3 Standalone Monitoring

Overview

The monitor is available as a standalone (model 802LT0N) or wireless model (model 802LTRN).

This chapter describes the operation of the standalone monitor, and of the wireless monitor when it is not in communication with the Welch Allyn Flexnet® network and an Acuity® Central Station.

About the Model 802LT0N (Standalone) Monitor

The model 802LT0N monitor operates in standalone mode. It measures and displays vital signs, stores patient data, and locally indicates alarms and alert conditions.

- The configuration of the monitor is not affected by Acuity.
- The vital signs stored by the monitor are not sent to Acuity.
- Alarms and alerts generated by the monitor do not appear on Acuity.
- Alarms and alerts generated by Acuity do not appear on the monitor.
- Acuity does not update the monitor time and date settings.

About the Model 802LTRN (Wireless) Monitor

See “Monitoring in Communication with Acuity” on page 77.

Preparing for a New Patient

To Begin Monitoring a New Patient

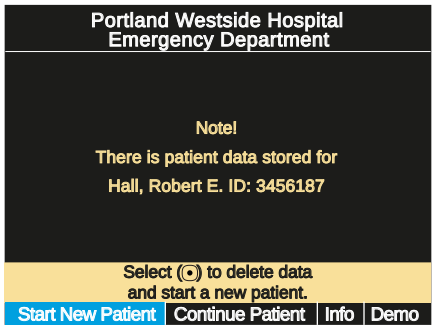
1. If the monitor is on, press ⏻ to turn it off.

   If prompted to save or delete existing data, highlight **Delete** and press ⊙. The monitor deletes any saved data and temporary settings, and then shuts down.

2. Press ⏻ to turn on the monitor.

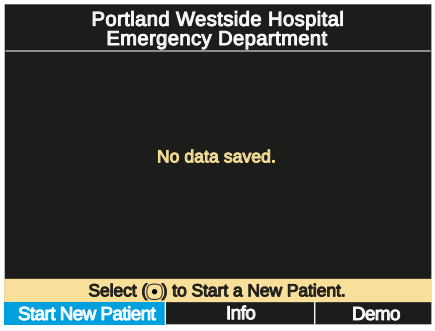
   - If the monitor holds stored data from the previously monitored patient, it displays the "data saved" start-up screen (Figure 43, left):

Figure 43. Start-Up with Saved Data



   - If the data from the previously monitored patient was deleted on shut-down, the "no data saved" start-up screen appears (Figure 44):

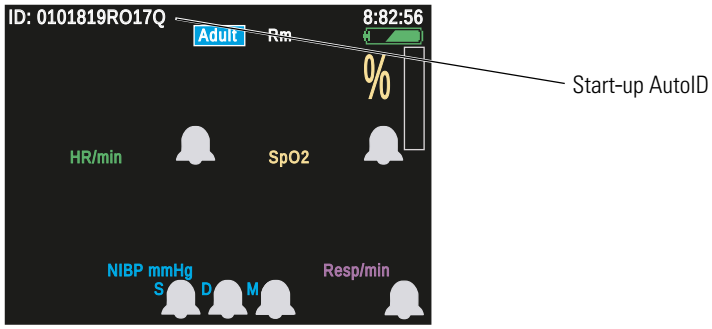
Figure 44. Start-Up with No Saved Data



3. Highlight **Start New Patient** and press ⊙. The first configured data display appears (Figure 45).

   In place of a patient name, **ID:** is followed by a string that is generated by the monitor when you select 'Start New Patient'. This AutoID string, a combination of serial number, time, and date, is unique to each new patient, and identifies the patient until you supply the patient identification data.

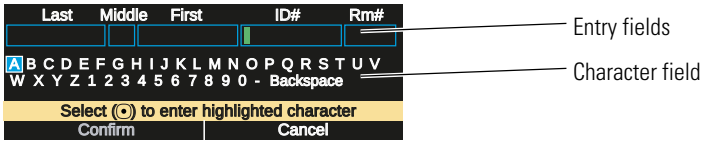
Figure 45. Data Display with AutoID



4. In the primary data display, highlight **ID:** (upper left) and press ⦿.

   The Patient Information Entry screen appears (Figure 46):

Figure 46. Patient Information Entry



5. Enter the ID and name of the new patient.

   a. Press ◀ or ▶ to highlight (blue) a character in the character field (Figure 47).

   b. Press ⦿ to copy it to the green-highlighted location in the entry fields (Figure 46).

   c. Repeat from step a until all characters are entered into the field.

   d. Press ▲ until the insertion point in the entry field changes from green to blue.

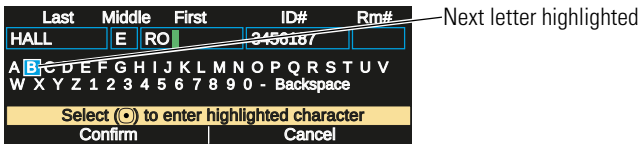
   e. Press ◀ or ▶ to move the insertion point to another entry field.

   f. Press ▼ to return to the character field.

   g. Repeat from step a until all fields are complete.

Note To correct an error in an entry field: Place the cursor (step d and step e) to the right of the error location, highlight and enter **Backspace** in the character field to delete the erroneous character, and then enter the correct character.

Figure 47. Patient Information Entry (continued)



6. Highlight **Confirm** and press ⦿.

Note Name alone is not sufficient to confirm a patient ID; thus, you can confirm the patient name only after you have entered the patient ID.

7. Verify that the patient mode (adult, pediatric, or neonate) is set correctly for this patient.

   Neonatal Term birth through 28 days, or up to 44 gestational weeks.

   Pediatric Between 29 days and 12 years.

   Adult 13 years and older.

   If the current patient mode setting is not correct:

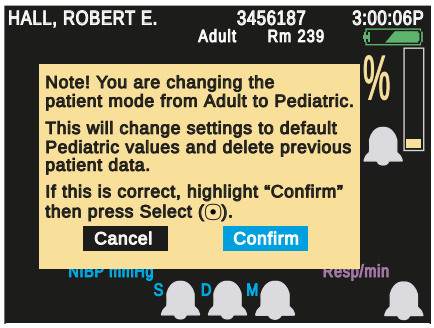
   a. Highlight the current patient mode (**Adult**, **Pediatric**, or **Neonate**) and press ⦿.

   b. From the Patient Mode selection menu (Figure 48), highlight the appropriate patient mode and press ⦿.

Figure 48. Changing Patient Mode

   c. A confirmation screen appears:

Figure 49. Confirming a Change of Patient Mode



   d. To confirm the change, highlight **Confirm** and press ⦿.

