty in its entirety.

The advanced digital circuitry within the 920M PLUS requires no periodic maintenance or calibration.

Respironics does not recommend field repair of the 920M PLUS. The circuit board in the 920M PLUS is a multi-layer board using very narrow traces. Due to the very small trace size, extreme care must be used when replacing components to prevent permanent, non-repairable damage to the circuit board. Most components are surface-mounted and require special hot-air jet soldering and desoldering equipment. After any repairs are made, the 920M PLUS must be tested to ensure correct operation.

For additional technical information contact Respironics' Customer Support department at:

Respironics, Georgia Inc.

175 Chastain Meadows Court
Kennesaw, Georgia 30144 USA

(800) 345-6443 (USA and Canada)
(724) 387-4000

Fax (800) 886-0245 (USA and Canada)
(412) 473-5010

www.respironics.com

All non-warranty work shall be done according to Respironics standard rates and charges in effect at the time of delivery to Respironics. All repairs include an 18-hour minimum burn-in and a complete retest of the 920M PLUS using factory test fixtures.

Warranty

RESPIRONICS, INC., (Respironics) warrants to the purchaser, for a period of three years from the date of purchase, each Model 920M PLUS Handheld Pulse Oximeter exclusive of sensors, cables, and batteries. (Refer to the individual package inserts for specific warranty information for sensors, cables, and other accessories.) Respironics shall repair or replace any 920M PLUS found to be defective in accordance with this warranty, free of charge, for which Respironics has been notified by the purchaser by serial number that there is a defect, provided said notification occurs within the applicable warranty period. This warranty shall be the sole and exclusive remedy by the purchaser hereunder for any 920M PLUS delivered to the purchaser which is found to be defective in any manner whether such remedies be in contract, tort or by law.

This warranty excludes cost of delivery to and from Respironics. All repaired units shall be received by the purchaser at Respironics' place of business. For any 920M PLUS sent to Respironics for warranty repair which is found to be within specification, the purchaser agrees to pay \$100.00 (US dollars).

The 920M PLUS is a precision electronic instrument and must be repaired by knowledgeable and specially trained Respironics-designated personnel only. Accordingly, any sign or evidence of opening the 920M PLUS, field service by non-Respironics personnel, tampering, or any kind of misuse or abuse of the 920M PLUS, shall void the warranty in its entirety.

All non-warranty work shall be done according to Respironics standard rates and charges in effect at the time of delivery to Respironics.

DISCLAIMER/EXCLUSIVITY OF WARRANTY:

THE EXPRESS WARRANTIES SET FORTH IN THIS MANUAL ARE EXCLUSIVE AND NO OTHER WARRANTIES OF ANY KIND, WHETHER STATUTORY, WRITTEN, ORAL, OR IMPLIED INCLUDING WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY SHALL APPLY.

Accessories

The following Respironics accessories function with the 920M PLUS:

Part Number	Description
1007355	Rechargeable NiMH Battery Pack
920MPC	Charger Stand
1007334	Charger Stand Power Supply - Domestic
1007333	Charger Stand Power Supply - Universal
Contact your distributor or Respironics	Charger Stand Power Cord - Universal
1007332	Carrying Case (Blue)
1007474	Operator's Manual for the 920M PLUS
1007473	Operator's Manual for the Model 920MPC Charger Stand

Pulse Oximeter Reusable Sensors

936	Adult Articulated Finger Clip Sensor (1 meter)
936P	Pediatric Finger Clip Sensor
953	Adult Flex Sensor
934	Infant Flex Sensor
935	Neonatal Flex Sensor
948	Ear Clip Sensor

Pulse Oximeter Disposable Sensors

953D	Adult Finger Flexi-Form Sensor, 10 per box
937D	Pediatric Finger Flexi-Form Sensor, 10 per box
934D	Infant Toe Flexi-Form Sensor, 10 per box
935D	Neonatal Foot Flexi-Form Sensor, 10 per box

Part Number	Description
Other Accessories	
Contact your distributor or Respirationics	Data retrieval software for Microsoft Windows 95/98/00 operating systems
954A	Adult FlexiWrap Sensor Wrap
954I	Infant FlexiWrap Sensor Wrap
954N	Neonatal FlexiWrap Sensor Wrap
927	Patient Extension Cable (1 meter)
955	Patient Simulator
960	Finger Phantom [®] Pulse Oximeter Tester
1007476	Memory Cable (for use between the 920M PLUS and a PC running Microsoft Windows 95/98/00 operating systems)
1007478	Real-Time and Memory Cable (for use with 920M PLUS and a PC running Microsoft Windows 95/98/00 operating systems)

For more information about Respirationics parts and accessories, contact your distributor, or contact Respirationics at (800) 345-6443 (USA and Canada) or (724) 387-4000.