Note When you change the patient mode and confirm the change:

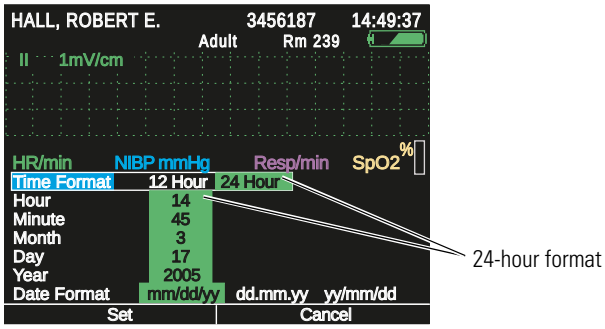
- All vital-signs data for the patient is lost.
- All monitor settings revert to the defaults for the new patient mode.

8. Verify that the displayed time and date are correct.

   - The monitor displays time in either the 12-hour (AM/PM) or 24-hour format, and displays date in either the mm/dd/yy, dd.mm.yy, or yy/mm/dd format.
   - The date does not appear on the primary display screens. It appears on the snapshot list and on the snapshot display.

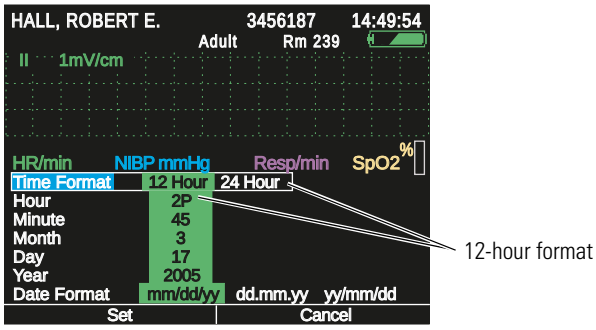
   a. Highlight the time display (in the upper right corner of the screen) and press ⦿. The Time/Date screen appears (Figure 50).

Figure 50. Time/Date Screen: 24-Hour Format



   b. If the displayed time or date is not correct, press ▲ or ▼ to move the highlight from one parameter to another, and press ◀ or ▶ to change the value of the highlighted parameter. For example, to change the time display format from 24-hour to 12-hour, highlight **Time Format** and press either ◀ or ▶ once (Figure 51).

Figure 51. Time/Date Screen: 12-Hour Format



   c. When the time and date are correct and formatted appropriately, press ⦿ to accept the changes and return to the vital-signs display.

Note If you change the time or date settings and then decide not to accept the changes, press [waveform] to cancel the changes and return to the vital-signs display.

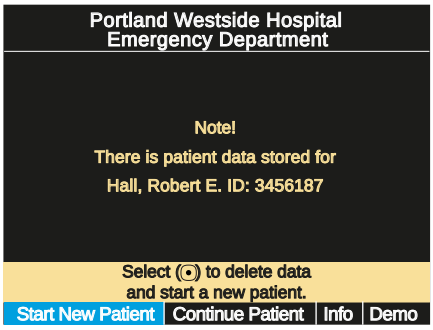
Continuing to Monitor a Patient on Power-Up

If a patient's data was saved before the monitor was last turned off (see "To Turn Off the Monitor" on page 45), you can resume monitoring that patient when the monitor is turned on again. (When patient data is saved, the monitor settings are also saved.)

To resume monitoring the same patient:

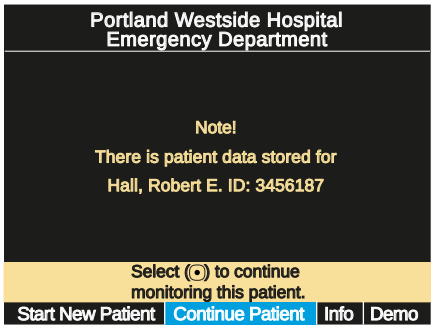
1. Turn on the monitor. The "patient data stored" screen appears (Figure 52):

Figure 52. Start-Up with Saved Data



2. Verify that the displayed name and ID match that of the current patient.
3. Highlight **Continue Patient** (Figure 53) and press ⊙.

Figure 53. Start-Up with Saved Data



Monitoring ECG and Resp

Overview

Note In this manual, **lead** refers to an ECG electrode or lead wire, and **Lead** refers to a waveform source.

You can monitor heart signs (ECG) and respiration rate (Resp) using either a 3-lead or a 5-lead ECG cable. Using a 3-lead cable, you can display one signal waveform for lead I, II, or III. Using a 5-lead cable, you can display either one or two signal waveforms (I, II, III, V; and if enabled in the configuration, aV_R, aV_L, or aV_F). You can also display the SpO_2 or Resp waveform in place of an ECG waveform.

Safety

WARNING Always monitor and set alarms for SpO_2 when using impedance pneumography to monitor respiratory function.

WARNING When monitoring respiration via impedance pneumography, always select the ECG Lead with the most prominent QRS complex. The monitor rejects cardiovascular artifact, but this function depends upon accurate ECG R-wave detection.

WARNING Do not place the monitor near another respiration monitor. Resp measurement frequencies can cause mutual interference.

WARNING Do not perform impedance pneumography on paced patients. Pacemaker pulses can sometimes be falsely counted as breaths.

WARNING Always keep patient motion to a minimum. Motion artifact can cause incorrect breath rate or heart rate readings.

WARNING If a disconnected lead is too close to other electrical devices, it can cause a false heart rate, a false respiration rate, or a failure to display a "Lead Fail" message.

WARNING The monitor displays + + + for HR numerics between 301-350 beats per minute. For heart rates above 350 beats per minute, it might display incorrectly low heart readings, due to intermittent picking of R-waves.

WARNING The monitor does not provide internal arrhythmia analysis; therefore, arrhythmias can cause the monitor to display inaccurate heart rates.

WARNING Motion artifact can cause the monitor to display inaccurate heart rates. Minimize patient motion whenever possible.

WARNING (1) During a surgical procedure, do not use small ECG electrodes. (2) Select ECG electrode attachment points remote from the surgical site and remote from the electrosurgical return electrode. (3) Use electrosurgical return electrodes with the largest practical contact area. (4) Assure proper application of the electrosurgical return electrode to the patient.

High-intensity radio-frequency (RF) energy from external sources, such as an improperly connected electrosurgical unit, can induce heat into electrodes and cables, which can cause burns on the patient and can lead to measurement errors.

WARNING Make sure the patient mode is correct. Incorrect patient mode can result in inaccurate heart rate readings and inappropriate alarm settings.

WARNING Always use the provided garment clips to route ECG cables away from the patient's head.

WARNING Use only accessories listed in the Welch Allyn *Products and Accessories* guide (810-0409-XX).

WARNING Never use ECG cables with loose or faulty detachable lead wires. These can cause erratic behavior of the ECG and respiration waveforms due to intermittent ECG lead wire connections.

WARNING Resp is derived from the same leads as the ECG channel, so the monitor determines which signals are cardiovascular artifact and which signals are a result of respiratory effort. If the breath rate is within five per cent of the heart rate or is a multiple or submultiple of the heart rate, the monitor might ignore breaths and trigger a respiration alarm.

Caution Never use an ECG cable longer than 10 feet (3 meters) including extensions. If you use an ECG extension cable with an ECG cable longer than 4 feet, the monitor acts as though no ECG cable is connected.

Caution To protect the monitor from damage during defibrillation or electrosurgery, for accurate ECG information, and for protection against noise and other interference, use only ECG electrodes and cables specified or supplied by Welch Allyn (these cables have the required current-limiting resistors). Follow recommended application procedures.

Note The monitor contains type CF fully isolated patient-connected circuitry, but it is not intended for direct application on a patient's heart.

Severe artifact and interference (such as defibrillation interference) can cause the waveform to move off of the display for a few seconds before it is restored.

Impedance pneumography (Resp) is not recommended for use with high-frequency ventilation.

The monitor counts as breaths any respiratory efforts larger than twice the background cardiovascular artifact.

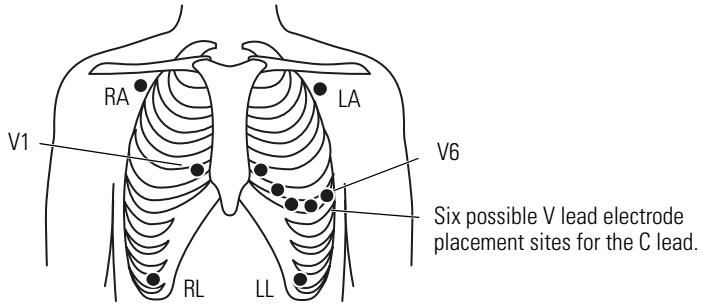
Use only silver/silver chloride electrodes. Other electrodes, such as stainless steel electrodes, squeeze-bulb electrodes, or electrodes with dissimilar metals, are subject to large offset potentials due to polarization. Other electrodes can also have slower recovery time after the application of defibrillator pulses.

Monitoring ECG

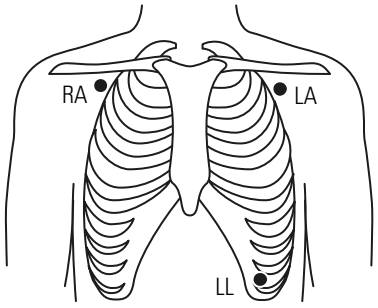
Procedure

1. Inspect the ECG cable. Replace it if it shows any signs of wear, breakage, or fraying.
2. Plug the cable into the monitor.
3. Select electrode sites on the patient (Figure 54), choosing flat areas and avoiding fatty or bony areas and major muscles.

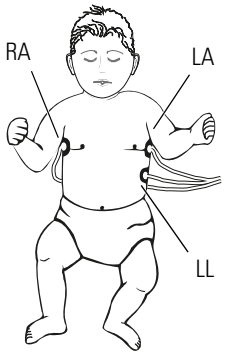
Figure 54. ECG Leads - Actual Placement



5-lead, adult and pediatric



3-lead, adult and pediatric



3-lead, neonatal

4. Shave or clip the hair from the electrode sites.
5. Thoroughly clean the skin, using soap and water, isopropyl alcohol, or skin preparation pads, and lightly rub it dry.

Caution To protect the patient from allergic reactions to electrodes, refer to the electrode manufacturer's directions for use.

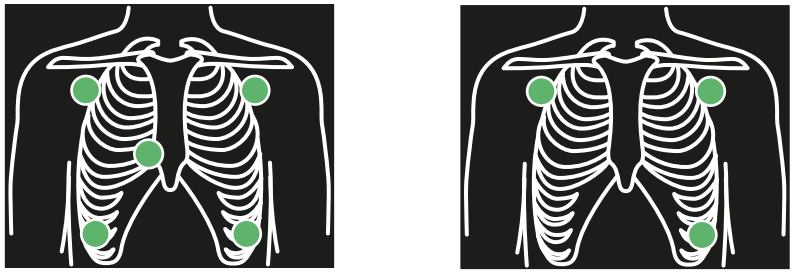
6. If you are using gelled electrodes, verify that the electrode expiration date has not passed and that the gel is intact and not dried out.

   If you are not using gelled electrodes, apply a mound of gel (1/4-inch to 1/2-inch, or 0.6-cm to 1.3-cm) to each electrode contact area.

7. Attach lead wires to the electrodes before applying them to the patient.
8. Apply the electrodes to the patient in the proper locations (Figure 54).

Note At least three appropriate electrode connections are required for ECG/Resp monitoring.

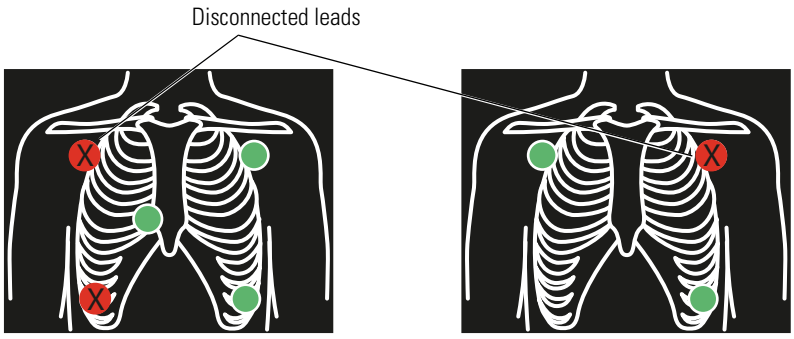
Figure 55. ECG Leads - Placement Displays, 5-Lead and 3-Lead



The locations of the circles displayed on the monitor (Figure 55) for each lead are fixed, and do not indicate the exact placement of the electrodes on the patient.

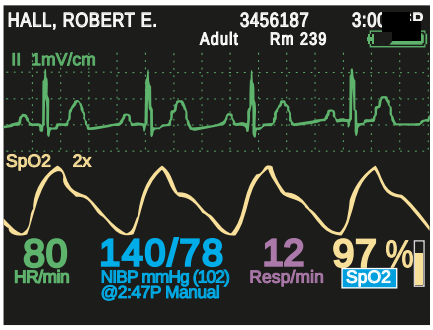
If the monitor detects that some lead wires are not connected, it displays an "ECG Fault" equipment alert and a chest diagram (Figure 56) indicating the location of the disconnected lead or leads. If the disconnected lead(s) invalidate the Lead used for HR determination, then the monitor reassigns, if possible, the Lead used for HR. If the reassignment succeeds, the monitor then displays another equipment alert with the message "ECG Lead changed".