Troubleshooting Guide

Troubleshooting Guide

Problem	Possible Cause	Possible Solution
<i>The unit will not turn on.</i>	The batteries are depleted.	Replace all 4 batteries.
	The batteries are installed incorrectly.	Verify correct battery installation.
	Metal contact in battery compartment is missing or damaged.	Contact Respirationics Customer Support.
<i>A dash appears in the left digit of the SpO₂ display.</i>	A sensor fault exists. The sensor may have become dislodged from the 920M PLUS or from the patient.	Verify that the sensor is correctly connected to the 920M PLUS and the patient; try a new sensor if the condition persists.
<i>The middle digits display dashes in both the SpO₂ and pulse rate displays.</i>	No signal is detected because the sensor is not plugged in.	Verify the sensor connections.
	There is a sensor failure.	Replace the sensor.
<i>The displayed pulse rate does not correlate to the pulse rate displayed on the ECG monitor.</i>	Excessive motion at the sensor site may be preventing the 920M PLUS from acquiring a consistent pulse signal.	Eliminate or reduce the cause of the motion artifact, or reposition the sensor to a site where motion is not present.
	The patient may have an arrhythmia, resulting in heart beats that do not yield a pulse quality signal at the sensor site.	Examine the patient: the condition may persist even though both monitors are functioning properly if the patient's arrhythmia persists.
	A non-Respirationics sensor is being used.	Replace the sensor with a Respirationics sensor.
	The ECG monitor may not be functioning properly.	Examine the patient: replace the ECG monitor, or refer to the operator's manual for the ECG monitor.
<i>An erratic pulse rate display and/or a yellow pulse quality indicator during the concurrent use of electrosurgical equipment (ESU).</i>	The ESU may be interfering with the pulse oximeter performance.	Examine the patient: move the 920M PLUS, cables, and sensors as far away from the ESU as possible or refer to the ESU operator's manual.
<i>The pulse quality indicator is blinking yellow with each pulse.</i>	The quality of the pulse signal at the sensor site is marginal.	Examine the patient: reposition the sensor or select an alternate sensor site.

Troubleshooting Guide (Continued)

Problem	Possible Cause	Possible Solution
<i>You are unable to obtain a green blinking pulse quality display.</i>	Low patient pulse strength; or the sensor site is poorly perfused; or the sensor is not correctly positioned.	Reposition the sensor on the patient.
	The sensor is attached too tightly, or tape or other items are restricting the pulse quality at the sensor site.	Reapply the sensor, select an alternate sensor site, or remove the restrictive material from the sensor site.
	Circulation is reduced due to excess pressure between the sensor and a hard surface.	Allow the sensor and finger, foot, etc., to rest comfortably on the surface.
	Excessive ambient light.	Reduce the ambient light.
	Excessive patient motion.	Reduce the patient motion.
	The sensor is applied to a polished finger or toe nail.	Remove the nail polish.
<i>Pulse quality indicator is blinking red and the SpO₂ and/or pulse rate displays show dashes.</i>	Interference from: • arterial catheter • blood pressure cuff • electrosurgical procedure • infusion line	Reduce or eliminate the interference.
	An inadequate signal at the sensor site.	Examine the patient: reposition the sensor or select an alternate sensor site.
	Excessive motion at the sensor site may be prohibiting the 920M PLUS from acquiring a consistent pulse signal.	Eliminate or reduce the cause of the motion artifact or reposition the sensor to a sensor site where motion is not present.
	Sensor failure.	Replace the sensor.
<i>Segments of the SpO₂ or pulse rate displays are missing.</i>	Defective LED displays.	Displayed values may not be reliable; discontinue use of the 920M PLUS.
<i>Disruption in the 920M PLUS performance.</i>	Electromagnetic interference (EMI).	Remove the 920M PLUS from the EMI environment.

If these solutions do not correct the problem, please contact Respironics Customer Support at (800) 345-6443 (USA and Canada) or (724) 387-4000.

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