Figure 56. ECG Leads - Disconnected Leads



9. When all leads are properly connected, confirm that the monitor displays the ECG waveform, heart rate, and other patient data.

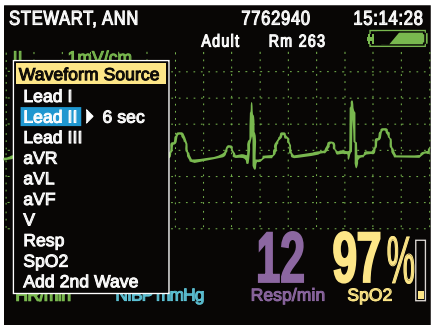
Figure 57. All Vital Signs Being Displayed



To Change the Waveform Selection

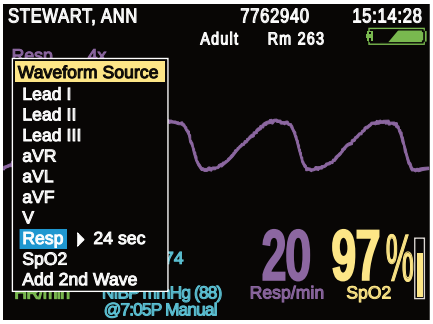
1. Highlight the current waveform source selection (Lead **II**, for example) and press ⦿.

Figure 58. Waveform Source: II



2. Highlight your waveform source choice and press 〰 or ⦿.

Figure 59. Waveform Source: Resp



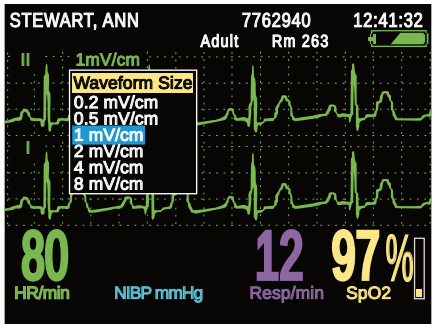
Note If you scroll to the bottom selection of the Waveform Source menu—either **Add 2nd Wave** or **Remove 2nd wave**—the selection takes effect immediately and the monitor returns to the primary data display.

Note In the Waveform Source menu, either the source Lead or the waveform period can be highlighted. If the waveform period is highlighted, a second trace of the same source will be cascaded to double the period obtained from a single trace.

To Change the Waveform Size

1. Highlight the current waveform scale (**1mV/cm**, for example) and press ⦿.

Figure 60. Waveform Size Popup Menu



2. Highlight the desired scaling factor and press ⦿. (Waveform size does not affect QRS-detector sensitivity.)

About Pacemakers and ECG Monitoring

If the patient being monitored has a pacemaker, the monitor detects and can indicate the occurrence of pacemaker signals. If the Pacer Indicator setting is ON, the monitor displays and prints vertical dashed lines to indicate detected pacemaker signals. If Pacer Indicator is OFF, the monitor continues to detect the pacemaker signals but does not display or print the pacer markers.

Safety

WARNING Signals differ between pacemakers. The Association for Advancement of Medical Instrumentation (AAMI) cautions that "in some devices, rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. All pacemaker patients should be kept under close or constant observation."

WARNING Use of respiration monitoring by impedance pneumography can affect the operation of some pacemakers. If pacemaker operation is affected, turn off respiration pneumography. (See Figure 61 on page 61.)

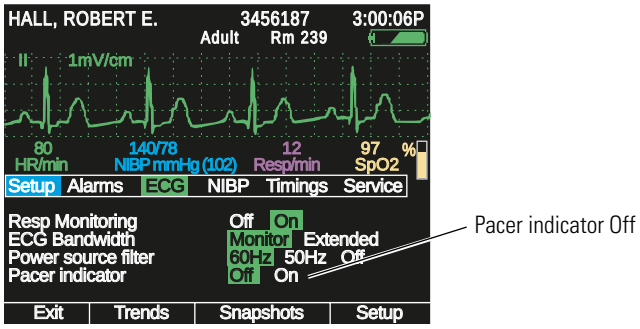
WARNING Always use fresh ECG electrodes and make sure the ECG cable lead wires make good connections. The presence of pacer-like noise can cause the displayed heart rate to be erratic even though the ECG trace might look undistorted with the pacer indicator off.

Procedure

To enable or disable the display of pacer indicators, follow these steps:

1. Access the **Setup** menu. (See "To Access the Setup Menus" on page 38.)
2. Highlight **ECG** (Figure 61)**.**

Figure 61. Turning the Pacer Indicator Off in the ECG Setup Menu



3. Highlight **Pacer indicator** and press ◀ or ▶ to highlight **Off** or **On**.
4. To exit the Setup menu, press ⦿ or 📈, or highlight **Exit** and press ⦿.

Note If the pacemaker signal is strong enough, the monitor displays it as a waveform spike. This is true with Pacer indicator ON or OFF.

In accordance with the Pacer Pulse Rejection specification ("Pacer pulse rejection" on page 165.), pacemaker pulses are not counted as heartbeats whether Pacer Indicator is On or Off.

Noise on the ECG signal might be detected as pacer signals, causing the pacer indicator to appear on the display. If you do not need to indicate pacemaker signals, turn off the pacemaker indicator for a better ECG waveform display.

Improving the Waveform Display

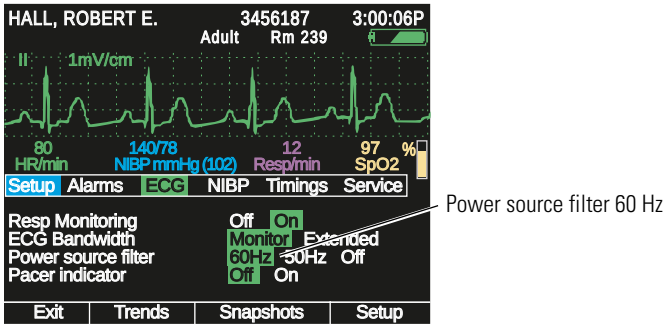
If the power source filter is off, noise from the power source can cause an unclear or noisy waveform.

To Change the Power Source Filter to Reduce Noise

1. Access the **Setup** menu. (See "To Access the Setup Menus" on page 38.)
2. Highlight **ECG**.

   Verify that the setting for **Power source filter** (Figure 62) is correct for the power source in your facility. If you do not know what this setting should be, consult a qualified service person.
3. Highlight **Power source filter** and press ◀ or ▶ as needed to select **60 Hz**, **50 Hz**, or **Off**.

Figure 62. Turning On the 60 Hz Power Source Filter in the ECG Setup Menu



4. Exit the Setup menu by pressing ⦿ or 📈.

Monitoring Respiration

Resp is based on impedance pneumography, where respirations are sensed from the ECG electrodes.

Note All ECG cables listed for the Propaq LT monitor in *Products and Accessories* (810-0409-XX) permit respiration monitoring and electrosurgical interference suppression.

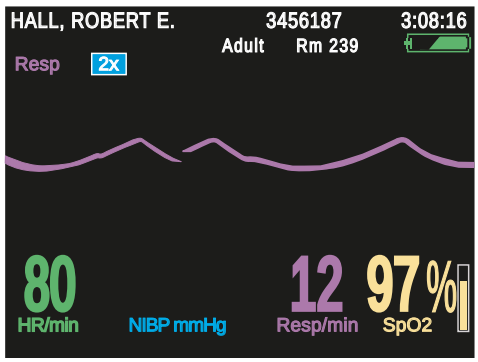
Note To measure Resp with Lead II selected, the LL lead must be attached to the patient.

Resp is part of ECG monitoring. The Resp numeric is displayed (in purple) in the lower right corner. To view the Resp waveform:

Change the waveform source to **Resp** (Figure 63). (See "To Change the Waveform Selection" on page 59.)

WARNING Use of respiration monitoring by impedance pneumography can affect the operation of some pacemakers. If pacemaker operation is affected, turn off respiration pneumography. (See Figure 61 on page 61.)

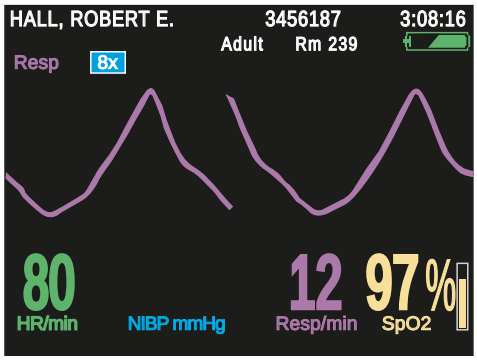
Figure 63. Resp Waveform, Default Size (2x)



For more detail, change the waveform size to **8x** (Figure 64). (See "To Change the Waveform Size" on page 60.)

Note Waveform size does not affect breath-detector sensitivity.

Figure 64. Resp Waveform Enlarged for Detail (8x)



Monitoring SpO_2

Safety

WARNING Accurate measurements of oxygen saturation, when derived from pulse oximetry, depend to a great extent on patient condition and proper sensor placement. Patient conditions such as shivering and smoke inhalation can result in erroneous readings. If you believe a measurement might be inaccurate, verify it using another clinically accepted measurement method, such as arterial blood gas measurements using a co-oximeter.

WARNING Use only Nellcor accessories listed in the Welch Allyn *Products and Accessories* guide (810-0409-XX). Inspect sensors and cables, and discard any that are damaged. Do not use a sensor with exposed optical components.

WARNING If you need to increase the length of the sensor cable, use only one extension. Use of multiple extensions can adversely affect performance. Do not attach any cable that is intended for computer use to the SpO_2 connector at the monitor.

WARNING Tissue damage and erroneous measurements can be caused by incorrect application or use of a sensor. (Examples of bad practices: wrapping the sensor too tightly, applying supplemental tape, failing to periodically inspect the sensor site, leaving a sensor on too long in one place.) Refer to the manufacturer's directions for specific instructions on application and use, and for description, warnings, cautions, and specifications.

WARNING Do not modify the sensor.

WARNING Do not wet the sensor or immerse it in fluid. Do not attempt to sterilize a sensor.

WARNING Sensors exposed to ambient light while not applied to a patient can exhibit seminormal saturation readings. Be sure the sensor is securely placed on the patient and check its application often to ensure accurate readings.

WARNING Inaccurate measurements might be caused by venous pulsations.

WARNING The pulse oximeter can be used during defibrillation, but the readings might be inaccurate for a short time.

WARNING Do not use the pulse oximeter as an apnea monitor.

WARNING When using the motion-tolerant pulse oximetry channel, a very sudden and substantial change in pulse rate can result in erroneous pulse rate readings. Always validate the patient data and patient condition before effecting an intervention or a change in patient care.

WARNING Interfering substances: Carboxyhemoglobin can erroneously increase readings; the level of increase is approximately equal to the amount of carboxyhemoglobin present. Methemoglobin and other dysfunctional hemoglobins can also cause erroneous readings. Further assessment beyond pulse oximetry is recommended. Intravascular dyes, or any substances containing dyes, that change usual arterial pigmentation can cause erroneous readings. Darkly pigmented skin can adversely affect SpO_2 readings.

WARNING For a premature infant, high oxygen levels might predispose the infant to develop retinopathy. Therefore, the upper alarm limit for oxygen saturation must be carefully selected in accord with accepted clinical standards and considering the accuracy range of the monitor.

Caution If liquid gets into the SpO_2 connector cavity, discontinue SpO_2 monitoring until the liquid is removed and the cavity is dry.

Procedure

1. Inspect the SpO_2 cable. Replace it if it shows any signs of wear, breakage, or fraying.
2. Plug the cable into the sensor and the monitor.

   Each SpO_2 sensor is intended for application to a specific site and site size on the patient. To obtain optimal performance, use the right sensor and apply it as instructed by the sensor manufacturer.
3. Clean the application site. Remove anything, such as nail polish, that could interfere with the operation of the sensor.
4. Attach the SpO_2 sensor to the patient according to the manufacturer's directions for use, observing all warnings and cautions.
5. Confirm that the monitor displays SpO_2 data within a few seconds of being connected to the patient.

   - If ambient light is too bright, shield the sensor site with opaque material. Failure to do so can result in inaccurate measurements. Light sources that can affect performance include the following:
     - surgical lights (especially those with a xenon light source)
     - bilirubin lamps
     - fluorescent lights
     - infrared heating lamps
     - direct sunlight.
   - When NIBP and SpO_2 are monitored simultaneously, place the NIBP cuff on a different limb than the SpO_2 sensor to help reduce unnecessary SpO_2 alarms.
   - Do not attach the SpO_2 sensor on the same limb as an arterial catheter or intravascular line.

- The pulse signal can disappear if any of the following conditions exists:
  - the sensor is too tight
  - ambient light is too bright
  - an NIBP cuff is inflated on the same limb as the sensor
  - arterial occlusion occurs near the sensor
  - the patient is in cardiac arrest or shock
  - the patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
- If poor perfusion affects performance for an adult, consider using the adult nasal sensor.
- If a sensor is connected and the sensor light does not come on within 3 seconds:
  - Verify that SpO_2 is turned on (Figure 65)
  - Replace the sensor
- The SpO_2 system is tolerant of normal patient motion. If excessive or prolonged patient movement interferes with measurements, consider the following possible solutions:
  - be sure the sensor is secure and properly applied
  - use a new sensor with fresh adhesive backing
  - select a different type of sensor
  - move the sensor to a less active site

6. Periodically verify that the sensor remains properly positioned on the patient.

About SpO_2 Spot Check

Note The Spot Check feature is available only if it is enabled in the monitor configuration. Refer to "Configuring the Monitor" on page 126.'

When SpO_2 is turned on, the monitor generates an alarm condition whenever SpO_2 readings are interrupted, such as when the sensor is disconnected from the patient after the monitor begins taking SpO_2 readings.

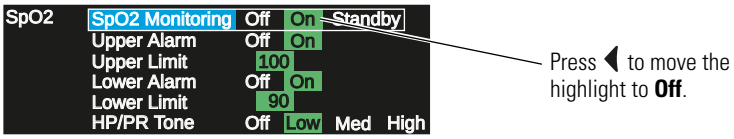
Using the SpO_2 Spot Check feature, however, you can take any number of spot SpO_2 readings at random intervals, attaching and detaching the sensor repeatedly without generating alarms.

To Prepare to Take a Spot Check Reading

1. Highlight **SpO_2** and press ⦿.

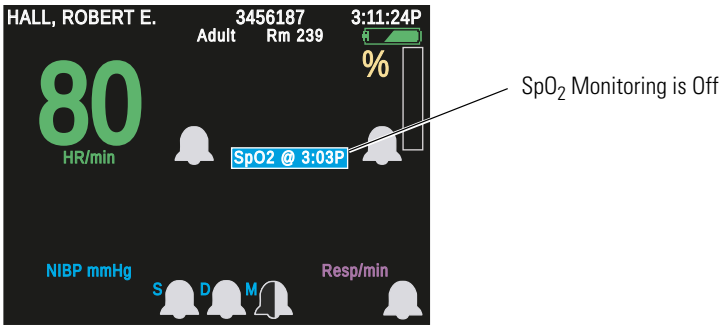
2. Highlight **SpO_2 Monitoring** (Figure 65), press ◀ to highlight **Off**, and press ⦿ to return to the main screen.

Figure 65. SpO_2 Monitoring Turned Off



'SpO_2' has changed to 'SpO_2 @ *(time)*' (Figure 66). Spot checks are now enabled.

Figure 66. SpO_2 Monitoring Turned Off

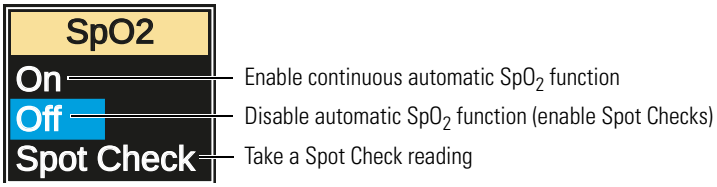


To Take an SpO_2 Spot Check Reading

1. Enable spot checks. (See "To Prepare to Take a Spot Check Reading" on page 66.)
2. Attach the sensor to the monitor and the patient.
3. Highlight **SpO_2 @ XX:XX** and press ⦿. The SpO_2 drop-down menu appears (Figure 67).

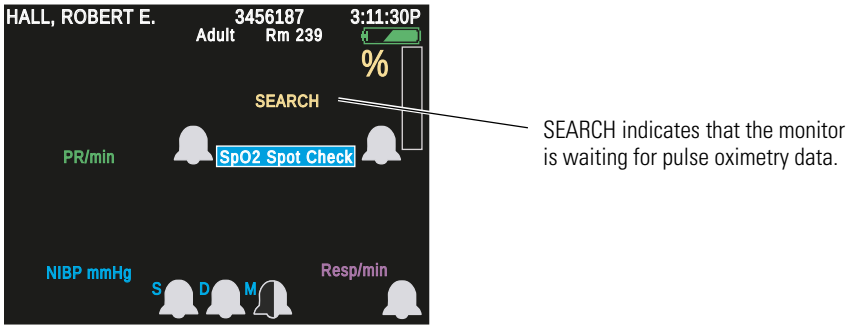
Note The SpO_2 drop-down menu can be accessed only when SpO_2 is set to **Off**.

Figure 67. SpO_2 Drop-Down Menu



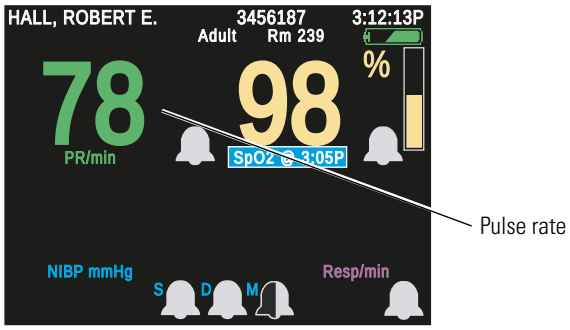
4. Press ▼ to highlight **Spot Check**.
   - The drop-down menu disappears. SEARCH appears above SpO_2 Spot Check (Figure 68) (with pulse rate if SpO_2 is the source of pulse rate).

Figure 68. SpO_2 Spot Check: Waiting for an SpO_2 Signal



- After a few seconds, the SpO_2 heart-beat indicator starts showing heart beats.
- After about 30 seconds, SEARCH disappears and the pulse oximetry reading appears (Figure 69).

Figure 69. SpO_2 Spot Check: Pulse Rate Reading



- The spot check ends, and SpO_2 monitoring is again turned off.
- The SpO_2 text on the display screen now includes the time of the most recent SpO_2 measurement. For example: **SpO_2 @ 3:05P**.

Note Spot checks are included in trends displays.

5. Detach the sensor from the patient.
6. To take another spot check later, repeat from step 2.

To Return to Continuous SpO_2 Measurements

1. Highlight **SpO_2 @ XX:XX** and press ⦿.
2. Press ▲ to turn automatic SpO_2 **On**. The pop-up menu disappears.

To Adjust the SpO_2 and ECG Pulse Tone Volume

1. Highlight **SpO_2** and press ⦿.
2. Highlight **HR/PR Tone**.
3. Highlight the desired volume level (**Off**, **Low**, **Med**, or **High**) and press ⦿.

Monitoring Blood Pressure (NIBP)

Safety

WARNING Always use a properly fitting cuff, placing it carefully on the patient according to the instructions presented below. Failure to fit and locate the cuff correctly can lead to inaccurate pressure readings.

WARNING During monitoring, periodically observe the patient's limb to make sure that the circulation is not impaired for a prolonged period. Prolonged impairment of circulation or improper cuff placement can cause bruising.

WARNING Do not use the monitor to simultaneously measure NIBP on one patient and monitor ECG on another patient.

WARNING If an NIBP measurement is suspect, repeat the measurement. If you are still uncertain about the reading, verify it using another method.

WARNING Do not take NIBP measurements on patients during cardiopulmonary bypass.

WARNING When monitoring NIBP, match the monitor patient mode to the NIBP cuff. For neonates, set the monitor to **Neonatal Mode** unless the circumference of the limb is too large for the cuff. In that case, use the **Pediatric Mode**. Be aware, however, that the maximum cuff inflation limits are based on the patient mode, not the cuff; the maximum cuff inflation limits for Pediatric Mode are greater than for Neonate Mode. (See "NIBP" on page 168 for values.)

Caution Pulse-rate measurements generated through the blood pressure cuff or through SpO_2 are subject to artifact and might not be as accurate as heart-rate measurements generated through ECG or through manual observation.

Procedure

When the monitor is powered on, the default cuff inflation pressure is based on the patient mode. (See "Default inflation pressure" on page 169.) After an NIBP measurement occurs, the monitor adjusts the inflation pressure to optimize subsequent NIBP measurements.

Note Always cycle the monitor power before you begin to monitor another patient.

Normal physiological pressure variations affect NIBP measurements from reading to reading.

If the monitor is in Adult mode and a neonate cuff is connected to the monitor, the monitor generates an equipment alert.

1. Select cuff size based on limb circumference. Use only hoses and cuffs listed in the Welch Allyn *Products and Accessories* guide.
2. Squeeze all the air from the cuff before placing the cuff on the patient.
3. Place the cuff on the limb, as near heart level as possible (Figure 70 on page 70).

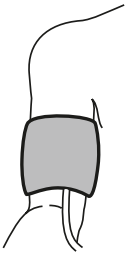
Note For every inch the cuff is placed above the heart, add 1.9 mmHg (0.253 kPa) to the displayed NIBP reading. For every inch below the heart, subtract 1.9 mmHg (0.253 kPa).

- The cuff must fit snugly without being uncomfortably tight.
- The hose must be free of kinks and not pinched.

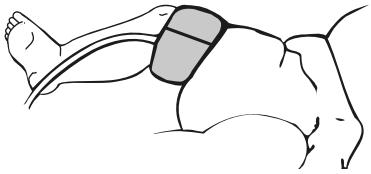
4. Align the point where the tubing connects to the cuff over the brachial or other appropriate artery.

Note If you are simultaneously monitoring blood pressure and SpO_2, you can reduce or eliminate unnecessary SpO_2 alarms by placing the cuff and the SpO_2 sensor on different limbs.

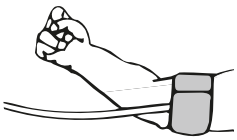
Figure 70. Cuff Placement



Cuff applied evenly and snugly. The center of the cuff is at heart level, and the bottom edge is one inch (2.5 cm) above the antecubital fossa.



Possible cuff placements for neonates



5. Screw the hose connector onto the NIBP air connector on the top of the monitor (see Figure 4 on page 9).
6. Press to start a reading.

Note If the battery charge is low and the monitor is not in the cradle, the battery icon indicates low battery and NIBP monitoring is disabled.

- If you need to stop the reading and vent the cuff at any time during the measurement, press .
- If the monitor cannot get a valid NIBP reading, it displays the message 'NIBP retry in progress' in the upper left corner of the screen and attempts another measurement. Depending on settings and patient mode, the monitor attempts one or two retries.

7. If motion artifact, such as shivering or coughing, interferes with NIBP readings, do the following:

- Position the patient's limb away from the body so that the applied cuff is not in contact with the patient's body or any other object (such as a bed rail). Keep the cuff as close to heart level as possible.

- Verify that the Smartcuf filter is ON. (See "Improving NIBP Accuracy with Smartcuf" on page 71.)
- Verify that the ECG leads are properly connected to the patient and monitor ECG during NIBP. (ECG monitoring is required for Smartcuf.)

Note The message **???/???/(???)** in an NIBP TREND display or printout indicates that the monitor could not complete an NIBP measurement during that period.

Note On-demand NIBP readings (manual or turbo) are delayed by 8 seconds if they are started while the monitor is in a power-saving mode such as display time-out.

Improving NIBP Accuracy with Smartcuf

Note **Smartcuf will be available in 2006.**

Many factors can adversely affect an NIBP measurement: cardiac arrhythmias, sudden changes in blood pressure, patient motion such as convulsions or shivering, sudden cuff movement, vibration, vehicle motion, or a weak pulse. The Smartcuf feature increases NIBP measurement accuracy in the presence of moderate motion artifact or diminished pulses.

Note Smartcuf can function only when ECG is being monitored.

To Enable Smartcuf

1. Simultaneously monitor ECG and NIBP.
2. Access the **Setup** menu. (See "To Access the Setup Menus" on page 38.)
3. Highlight **NIBP**, highlight **Smartcuf**, and enable the Smartcuf filter.

If Smartcuf is enabled and motion artifact is so severe that it still affects measurement accuracy, the measurement is marked with the symbol on the display and on printouts. During certain types of arrhythmias and other situations where a good ECG signal cannot be obtained, consider disabling Smartcuf, as follows:

To Disable Smartcuf

1. Access the **Setup** menu. (See "To Access the Setup Menus" on page 38.)
2. Highlight **NIBP**, highlight **Smartcuf**, and disable the Smartcuf filter.

Taking Automatic NIBP Readings

In the Auto NIBP mode, for intervals shorter than 5 minutes, the monitor immediately begins taking NIBP readings at the specified interval. For intervals of 5 minutes or longer, the readings begin when the time of day is a multiple of the interval. (If the interval is 15 minutes, for example, then the readings begin at 00, 15, 30, or 45 minutes after the hour.)

To Start Automatic NIBP Readings

1. Select and apply the appropriate NIBP cuff and hose. ("Monitoring Blood Pressure (NIBP)" on page 69.)
2. Highlight **NIBP** and press ⦿.
3. Highlight **NIBP Mode** and select **Auto**.
4. Highlight **Auto Interval (min)** and select an interval.

Note After you invoke an automatic NIBP, expect a delay before the monitor starts the first measurement. The delay can be as long as the interval selected.

To Stop Automatic NIBP Readings

1. Highlight **NIBP** and press ⦿.
2. Highlight **NIBP Mode** and select **Manual**.

Taking NIBP Readings Using Turbo Mode

In Turbo mode, the monitor starts an NIBP reading and then takes as many more readings as possible within five minutes.

To Use the Turbo Mode

1. Select and apply the NIBP cuff and hose. ("Monitoring Blood Pressure (NIBP)" on page 69.)
2. Highlight **NIBP** and press ⦿.
3. Highlight **NIBP Mode** and select **Turbo**.

Note If you cycle the monitor power, NIBP returns to manual mode.

To End the Turbo Mode

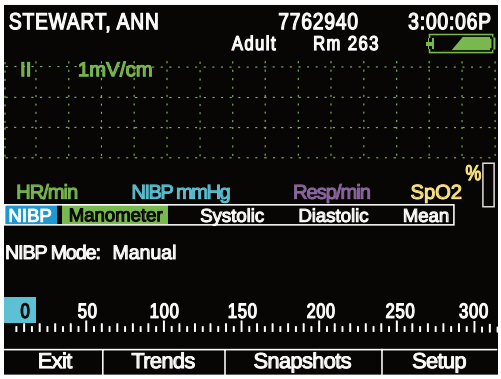
Press or select **NIBP Mode Manual**. The monitor returns to manual NIBP measurement mode.

Taking NIBP Readings Using the Digital Manometer

To Use the Digital Manometer

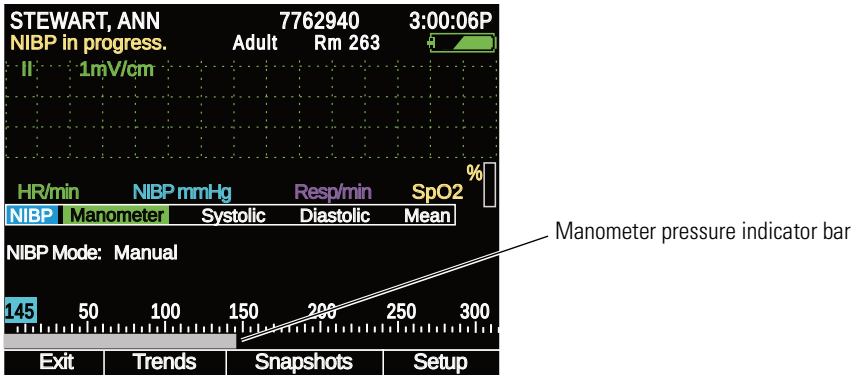
1. Attach the appropriate cuff to the patient. (See Step 1 on page 69.)
2. In the **NIBP** control menu (see "Using Control Menus" on page 34), highlight **Manometer**. The manometer menu appears (Figure 71).

Figure 71. NIBP: Manometer Initial View



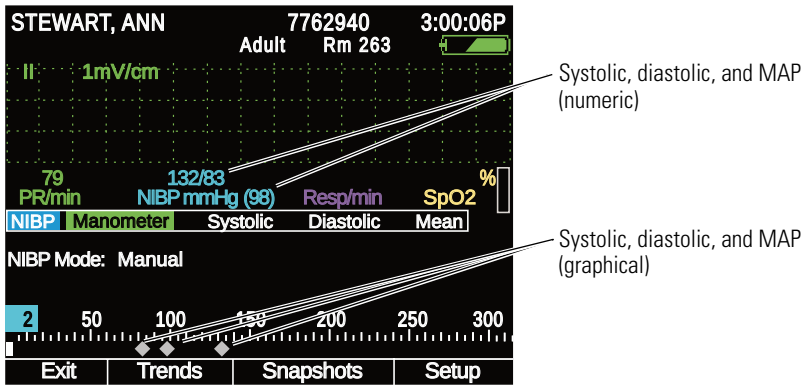
3. Press to start the NIBP measurement cycle. When the cuff is inflated, the manometer bar dynamically displays the pressure reading (Figure 72).

Figure 72. NIBP: Manometer Reading in Progress



When the cycle completes, measurement numerics appear below the waveform grid and the systolic, diastolic, and MAP values are displayed as markers along the manometer scale (Figure 73).

Figure 73. NIBP: Manometer Reading Complete



NIBP Measurements in Power-Saving Mode

When a manual or turbo NIBP activity awakens the monitor from power-saving mode ("Power Saving" on page 45), cuff inflation pressure is reset to default levels and cuff inflation is delayed for up to 8 seconds.

NIBP Disabled When the Battery is Low

If the battery is low and the monitor is operating on battery power, NIBP functions are disabled and the monitor displays the message "NIBP off. Low battery."

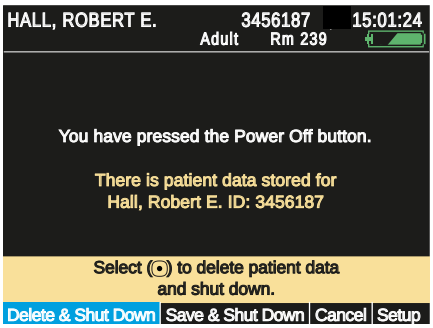
If you attempt to start an NIBP measurement during a low-battery condition, the monitor displays an equipment alert with the message "Low battery. NIBP disabled."

Note Inserting a monitor into a powered cradle during a low-battery condition immediately enables NIBP monitoring.

To Discontinue Monitoring

1. Press ⏻. The Power Off screen appears (Figure 74 on page 75).

Figure 74. Power Off



- If you intend to continue monitoring the same patient when the monitor is turned on again, and if you want to save the stored vital-signs data and monitor settings (to print them at a PC), highlight **Save & Shut Down** and then press ⊙. The monitor saves the patient data and the monitor settings, and then turns off.
- If you do not intend to continue monitoring the same patient when the monitor is turned on again, highlight **Delete & Shut Down** and then press ⊙. The monitor turns off without saving the data and the settings.

2. Disconnect the leads and sensors from the patient.

If you press ⏻ and then decide that instead of turning off the monitor you want to resume monitoring the same patient, do one of the following:

- Highlight **Cancel** and press ⊙.
- Wait for 30 seconds.
- Press ⌇.

Note When you power down from Demo mode, you cannot save settings and patient data. In this case, the following screen appears: