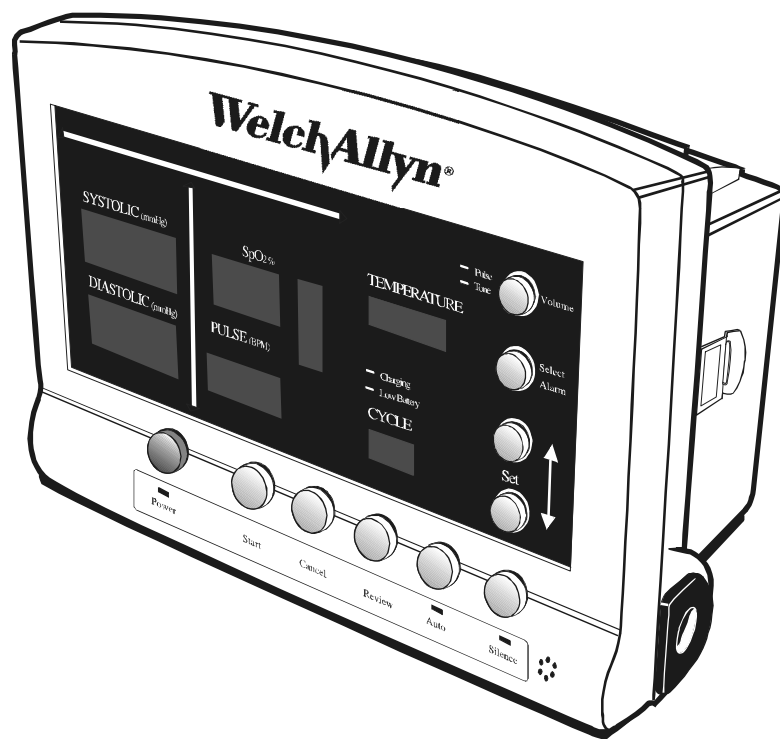


WelchAllyn



Vital Signs Monitor Operator's Manual

CAUTION: United States Federal Law restricts this device to sale by or on the order of a licensed health care practitioner.

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About the Operator's Manual

The operator manual is designed to help you understand the capabilities and operation of your Welch Allyn Vital Signs Monitor.

The information included in this manual is inclusive of all options available with the Welch Allyn Vital Signs Monitor (ie. SpO₂, Temperature and Printer). **The applicability of some sections of this operator manual will depend on the configuration of your particular unit.**

This information is intended as a comprehensive guide to the operation of the Welch Allyn Vital Signs Monitor. To achieve satisfactory results, the operator should read this manual thoroughly before attempting to use the monitor. A quick reference operator's guide is provided on the side of the monitor as a convenient reference for experienced operators.

Product Overview

The Welch Allyn Vital Signs Monitor is designed to non-invasively and automatically measure systolic and diastolic blood pressure, pulse rate, temperature and oxygen saturation (SpO₂) for adult and pediatric patients. The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients. All blood pressure, pulse, temperature and SpO₂ values are displayed on large, easy-to-read displays, and may be printed via an integrated thermal printer, as desired.

The rechargeable battery and wide variety of mounting accessories make the Welch Allyn Vital Signs Monitor convenient for many locations. The operator may choose any combination of simultaneous measurement modalities. This flexibility, combined with features such as programmable alarms and automatic blood pressure cycles, makes the Welch Allyn Vital Signs Monitor ideal for a wide variety of patient monitoring needs.

The Welch Allyn Vital Signs Monitor is intended for use in a wide variety of health care settings. This includes hospital departments, as well as patient transport within the hospital environment. The Welch Allyn Vital Signs Monitor is also intended for use in alternate care settings, such as physician offices, freestanding ambulatory care and surgery centers, health clinics and nursing homes. The Welch Allyn Vital Signs Monitor may also be used during patient transport within any of these alternate care environments.

The Welch Allyn Vital Signs Monitor is not intended for the monitoring of patients during transport external to the health care environment (eg. ambulance, helicopter transport). The Welch Allyn Vital Signs Monitor is not intended for use in environments which are not supervised by a health care practitioner.

Indications/Contraindications for Use

The Welch Allyn Vital Signs Monitor is intended for monitoring of blood pressure, pulse rate, temperature and oxygen saturation (SpO₂) of adult and pediatric patients. The device is not designed, sold or intended for use except as indicated.


The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients.* To ensure pediatric blood pressure accuracy and safety, note that the Welch Allyn Small Child cuffs are the SMALLEST CUFFS approved for use with young children and infants. The circumference of the child’s arm must fit within the range markings on the cuff.

* Welch Allyn defines neonates as children 28 days or less of age if born at term (37 weeks gestation or more); otherwise, up to 44 gestational weeks. This definition comes from the AAMI SP10 1992 standard.

The monitor should not be used on patients who are linked to heart/lung machines.


Safety Warnings & Cautions

All operating personnel should be familiarized with the general safety information in this summary. Specific warnings and cautions will also be found throughout the operator's manual. Such specific warnings and cautions may not appear here in this summary.




Conforms to
IEC60601-1
UL2601-1
CAN/CSA C22.2 No 601-1


Approved to Australia AS 3200.1,
Appendix Z




Attention, Consult Accompanying Document




Class II Equipment



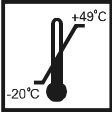
Not protected against the ingress of water




Defibrillator-proof,
Type BF Applied Part




Battery Operated Device
See “Battery Compartment” on page 16 for Location
See “Charging the Battery” on page 17
See “Battery Removal & Replacement” on page 48



Transport Temperature



Storage Humidity



Handle with Care

General Warnings

- **THE WELCH ALLYN VITAL SIGNS MONITOR IS NOT INTENDED TO BE USED ON NEONATAL PATIENTS.** Welch Allyn defines neonates as children 28 days or less of age if born at term (37 weeks gestation or more); otherwise, up to 44 gestational weeks. This definition comes from the AAMI SP10 1992 standard.
- To ensure pediatric blood pressure accuracy and safety, note that the Welch Allyn Small Child cuffs are the SMALLEST CUFFS approved for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.
- The Welch Allyn Vital Signs Monitor is designed for use by medical clinicians. Although this manual may illustrate medical monitoring techniques, this system should only be used by a trained clinician who knows how to take and interpret a patient's vital signs.
- The information in this operator's manual is a comprehensive guide to the operation of the Welch Allyn Vital Signs Monitor. To achieve satisfactory results the operator should read the manual thoroughly before attempting to use the Monitor.
- To ensure patient safety, use only accessories and supplies (i.e. cuffs, hoses, temperature probes, SpO₂ sensors etc.) recommended or supplied by Welch Allyn for the Welch Allyn Vital Signs Monitor.
- Do not operate the Welch Allyn Vital Signs Monitor in the presence of flammable anesthetics or other explosive atmosphere. An explosion may result.
- It is the operator's responsibility to set alarm limits as appropriate for each individual patient.
- Avoid compression of the pneumatic tubing of the Welch Allyn Vital Signs Monitor. Compression of the tubing may cause system errors to occur in the Monitor.
- The Welch Allyn Vital Signs Monitor is safe to use in the presence of high frequency surgical equipment
- Care should be taken to prevent water or other fluid from entering any connectors on the Monitor. Should this occur, the connectors should be dried with warm air. All monitoring functions should then be checked for proper operation.
- Any Monitor which has been dropped or damaged should be checked by qualified service personnel to ensure proper operation prior to use.
- Cords should periodically be checked for fraying or other damage, and replaced as necessary.
- There are no user serviceable parts inside the Monitor other than paper replacement and battery replacement.
- This Monitor should not be used on patients who are linked to heart/lung machines.
- This Monitor will not operate effectively on patients who are experiencing convulsions or tremors.
- This device complies with current required standards for electromagnetic interference and should not present problems to other equipment or be affected by other devices. As a precaution, avoid using this device in close proximity to other equipment.
- Do not autoclave.

Blood Pressure Warnings

- To ensure pediatric blood pressure accuracy and safety, note that the Welch Allyn Small Child cuffs are the SMALLEST CUFFS approved for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.

- Blood pressure measurements may be inaccurate if cuffs and/or hoses are used other than those provided for the Welch Allyn Vital Signs Monitor by Welch Allyn.
- Blood pressure measurements may not be accurate for patients experiencing moderate to severe arrhythmias.
- When monitoring over an extended period of time, or at frequent intervals, it is recommended to check the cuff site and cuffed extremity regularly for possible ischemia, purpura and/or neuropathy.
- Do not fit the Blood Pressure system with Luer Lock adapters. There is a risk of user misconnection with an IV line introducing air bubbles into a patient's blood.

SpO₂ Warnings

- The operation of the SpO₂ sensor in MRI environments is specifically not recommended.
- If pulse oximetry measurements are suspect, verify the reading using another clinically accepted measurement method.
- Prolonged use or the patient's condition may require changing the SpO₂ sensor site periodically.
- Change the sensor site and check skin integrity, circulatory status, and correct alignment at least every 4 hours.
- When using the motion tolerant pulse oximetry channel, a very sudden and substantial change in pulse rate can result in erroneous pulse rate readings. Be sure to validate the patient data and patient condition before intervention or change in patient care.
- Use only SpO₂ sensors and accessories which are compatible with the SpO₂ configuration purchased. Welch Allyn Vital Signs Monitor with the Nellcor Puritan Bennett pulse oximetry option may only be used with Nellcor brand sensors and accessories.
- Do not use a damaged sensor or pulse oximetry cable. Do not use a sensor with exposed optical components.
- Tissue damage is caused by incorrect application or duration of use of an SpO₂ sensor. Inspect the sensor site periodically as directed in the sensors direction for use.
- Pulse oximetry readings and pulse signal is affected by certain ambient environmental conditions, sensor application errors, and certain patient conditions.
- Do not immerse or wet the sensor.

Temperature Warnings

- Single-use, disposable probe covers, available from Welch Allyn will limit patient cross-contamination. The use of any other probe cover or the failure to use a probe cover may produce temperature errors and is specifically not indicated.
- Oral probes (blue) are to be used for taking oral and axillary temperatures only. Rectal probes (red) are to be used for taking rectal temperatures only. The use of the wrong probe may produce temperature errors.
- Do not allow the tip of the temperature probe to come into contact with any heat source (e.g., hands or fingers) prior to taking a temperature measurement. If this occurs, discard the probe cover and start the temperature determination again.

General Cautions

- If the accuracy of any measurement is in question, check the patient's vital sign(s) by an alternate method and then check the Monitor for proper functioning.
- Ensure the Monitor is placed on a secure surface or use one of the optional mounting accessories.
- Do not place fluids on the Monitor.

Blood Pressure Cautions

- Extremity and cuff motion should be minimized during blood pressure determinations.
- If the blood pressure cuff is not at heart level, the difference in reading due to the hydrostatic effect should be noted. The value of 1.80 mmHg must be added to the displayed reading for every inch (2.5cm) above heart level. The value of 1.80 mmHg must be subtracted from the displayed reading for every inch (2.5cm) below heart level.
- Proper blood pressure cuff size and placement is essential to the accuracy of the BP determination. See "Chart for Determining Cuff Size" on page 27.
- When measuring blood pressure on children younger than age 3 it is recommended that the Pressure Preset (initial inflation pressure) be set at 160 mmHg or lower.

SpO₂ Cautions

- The pulse oximeter is calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.
- Some intravascular dyes, depending on the concentration, may affect the accuracy of the SpO₂ measurement.
- Some sensors may not be appropriate for a particular patient. If at least 10 seconds of perfusion pulses cannot be observed for a given sensor, change sensor location or sensor type until this condition is achieved.

Temperature Cautions

- Do not allow the tip of the temperature probe to come into contact with a heat source (i.e. hands or fingers) prior to taking a temperature measurement. If this occurs discard the probe cover and start the temperature determination process again.
- Normal mode (10 second) axillary temperatures are accurate only for children under the age of four. Normal mode axillary temperatures will not be accurate on older children or adults. The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients.

When taking rectal temperatures, extreme caution should be used to avoid risk of bowel perforation in children.

Special Features

The following special features enhance the use of the Welch Allyn Vital Signs Monitor:

- Choice of Measurement Modalities
- Non-invasive blood pressure, temperature, and SpO2 measurements may be made independently or simultaneously.
- Operator Selectable BP Measurement Intervals
- Automatically takes BP measurements at intervals from 1 to 90 minutes. Special "STAT" mode allows continuous blood pressure measurements for up to 15 minutes.
- Programmable Alarms
- Both visual and audible alarms indicate readings outside of operator programmable high/low limits, and also indicate system hardware/software problems.
- Non-Invasive, Oscillometric BP
- Eliminates the risks associated with invasive monitoring, with no need for microphones or external transducers.
- Prior Data Recall
- Measurement data from up to 99 previous determinations is available at the touch of a button.
- Operator-Friendly Results
- Large, easy-to-read LED displays are complemented by an integrated thermal printer.
- AC or Self-Contained Battery Power
- The Welch Allyn Vital Signs Monitor is conveniently available in many locations, for a variety of monitoring needs, including interdepartmental transport within the facility.

Blood Pressure Operating Modes

When a blood pressure measurement cycle is initiated, the cuff will automatically inflate to the default pressure level.

The cuff will immediately begin to deflate in a stepped fashion and will determine systolic pressure and diastolic pressure from the pulses sensed by the cuff at various pressure levels. This is the oscillometric method of non-invasive blood pressure monitoring.

Blood pressure measurements may be initiated manually, or automatically at time intervals determined by the user.

At the completion of a measurement cycle the systolic and diastolic pressures are displayed. If the Monitor is in Automatic Mode, the measured values are kept on display until the next BP measurement is initiated. When not in Automatic Mode, the measured values are displayed for two minutes, after which time the display screen is blanked. The most recent BP measurement may be recalled by pressing the REVIEW button.

When in Automatic Mode, if the unit is unable to determine the systolic or diastolic value, the measurement will be automatically repeated once.

Blood Pressure Manual Mode

In the Manual Mode, a single blood pressure determination is made only when the START button is pushed. The manual mode is the default mode of operation for blood pressure determinations.

A measurement cycle may be cancelled at any time by pressing the CANCEL button. This action immediately initiates a rapid cuff deflation.

The blood pressure measurement data will appear on the display immediately following the measurement. The display will blank after two minutes. If the display is blanked, pressing the REVIEW button on the front panel will recall the measurement. Up to 99 prior measurements are available for review or printing.

In Blood Pressure Manual Mode, the following alarm limits may be activated; SYSTOLIC HIGH LIMIT, SYSTOLIC LOW LIMIT, DIASTOLIC HIGH LIMIT, DIASTOLIC LOW LIMIT, PULSE RATE HIGH LIMIT and PULSE RATE LOW LIMIT. Blood pressure determinations which activate alarms are indicated by flashing displays and a repetitive audible tone. If an alarm limit is violated, subsequent blood pressure determinations may be made only after the alarm condition is reset by pressing any button on the Monitor's display.

Blood Pressure Automatic Mode

The Automatic Blood Pressure Mode is entered by pressing the AUTO button. Pressing the AUTO button displays a choice of 11 cycle interval times as follows: "St" (STAT mode), 1 minute, 3 minutes, 4 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 45 minutes, 60 minutes and 90 minutes. These choices represent the time interval from the beginning of one cycle to the beginning of the next automatic cycle. STAT mode allows the monitor to take continuous blood pressure measurements for 15 minutes. In addition, the operator may choose to disable the Auto Mode by choosing "--" (two dashes).

NOTE: In the STAT and 1-minute automatic cycle mode, the Welch Allyn Vital Signs Monitor will automatically take blood pressure measurements in 1-minute intervals for up to 15 minutes.

A measurement cycle may be cancelled at any time by pressing the CANCEL button. This action immediately initiates a rapid cuff deflation.

The blood pressure measurement data will appear on the display immediately following the measurement and will remain displayed until the next measurement cycle is initiated.

In Blood Pressure Auto Mode, the following alarm limits may be activated; SYSTOLIC HIGH LIMIT, SYSTOLIC LOW LIMIT, DIASTOLIC HIGH LIMIT, DIASTOLIC LOW LIMIT, PULSE RATE HIGH LIMIT and PULSE RATE LOW LIMIT. Blood pressure determinations which activate alarms are indicated by flashing displays and a repetitive audible tone. Any alarm limit violation must be reset to continue automatically timed blood pressure determinations. The alarm may be reset by pressing any button on the Monitor's display.

Temperature Operating Modes

Thermometry measurements are made with the integrated Welch Allyn SureTemp® thermometer. Oral and rectal probes utilize single-use disposable probe covers which limit cross-contamination. Oral, axillary or rectal temperatures are taken using 'Normal' or 'Monitor' operating modes. Axillary temperatures are taken using the oral probe.

In Normal mode the thermometer's microprocessor "predicts" body temperature in about 4 seconds for oral temperatures, about 10 seconds for axillary temperatures and in about 15 seconds for rectal

temperatures. The Monitor mode displays the patient's actual temperature after 3 minutes for oral/rectal mode and 5 minutes for axillary mode, and will continue to display an updated temperature as long as the probe remains in place.

NOTE: Normal mode axillary temperatures (10 seconds) are accurate only for children under the age of four.

NOTE: The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients.

Temperature readings may be displayed in Fahrenheit or Celsius scales.

Temperature Normal Mode

In Normal mode, the device will measure temperature at discrete intervals and then calculate the rate of change according to a proven algorithm. This allows the thermometer to predict the end point that the thermistor would reach if it were left in the mouth until it reached mouth temperature. This predictive feature allows the thermometer to arrive at an accurate oral temperature reading in approximately 4 seconds.

Normal mode is the default operating mode for temperature determinations.

Operator selectable patient alarm limits are not available in temperature Normal mode. However, temperatures which are outside of the operating range of the device will be noted on the temperature display.

Temperature Monitor Mode

Continuous Monitor mode operation is normally used for longer term monitoring and when difficult situations prevent accurate temperatures from being taken in the Normal mode. The probe must be in contact with tissue for at least three (3) minutes for accurate oral/rectal temperature measurement and five (5) minutes for accurate axillary temperature measurement. Monitor mode temperatures may not be identical to predicted 'Normal' temperatures because of ambient temperature influence and other factors. The trend in temperature is the important standard to be observed when in the Monitor mode.

Operator selectable patient alarm limits are not available in temperature Monitor mode. However, temperatures which are outside of the normal operating range of the device will be noted on the temperature display.

SpO₂ Operating Mode

The Welch Allyn Vital Signs Monitor incorporates the Nellcor Puritan Bennett™ pulse oximetry module which determines arterial oxyhemoglobin saturation (SpO₂%) by measuring the absorption of red and infrared light passed through the tissues. Changes in absorption caused by pulsation of blood in the vascular bed are used to determine arterial saturation and pulse rate.

Oxygen saturation percent is calculated with each pulse detected, and thus the monitor display is continually updated. The pulse signal bar graph is an indicator of the strength and quality of the detected pulses.

When SpO₂ is measured, the patient's pulse rate is also measured and displayed. A pulse rate measurement from the SpO₂ determination overrides a pulse rate measurement derived from a blood pressure measurement.

When measuring SpO₂ the user may enable the SpO₂ Pulse Tone feature. A short audible tone is emitted with every patient heartbeat. The frequency of the tone is based on the patient's SpO₂ level. The lower the frequency of the tone, the lower the patient's SpO₂ level.

In SpO₂ monitoring mode, operator selectable alarm limits for low SpO₂ % may be activated. A condition which violates the SpO₂ low limit alarm is indicated by a flashing display and repetitive audible tone. Should a patient alarm condition for SpO₂ or pulse rate occur, the Monitor will indicate an alarm condition (flashing & beeping) while continuing to monitor and display the patient's current SpO₂ %. The alarm will automatically reset when the patient's condition returns to within the preset alarm parameters.

Should a patient alarm condition for SpO₂ or pulse rate occur, the operator may invoke "Silence Mode" by pressing the SILENCE button. This will silence the audible tone (display will continue to flash), while the practitioner attends to the patient and the monitor. Silence mode resets automatically after 30 seconds, or when the patient's condition returns to within the preset alarm parameters.

Removal of the SpO₂ sensor from the patient will initiate an alarm, unless the SpO₂ and pulse rate alarms are turned off. To reset the sensor alarm, press any button on the Monitor's display.

SpO₂ is generally measured via pulses detected using a finger sensor. However, for certain situations SpO₂ may be measured at alternate sites including the earlobe, forehead and toes. Special sensors must be employed in these situations.

SpO₂ Monitor Mode

The SpO₂ monitor performs most accurately with the fingerclip sensor, which may be used on all fingers except the thumb. The finger clip sensor is recommended for spot checks or short term continuous monitoring.

The device determines arterial oxyhemoglobin saturation (SpO₂ %) by measuring the absorption of red and infrared light passed through the tissue. Oxygen saturation and pulse rate are displayed on the LED digital display. On each detected pulse, the pulse signal bar graph flashes. The intensity of this signal is a simple visual indicator of waveform signal strength, and can identify situations where the pulsatile nature of the tissue may not be adequate for an accurate SpO₂ reading. The update interval of the bar graph should correspond to the patient's pulse rate. This is an indication of the quality of the SpO₂ signal.

All Welch Allyn Vital Signs Monitors with pulse oximetry capability are equipped with a pulse tone. This audible tone beeps in synchronization with each beat of the patient's heart. In addition, the frequency of the tone will vary based on the patient's oxygen saturation value. The higher the tone's frequency, the higher the patient's oxygen saturation value. The user may change the pulse tone volume, or turn this feature off as necessary.

Pulse Rate Feature

The Welch Allyn Vital Signs Monitor is capable of determining pulse rate as an adjunct to the blood pressure measurement and the SpO₂ measurement.

The pulse rate, in beats per minute, will be determined primarily from the SpO₂ measurement methodology. In the case where SpO₂ is not available, or is disabled, the pulse rate display will be driven by data from the blood pressure measurement method.

There are two operator selectable alarm limits for the pulse rate. They are PULSE RATE HIGH LIMIT and PULSE RATE LOW LIMIT. Pulse rates which activate alarm limits are indicated by a flashing display and a repetitive audible tone.

Should a pulse rate alarm occur when the pulse rate measurement is derived from the blood pressure measurement, no subsequent blood pressure or pulse rate measurements may be made until the alarm is reset. The alarm may be reset by pressing any button on the Monitor's display.

Should a pulse rate alarm occur when the pulse rate measurement is derived from the SpO₂ measurement, the monitor will indicate an alarm condition (flashing & beeping) while continuing to monitor and display the patient's current SpO₂% and pulse rate. The alarm will automatically reset when the patient's condition returns to within the preset alarm parameters.

Should a patient alarm condition for pulse rate occur during SpO₂ monitoring, the operator may invoke "Silence Mode" by pressing the SILENCE button. This will silence the audible tone (display will continue to flash), while the practitioner attends to the patient and Monitor. Silence mode resets automatically after 30 seconds, or when the patient's condition returns to within the preset alarm parameters. If an alarm limit is violated, subsequent determinations of any type may only be made after the alarm condition is reset.

Unpacking Checklist

After you have unpacked the Welch Allyn Vital Signs Monitor and the components, identify each item with the checklist that follows and inspect for missing items. Retain the shipping materials in the event of shipping damage or for return, if necessary, to Welch Allyn/Tycos for repair or warranty service.

All Welch Allyn Vital Signs Monitors include the following components (A-G):

A. Welch Allyn Vital Signs Monitor

This device is a portable, light weight device designed to automatically measure and display blood pressure and pulse rate. Options available include pulse oximetry, temperature and integrated printer.

B. Operator Manual (This manual)

To achieve satisfactory results, the operator should read this manual thoroughly before attempting to use the monitor. Save this manual for helpful product reference.

C. Instrument Warranty Card

Fill this out today and return to Welch Allyn. This card validates your warranty.

D. Blood Pressure Cuffs

Includes one (1) Adult and one (1) Large Adult blood pressure cuff.

NOTE: A full range of cuff sizes are available (as accessory items) however, the Large Adult cuff will fit the majority of adults and give the most accurate blood pressure measurement.

E. Blood Pressure Hose

With connector, connects a variety of blood pressure cuffs to the monitor.

F. AC Power Transformer and Line Cord

Operates the monitor and charges the internal battery.

G. Cuff Clip

Attaches to the rear of the monitor to hold the blood pressure cuff. Not used if mobile stand, pole mount or wall mount accessories are purchased.

Certain Welch Allyn Vital Signs Monitors will include the following items, based on the options purchased:

Printer Option

H. Box of Printer Paper

Six (6) rolls of thermal printer paper. One additional roll will be pre-loaded into the printer.

Pulse Oximetry (SpO₂) Option

I. Finger Clip SpO₂ Sensor and Cord

Other sensors are available separately.

Temperature Option

J. Oral Temperature Probe

The blue oral probe is used for both oral and axillary temperature determinations. A red rectal probe is available separately.

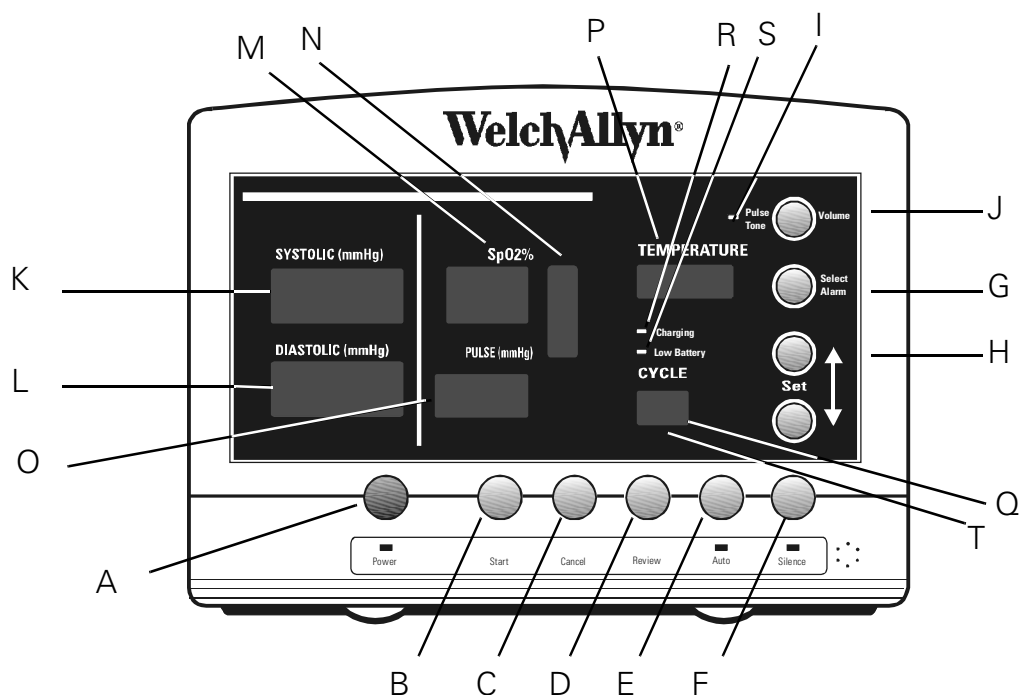
K. Temperature Probe Covers

One box of 25 single use, disposable probe covers for both oral and rectal temperature determinations.

NOTE: Report any signs of shipping damage to the carrier. If an item is missing or damaged, contact the Welch Allyn Service Center near you.

Controls, Indicators and Connections

NOTE: In this section, all drawing and text are representative of the Welch Allyn Vital Signs Monitor with all available options (i.e. Blood Pressure plus Pulse Oximetry (SpO₂), Temperature and Printer). Your Monitor may not include all functions, depending on the options purchased.



Front Panel Functions

A. POWER Button & Indicator Light

This on/off button controls the power to the Monitor. The indicator light will glow when the unit is on. Battery power will be used unless the Monitor is powered through the AC power transformer.

B. START Button

Pressing this button initiates an on-demand blood pressure cycle.

C. CANCEL Button

If a blood pressure cycle is in progress, pressing this button aborts the cycle and immediately releases the cuff pressure. In "STAT" automatic blood pressure mode, pressing the cancel button aborts the cycle in process, and cancels the "STAT" mode as well.

When pressed for 3 seconds, the cancel button erases all stored data in the Welch Allyn Vital Signs Monitor.

D. REVIEW Button

Pressing this button will display the most current set of stored data including BP & pulse rate and/or SpO₂ and/or temperature. Subsequent presses will display the next most recent data sets.

E. AUTO Button & Indicator

Pressing this button allows the operator to scroll through the automatic blood pressure interval options. Time intervals are displayed in minutes on the CYCLE display (see below). Choosing any time interval except "--" will cause the Auto indicator light to glow, and blood pressure determinations to be made according to the displayed time interval.

F. SILENCE Button & Indicator

During SpO₂ monitoring, should an SpO₂ or Pulse Rate alarm condition occur, pressing the Silence button invokes 'Silence Mode'. This will silence the audible tone (display will continue to flash), while the practitioner attends to the patient and Monitor. Silence mode resets automatically after 30 seconds, or when the patient's condition returns to within the preset alarm parameters. In Silence Mode, the silence indicator light will glow.

G. SELECT ALARM Button

Pressing this button allows the operator to select a specific parameter for which an alarm threshold will be set. The HIGH ("HI") or LOW ("LO") indicator will show in the CYCLE display, and the current value will appear in the respective display.

H. SET Buttons (Arrow Up or Arrow Down)

These buttons increment or decrement the currently displayed alarm threshold.

The SET-Arrow Up button has additional functionality. See "Using the RS232 Computer Interface" on page 40

I. PULSE TONE Indicator

This indicator will be lit when the pulse tone function is enabled.

J. PULSE TONE Button

Pressing this button allows the operator to control the volume of the SpO₂ pulse tone.

K. SYSTOLIC Display

This red LED display shows the systolic blood pressure.

Additionally, this display can show systolic alarm limits (see above).

L. DIASTOLIC Display

This red LED display shows the diastolic blood pressure

Additionally, this display can show diastolic alarm limits (see above).

M. SpO₂ Display

This red LED display shows the percent saturation of arterial hemoglobin (SpO₂%).

Additionally, this display can show SpO₂ low saturation alarm limits (see above).

N. PULSE SIGNAL BAR GRAPH

This bar graph gives a visual indication of the strength and quality of the pulses detected by the SpO₂ sensor. Additionally, this bar graph can indicate the volume level of the SpO₂ pulse tone. (see above).

O. PULSE Display

This yellow LED display shows the pulse rate.

Additionally, this display can show pulse rate alarm limits (see above).

P. TEMPERATURE Display and Indicator

The red LED display shows the temperature in degrees Fahrenheit or Celsius. The temperature scale (°F or °C) will be shown by a green indicator. Also, temperature monitor mode is indicated by a green indicator.

Q. CYCLE Display

This red LED display shows the time (in minutes) between automatically initiated blood pressure measurements, or "St" for STAT mode (continuous blood pressure measurements for up to 15 minutes).

Additionally, this display identifies the high and low alarm limits for the various parameters, during alarm select mode, and the cycle number during review mode.

R. CHARGING Indicator

This flashing yellow indicator will signify that the internal battery is being charged when the Monitor is powered through the AC power transformer. When the Monitor is fully charged, the flashing will be replaced with a solid yellow indicator light.

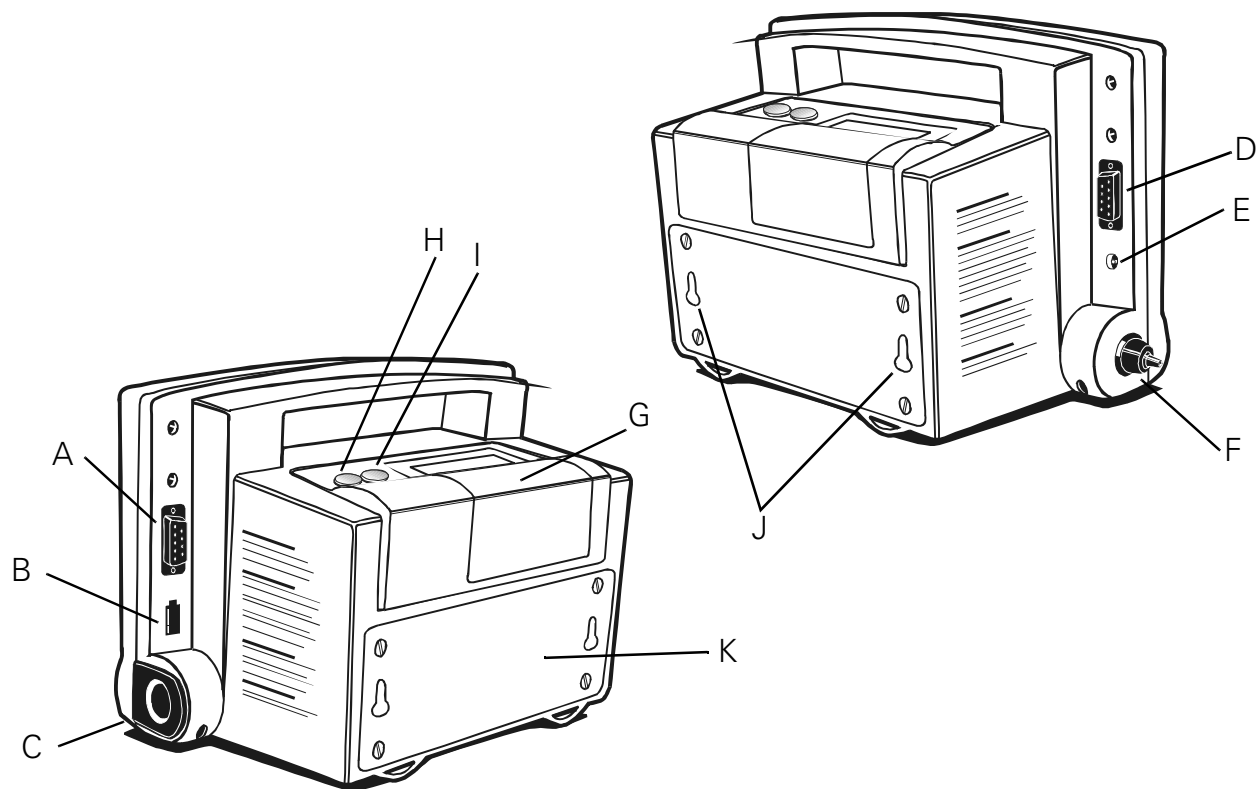
S. LOW BATTERY Indicator

This yellow indicator light will remain on continuously as a visual indicator when the battery charge is weak. The indicator will flash as a visual indicator that the battery charge is critically low.

T. MEMORY Indicator

This green indicator will flash when the unit has reached its maximum capacity of 99 data sets in storage. Also, it will remain on continuously when the operator is reviewing stored data sets.

Side & Rear Panel Connections



A. SpO₂ Sensor Connection

Nine pin connector for the SpO₂ sensor.

B. Temperature Probe Connector

Connector for either oral/axillary (blue) or rectal (red) probe.

C. Temperature Probe Holder

Active temperature probe is inserted here when not in use. Removing and replacing the probe turns the temperature on and off, respectively.

D. RS232 Data Interface Connector

Port for the connection of a cable to an external computer, network, or nurse call system.

E. Transformer Power Connector

AC power transformer connector.

F. Pressure Hose Connector

Connector for blood pressure hose.

G. Printer

Compartment and paper feed area for integrated thermal printer.

H. Print Button

Pressing this button initiates a print operation.

I. Printer Feed Button

Pressing this button advances the paper in the printer.

J. Mounting Keyholes

Mounting accessories are attached via these keyholes.

K. Battery Compartment

Contains the internal battery. Removal of 4 screws allows changing battery without affecting other internal parts.

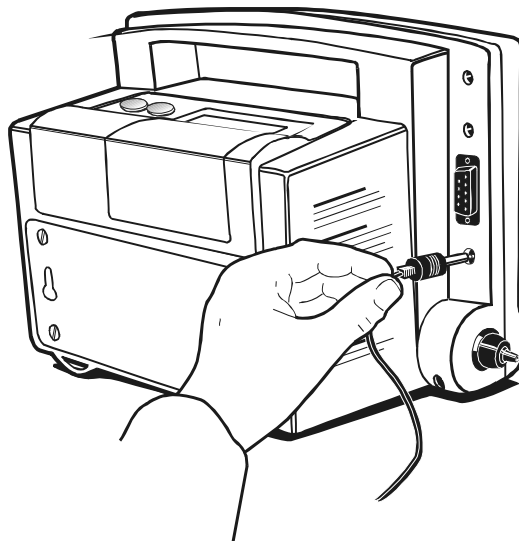
Set-Up Procedure

AC Power Connection

The Welch Allyn Vital Signs Monitor may be powered by either AC power or battery power after the battery has been charged.

To install the AC power transformer, insert the round transformer connector into the power port on the side of the Monitor as shown. Insert the connector into the port until it is fully seated. Insert the line cord into the line connector on the transformer.

To power the Welch Allyn Vital Signs Monitor, plug the line cord into the AC mains power source.



Inserting the AC power transformer connector into the Monitor port.

Charging the Battery

The Welch Allyn Vital Signs Monitor may be powered by either AC power or battery power after the battery has been charged.

UPON INITIALLY RECEIVING THE MONITOR, CHARGE THE BATTERY FOR SIXTEEN (16) HOURS OR UNTIL THE CHARGING INDICATOR LIGHT NO LONGER FLASHES. The battery is charged by attaching the AC power transformer to the Monitor, and plugging the AC power transformer into the AC mains power source.

While charging, the charging indicator will flash a yellow light. When the Monitor is fully charged the flashing light will be replaced with a solid yellow indicator light.

Power On/Off and System Check Procedure

Each time the Welch Allyn Vital Signs Monitor is turned on, the unit performs an internal self-diagnostic check.

To turn the unit on, press the POWER button.

Upon power up, note that all of the LED segments in each display turn on briefly. An audible tone should also sound. If the internal self-check is successful, the displays will assume their normal functions and the monitor is ready for operation. If the self-check fails, an error code will be shown in the displays.

To turn the unit off, press POWER button.

Note that turning the unit off will erase all stored blood pressure, temperature, SpO2 and pulse rate data.

Setting the Date and Time

1. Initiate the Monitor's internal configuration settings menu by powering up the unit while the START button is depressed. Hold the START button down until all the LED display segments go off. The first message displayed is the revision level of the internal software. This will be displayed in the systolic and diastolic displays.
2. Press the review button four (4) times to advance to the Date Set Screen. The year, month and day will appear in the systolic, diastolic and heart rate displays respectively.
3. Use the SELECT ALARM button to select the date item to be changed. When selected, the date item will flash.
4. Use the SET buttons (arrow up or arrow down) to change the selected date item.
5. After making all the desired date changes, press the REVIEW button to save the changes and advance to the Time Set Screen.
6. When in the Time Set Screen the hour (in 24 hour format) and minutes will appear in the systolic and diastolic displays respectively. Use the SELECT ALARM and SET buttons to set the time (in the same manner as described above).
7. When the time is set as desired, press the REVIEW button to save the time and advance to the next screen.
8. Press the POWER button to turn the Monitor off.

Choosing Operating Modes

For all Welch Allyn Vital Signs Monitors which are configured with blood pressure and pulse oximetry capability, the operator may choose to make either parameter non-functional. Having both blood pressure and pulse oximetry operational is the default operating mode. To make either mode non-functional, the user must enter the Monitor's configuration mode. This may be accomplished by following these instructions:

- Turn the Monitor off.
- Press both the POWER button and the START button simultaneously. The Monitor will enter it's internal configuration mode.
- Press the REVIEW button 9 times. "ON" will appear in both the Systolic and SpO₂ displays.
- Press the SET (arrow up and arrow down) buttons to cycle through the three options available:

Systolic Display	SpO2 Display	Monitor Functionality
On	On	Both blood pressure and pulse oximetry modes are operational. This is the factory-default mode.
OFF	On	Blood pressure mode is disabled. Pulse oximetry mode is operational.
On	OFF	Blood pressure mode is operational. Pulse oximetry mode is disabled.

- When the desired functionality is displayed, press the REVIEW button once to save this selection.
- Turn the Monitor off.
- When the Monitor is turned on, the new functionality setting will be established as the default level. The Monitor will always revert to this setting on power up.

Blood Pressure Hose & Cuff Connections

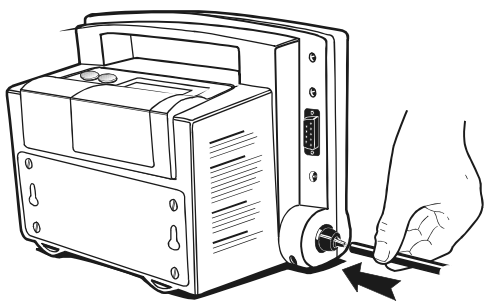
Identify and have available each of the following items:

- The Welch Allyn Vital Signs Monitor
- Blood pressure cuff
- Blood pressure hose

Using the illustrations below for reference, perform the following set-up procedures:

1. Inspect the blood pressure hose and note that one end has a connector fitting and the other end does not. Attach the end without the connector to the pressure hose connector on the monitor

by fitting the pressure hose on to the connector as shown. Be sure that the pressure hose is completely inserted over the connector and into the recess, and that the fit is snug.



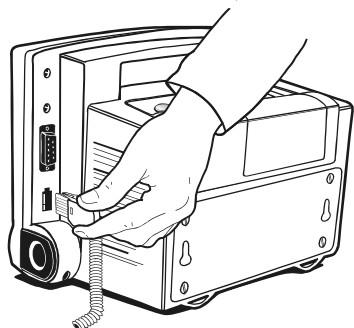
Attaching pressure hose to connector on monitor.

2. Join the other end of the blood pressure hose to the pneumatic tubing which is attached to the cuff. Twist the connectors together until finger-tight. DO NOT OVER TIGHTEN.

Temperature Probe Connection

The Welch Allyn Vital Signs Monitor is available with two probes; one for oral/axillary temperatures (blue), and one for rectal temperatures (red). The rectal probe is an accessory item and must be ordered separately.

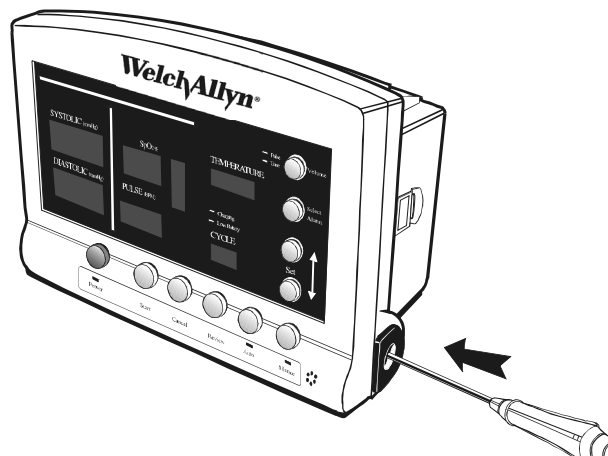
To install the temperature probe, press down on the tab on top of the connector and insert the connector into the temperature probe connector port on the side of the Monitor until the connector clicks into place. The temperature connector port on the Monitor is clearly labeled "TEMP." The probe connector can only be inserted one way, with the tab on top. The temperature probe should be inserted into the probe holder on the side of the Monitor.



Inserting the probe connector into the Monitor port.

Should removal of the temperature probe be necessary, press down on the connector tab and slide the connector out.

Placing the probe into the probe holder.

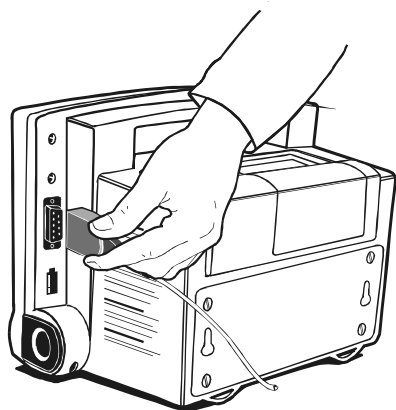


SpO₂ Sensor Connection

The Welch Allyn Vital Signs Monitor is available with a wide variety of SpO₂ sensors. The reusable finger clip sensor is shipped with the Monitor. All other sensors may be ordered separately as accessory items.

Attach the Nellcor SpO₂ sensor to the pulse oximetry extension cable. Then insert the connector end of the extension cable into the SpO₂ connector port on the side of the Monitor as shown. The SpO₂ connector port on the Monitor is clearly labeled "SpO₂". The extension cable can only be inserted one way; matching the shape and pin configuration of the connector to the port. Push the connector in until it is fully seated on the port.

NOTE: Only Nellcor SpO₂ sensors and accessories may be used with this configuration of the Welch Allyn Vital Signs Monitor.



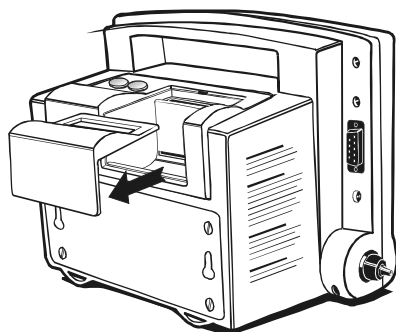
Inserting the sensor connector into the Monitor port.

Setting up the Printer

A fully integrated thermal printer is available as an option to the Welch Allyn Vital Signs Monitor.

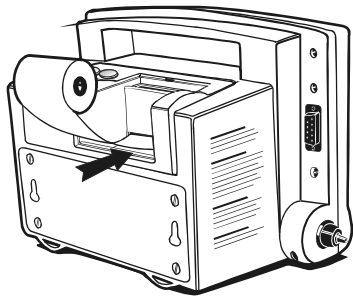
To load paper into the printer follow these steps:

1. Grasp the printer cover as shown, and slide the cover off of the Monitor by sliding the cover towards you.



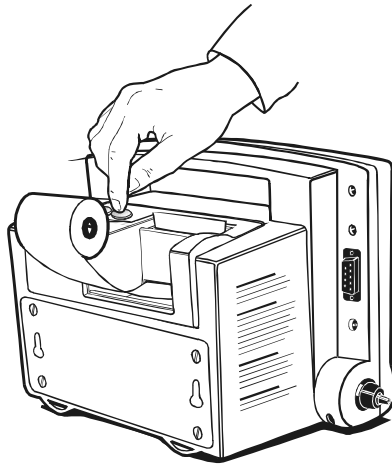
Sliding off the printer cover

2. Holding a new roll of paper as shown, feed approximately 1 inch of paper into the slot at the bottom of the paper holder. Release the paper roll so that it sits in the bottom of the paper holder.



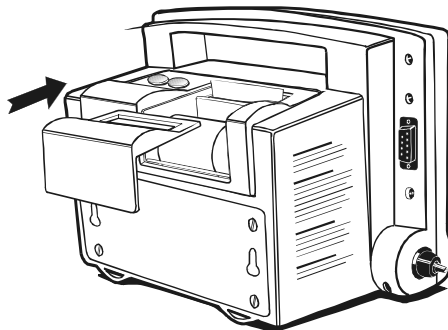
Feeding the paper into the slot.

3. Press the paper "FEED" button to advance the paper 3 to 4 inches above the top paper slot.



Advancing the paper.

4. Thread the paper through the paper slot on the printer cover. Slide the cover on to the Monitor and press down until it clicks into place as shown. The excess paper may be torn off if desired.



Replacing the printer cover.

NOTE: The operator will notice a red stripe along the edge of the printer paper when the paper roll is almost at the end. Replace the printer paper with a new roll when the red stripe is observed.

Setting the Programmable Alarms

The Welch Allyn Vital Signs Monitor has the ability to generate a visual and audible alarm when certain patient conditions are detected by the monitor. The following chart outlines the conditions, ranges, programming intervals and default values for the alarm function.

Warning: It is the operator's responsibility to set alarm limits as appropriate for each individual patient.

Programmable Alarm	Alarm Ranges	Programmable Intervals	Factory Default Values*
BP - High Systolic	245 - 65 mmHg	5 mmHg	200 mmHg
BP - Low Systolic	245 - 65 mmHg	5 mmHg	70 mmHg
BP - High Diastolic	35 - 155 mmHg	5 mmHg	155 mmHg
BP - Low Diastolic	35 - 155 mmHg	5 mmHg	50 mmHg
Pulse Rate - High	45 - 195 bpm	5 bpm	140 bpm
Pulse Rate - Low	45 - 195 bpm	5 bpm	45 bpm
SpO ₂ - Low	98 - 70%O ₂	1%O ₂	85%O ₂

NOTE: Temperature default alarms are 108°F, 42.2°C (high) and 84.0°F, 28.9°C (low). The temperature alarms are not programmable, they indicate that the patient's temperature has exceeded the functional range of the thermometer.

*The unit will default to these factory settings only until the operator selects a different alarm limit. When a new alarm limit is selected, the Monitor will retain this new limit setting in memory, even if the Monitor is turned off.

Alarm limits may be reviewed or changed by using the SELECT ALARM and SET (arrow up and arrow down) buttons, and viewing the CYCLE display and the display of the parameters being changed.

Blood Pressure - High Systolic Limit

Press the SELECT ALARM button until the SYSTOLIC display is illuminated, and the CYCLE display shows "HI." This indicates the high systolic alarm setting.

The systolic display will show the current alarm limit for high systolic blood pressure in mmHg or three dashes ("—") if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 mmHg intervals. The operator may choose the high systolic blood pressure limit within the range of 245mmHg through the current low systolic alarm limit. The alarm may be turned off by choosing "—."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Blood Pressure - Low Systolic Limit

Press the SELECT ALARM button until the SYSTOLIC display is illuminated, and the CYCLE display shows "LO." This indicates the low systolic alarm setting.

The systolic display will show the current alarm limit for low systolic blood pressure in mmHg or three dashes ("- - -") if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 mmHg intervals. The operator may choose the low systolic blood pressure limit within the range of the current high systolic alarm limit through 65 mmHg. The alarm may be turned off by choosing "- - -."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Blood Pressure - High Diastolic Limit

Press the SELECT ALARM button until the DIASTOLIC display is illuminated, and the CYCLE display shows "HI." This indicates the high diastolic alarm setting.

The diastolic display will show the current alarm limit for high diastolic blood pressure in mmHg or three dashes ("- - -") if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 mmHg intervals. The operator may choose the high diastolic blood pressure limit within the range of the current low diastolic alarm limit through 155 mmHg. The alarm may be turned off by choosing "- - -."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Blood Pressure - Low Diastolic Limit

Press the SELECT ALARM button until the DIASTOLIC display is illuminated, and the CYCLE display shows "LO." This indicates the low diastolic alarm setting.

The diastolic display will show the current alarm limit for low diastolic blood pressure in mmHg or three dashes ("- - -") if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 mmHg intervals. The operator may choose the low diastolic blood pressure limit within the range of 35mmHg through the current high diastolic alarm limit. The alarm may be turned off by choosing "- - -."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Pulse Rate - High Limit

Press the SELECT ALARM button until the PULSE display is illuminated, and the CYCLE display shows "HI." This indicates the high pulse rate alarm setting.

The pulse display will show the current alarm limit for low pulse rate in bpm, or "- - -" if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 bpm intervals. The operator may choose the high pulse rate limit within the range of the current low pulse rate limit through 195bpm. The alarm may be turned off by choosing "- - -."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Pulse Rate - Low Limit

Press the SELECT ALARM button until the PULSE display is illuminated, and the CYCLE display shows "LO." This indicates the low pulse rate alarm setting.

The pulse display will show the current alarm limit for low pulse rate in bpm, or "- - -" if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 5 bpm intervals. The operator may choose the low pulse rate limit within the range of 45bpm through the current high pulse rate alarm limit. The alarm may be turned off by choosing "- - -."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

SpO₂ - Low Limit

Press the SELECT ALARM button until the SpO₂ display is illuminated, and the CYCLE display shows "LO." This indicates the low SpO₂ alarm setting.

The SpO₂ display will show the current alarm limit for the SpO₂% or "--" if the alarm is turned off. Pressing the SET (arrow up and arrow down) buttons will cycle through the options in 1% intervals. The operator may choose the low SpO₂% limit within the range of 98-70%, or the alarm may be turned off by choosing "--."

When the desired alarm limit is displayed, pressing SELECT ALARM again saves the displayed alarm limit and changes the alarm parameter. Alternatively, pressing no buttons for approximately 10 seconds will cause the displayed value to be set as the alarm limit, and the Monitor will automatically revert to the current operating mode.

Temperature Measurement Range Indicators

Temperatures which are outside of the measurement range of the Monitor will cause the following to be displayed. Note the symbol shown in the tenths position of the display.

CONDITION	TEMPERATURE	DISPLAY
Temperature is outside of high measurement range of the Monitor.	Fahrenheit	108 ▯
	Celsius	42 ▯
Temperature is outside of low measurement range of the Monitor.	Fahrenheit	84 ▮
	Celsius	28 ▮

IMPORTANT: No audible tone will indicate that the temperature is outside of the measurement range of the Monitor. This is a visual indicator only.

Alarm Indications and Interpretation

Patient alarms will be activated when the patient's systolic pressure, diastolic pressure, pulse rate or SpO₂% exceed the alarm limits programmed by the operator. Patient alarm conditions are visually indicated by flashing LED displays for the parameter in question, accompanied by a repetitive audible alarm tone.

The Welch Allyn Vital Signs Monitor handles patient alarms in the following manner:

NOTE: Pulse rate measurements from the SpO₂ determination override pulse rate measurements from the blood pressure determination.

During Blood Pressure Measurement

Should a blood pressure or pulse rate patient alarm condition occur, no additional measurements may be initiated until the alarm is reset. Check the patient condition first, and then reset the patient alarm by pressing the SILENCE button. Measurements may now be resumed.

During SpO₂ Measurement

Should a patient alarm condition for SpO₂ or pulse rate occur, the Monitor will indicate an alarm condition (flashing & beeping) while continuing to monitor and display the patient's current SpO₂%. The alarm will automatically reset when the patient's condition returns to within the preset alarm parameters.

During SpO₂ Measurement

Should a patient alarm condition for SpO₂ or pulse rate occur, the operator may invoke "Silence Mode" by pressing the SILENCE button. This will silence the audible tone (display will continue to

flash), while the practitioner attends to the patient and Monitor. Silence mode resets automatically after 30 seconds, or when the patient's condition returns to within the preset alarm parameters.

NOTE: Certain alarms alert the operator to abnormal system conditions or internal system failures. Alarm conditions, error codes and suggested operator action are reviewed in the Troubleshooting section of this manual.

Measuring Blood Pressure

Setting the DEFAULT Inflation Pressure Preset Level

The default cuff inflation level for blood pressure measurements is set in the Monitor's internal configuration menu. The factory default level is 160 mmHg. If desired, the default pressure preset can be changed by following these instructions:

- Turn the monitor off.
- Press both the POWER button and the START button simultaneously. The Monitor will enter it's internal configuration mode.
- Press the REVIEW button 6 times. "PrP" will appear in the systolic display, and the default pressure preset level will appear in the diastolic display.
- Press the SET (arrow up and arrow down) buttons to cycle through the seven options available: 120, 140, 160, 180, 200, 240 and 280 mmHg.
- When the desired pressure preset level is illuminated, press the REVIEW button once to save this change.
- Turn the Monitor off.
- When the Monitor is turned on, the new pressure preset will be established as the default level. The Monitor will always revert to this pressure preset level, except in the circumstances noted below.

NOTE: In Manual Blood Pressure Operating Mode, the Monitor will inflate to the default pressure preset level. However, if a BP measurement is initiated within one minute of a prior BP measurement, the Monitor will inflate to a level which is 40 mmHg above the previous systolic reading.

In Automatic Blood Pressure Operating Mode, the Monitor will inflate to default pressure preset level for the initial BP determination only. After the initial measurement, the Monitor will inflate to a level which is 40 mmHg above the previous systolic reading.

CAUTION: When measuring blood pressure on children younger than age 3 it is recommended that the Pressure Preset (initial inflation pressure) be set at 160 mmHg or lower.

Blood Pressure Cuff Selection Criteria

NOTE: A large Adult size cuff is included with your Vital Signs Monitor. A full range of cuff sizes are available (as accessory items) however, the Large Adult cuff will fit the majority of adults and give the most accurate blood pressure measurement.

Research has shown that an undersized cuff will overestimate the true blood pressure by as much as 10 to 30 mmHg. Please refer to the reference markings located inside the cuff for correct cuff sizing. When there is an area of overlap whereby you could use a smaller or larger cuff, it is strongly recommended that you use the larger size cuff.

You may find that the bottom of the cuff extends to the antecubital fossa (bend in the elbow) on many people, but because the Monitor uses oscillometric technology, not auscultation, this will NOT result in an inaccurate blood pressure.

Careful sizing of the cuff is important to the accuracy of blood pressure readings. If the cuff is too small, the readings could be falsely high.

There are two simple methods for determining the correct cuff size for the patient. Use either method (A) or (B) below.

A. Determining Cuff Size with the Cuff Markings

One way to ensure proper cuff size is to wrap the cuff around the patient's upper arm and visually check it. The cuff is marked with a distinct white edge and two divisions that indicate "range." When the cuff is properly fit, the edge will meet the cuff at some point within the range.

B. Chart for Determining Cuff Size

You can also determine cuff size by measuring the patient's arm circumference midway between the elbow and shoulder, and then use the chart below to select the correct cuff.

Durable One-Piece Cuff (Single Unit)	Disposable One-Piece Cuffs (5 pack)	Cuff Size	Minimum (cm)	Maximum (cm)	Minimum (inches)	Maximum (inches)
5082-203-3	5082-93-3	Small Child	12.4	16.8	4.9	6.6
5082-204-3	5082-94-3	Child	15.8	21.3	6.2	8.4
5082-205-3	5082-95-3	Small Adult	20.0	27.0	7.9	10.6
5082-206-3	5082-96-3	Adult	25.3	34.3	10.0	13.5
5082-207-3	5082-97-3	Large Adult	32.1	43.4	12.6	17.1
5082-208-3	5082-98-3	Thigh	40.7	55.0	16.0	21.7

The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients. To ensure pediatric blood pressure accuracy and safety, note that the Welch Allyn Small Child cuffs are the SMALLEST CUFFS approved for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.

CAUTION: When measuring blood pressure on children younger than age 3 it is recommended that the Pressure Preset (initial inflation pressure) be set at 160 mmHg or lower.

Positioning the Blood Pressure Cuff

The preferred blood pressure measurement site for adults and children is the upper arm. The arm must be relaxed and motion-free during measurement(s).

WARNING: Do not place the cuff on any extremity being used for intravenous infusions, or any area where circulation is or may be compromised.

WARNING: Do not place the cuff on any extremity being used for SpO₂ monitoring. Cuff inflation during an SpO₂ measurement will cause inaccurate SpO₂ results.

Wrap the cuff snugly with room between the cuff and the arm for not more than one or two fingers. Excessive tightness may cause venous congestion and discoloration of the limb. If the cuff is wrapped too loosely, it cannot be inflated properly and the measured values may be in error.

It is best to place the cuff on a bare arm. Clothing may interfere with measurement accuracy.

When wrapping the cuff, observe the mark on the cuff which must be placed over the brachial artery. Ensure that the hose is not twisted, kinked or compressed, as this may cause measurement errors.

Manual Mode Blood Pressure

Blood pressure measurement may be initiated on demand by the operator. This is the manual mode of operation.

To operate the blood pressure monitor in manual mode, follow this procedure:

1. Ensure that the blood pressure cuff is properly sized and wrapped around the patient's upper arm (or alternate site, as necessary).
2. With the Monitor powered up, press the START button. The Monitor will inflate the cuff to the default pressure preset level.

NOTE: If a BP measurement is initiated within one minute of a prior BP measurement, the Monitor will inflate to a level which is 40 mmHg above the previous systolic reading.

3. The systolic display will show the pressure in the cuff as the blood pressure determination is being made.
4. When the measurement cycle is complete an audible tone will sound and the systolic, diastolic and pulse rate* display will show the values of the reading.
5. The reading will be displayed for two minutes, and then this display will be blanked. The reading may be recalled at any time prior to the next BP determination by pressing the REVIEW button.
6. Pressing CANCEL at any time during a blood pressure determination will cause the determination to be aborted, and the cuff to rapidly deflate.

*Pulse rate, as determined from the blood pressure measurement method, will be displayed with the BP reading only if SpO₂ option is absent or disabled. If the SpO₂ function is operational, all pulse rate determinations will come as a result of the SpO₂ measurement method.

Automatic Mode Blood Pressure

Blood pressure measurements may be automatically initiated at operator programmed time intervals.

To operate the blood pressure monitor in automatic ("Auto") mode, follow this procedure:

1. Ensure that the blood pressure cuff is properly sized and wrapped around the patient's upper arm (or alternate site, as necessary).

2. Press the AUTO button and note two dashes "--" in the CYCLE display. This is the default setting for AUTO mode and indicates that no time interval cycles have been selected.
3. Select one of the ten pre-programmed cycle interval times by pressing the AUTO button until the desired interval time (in minutes) is displayed. The operator may choose from the following time interval selections: 1, 3, 4, 5, 10, 15, 30, 45, 60 or 90 minutes. Note: These intervals represent the time from the beginning of one cycle to the beginning of the next cycle. Note: In 1-minute automatic cycle mode, the Monitor will automatically take BP measurements in 1 minute intervals for up to 15 minutes.

The operator may also choose "St", STAT mode. In STAT mode the Monitor takes blood pressure readings repeatedly for up to 15 minutes. A new measurement cycle will be initiated when the cuff pressure from the previous cycle drops below 10mmHg.

4. When the desired interval is displayed, the operator may select the interval by pressing any other button or by refraining from pushing the AUTO button for 10 seconds. When the interval is stored, the AUTO indicator light will glow green.
5. The unit will take its first automatic blood pressure determination 10 seconds after the time interval is selected. Subsequent readings will be taken according to the time interval selected.
6. For the first automatic blood pressure determination, the Monitor will inflate the cuff to the default pressure preset level. For all subsequent blood pressure determinations, the Monitor will inflate the cuff to a pressure 40 mmHg above the prior systolic reading.
7. The systolic display will show the pressure in the cuff as the blood pressure determination is being made.

Exception: In STAT mode, the systolic and diastolic displays will show the most current completed BP measurement.

8. When the measurement cycle is complete an audible tone will sound and the systolic, diastolic and pulse rate* displays will show the values of the reading.
9. The measurement will be displayed until the next measurement cycle is initiated.
10. Pressing CANCEL at any time during a blood pressure determination will cause the determination to be aborted, and the cuff to deflate. In STAT mode, pressing CANCEL will also terminate the STAT mode of operation.
11. To end an AUTO blood pressure session, press the AUTO button until two dashes "--" appear in the CYCLE display. Auto mode will then be terminated. STAT mode may be terminated in this manner, or by pressing the CANCEL button.

*Pulse rate, as determined from the blood pressure measurement method, will be displayed with the BP reading only if the SpO₂ option is absent or disabled. If the SpO₂ function is operational all pulse determinations will come as a result of the SpO₂ measurement method.

Reviewing Information From Prior Cycles

The Welch Allyn Vital Signs Monitor will hold in memory the previous 99 sets of vital signs data which include blood pressure, pulse rate and/or temperature and/or SpO₂. The information is held in memory until the Monitor is turned off. When memory capacity (99 sets of data) has been reached,

the MEMORY indicator will blink. After capacity is reached, the oldest stored reading will be deleted to make room for the newest data set.

The following criteria are applied for saving data:

Blood Pressure Data: is saved for both MANUAL and AUTOMATIC cycles.

Predictive Temperature Data: is always saved.

Monitor Mode Temperature Data: is saved only if concurrent with a blood pressure cycle.

SpO₂ Data: is saved if concurrent with a blood pressure cycle, or a predictive temperature measurement. Is saved if the START button is pressed while the BP mode is inactive. Is also saved (one data set per minute) if a patient alarm condition occurs.

Pulse Rate Data: is saved with every blood pressure and SpO₂ data set.

To review data from prior vital signs measurements, press the REVIEW button. The most recently obtained data will appear in the appropriate displays, and the CYCLE display will show the total number of data sets currently in memory. Also, the MEMORY indicator will be illuminated, indicating that stored data is being displayed.

Each subsequent press of the REVIEW button will display the next most recent data set. After the earliest data set has been displayed (CYCLE display = 1) the next press of the REVIEW button will return the display to the most recent set of measurements. At any time during REVIEW the operator may return to normal operating mode by pressing any other button or by refraining from pressing the REVIEW button for 10 seconds.

“Erase data” function

The CANCEL button may be used to erase all stored blood pressure, pulse rate, oxygen saturation and temperature data, without turning the Monitor off.

To erase all stored data in the Welch Allyn Vital Signs Monitor, press and hold the CANCEL button for three (3) seconds until a confirmatory beep is heard. This beep indicates that all data stored in the Monitor has been erased.

Data is also erased each time the Welch Allyn Vital Signs Monitor is turned off.

Measuring Temperature

Selecting the Temperature Scale

The temperature module option of the Welch Allyn Vital Signs Monitor is capable of displaying temperature in either degrees Fahrenheit (°F) or degrees Celsius (°C).

To determine the current temperature scale, remove the temperature probe from its holder and view the TEMPERATURE display. A small green display will illuminate showing either "°F" or "°C."

To change the temperature scale, the user must enter the Monitor's internal configuration mode:

1. While the Monitor is turned off, press both the POWER and START buttons simultaneously. Hold the START button down until all of the LED display segments are illuminated.
2. The operator can now cycle through the Monitor's internal configuration menu by pressing the REVIEW button. Pressing the REVIEW button three times will cycle to the temperature options and three dashes (—) will appear in the TEMPERATURE display.
3. The first option illuminated on the TEMPERATURE display is "°F." Pressing the ADJUST button twice will illuminate "°C." When the desired temperature scale is selected, press the REVIEW button again and then turn the Monitor off. By following this procedure, the selected temperature scale will be saved into memory.

Selecting Temperature Operation Mode

When configured with the temperature option the Welch Allyn Vital Signs Monitor has the capability of taking a temperature in either Normal or Monitor mode.

In the Normal mode the thermometer's microprocessor "predicts" body temperature in about 4 seconds for oral temperatures, about 10 seconds for axillary temperatures and in about 15 seconds for rectal temperatures.

Monitor mode is normally used for longer term monitoring and when difficult situations prevent accurate temperature from being taken in the Normal mode. In Monitor mode, the probe must be in contact with tissue for at least 3 minutes for accurate oral/rectal temperature measurement and five (5) minutes for accurate axillary temperature measurement.

NOTE: Normal mode axillary temperatures are only accurate on children under the age of four.

NOTE: The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients.

The default setting for the Monitor is Normal mode.

To change the operating mode for temperature determinations, the user must enter the Monitor's internal configuration mode:

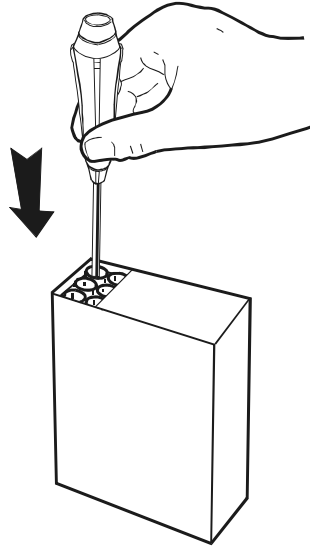
1. While the Monitor is turned off, press both the POWER and START buttons simultaneously. Hold the START button down until all of the LED display segments are illuminated.
2. The operator can now cycle through the Monitor's internal configuration menu by pressing the REVIEW button. Pressing the REVIEW button three times will cycle to the temperature options, and three dashes (—) will appear in the TEMPERATURE display.
3. Press the ADJUST button once to choose Monitor mode (°F), or three times to choose Monitor mode (°C). When the desired selections are made, press the REVIEW button again and then turn the Monitor off. These choices will be saved into memory.

NOTE: If the temperature is in Normal mode, the user may easily switch to Monitor mode without entering the Monitor's internal configuration mode. To do this, remove the probe from the probe holder, attach a new probe cover, and wait one minute (do not place probe in patients mouth, underarm or rectum at this time). After one minute the Monitor will automatically switch to temperature Monitor mode, and the green "Monitor Mode" display will be illuminated on the temperature display. The operator may now proceed to take the patient's temperature. After the probe is replaced in the holder, the Monitor will revert back to Normal temperature mode.

Taking An Oral Temperature

To take an oral temperature (in either Normal or Monitor mode) follow this procedure:

1. Ensure that the oral probe is connected to the unit. The oral probe has a BLUE tip. Accurate oral temperatures can only be obtained by using the blue temperature probe.
2. Remove the probe from the probe holder. A short self-test mode will be initiated where every LED segment on the TEMPERATURE display is illuminated briefly. Following this self-test the display will show "OrL". "OrL" = Oral Probe indicating that the oral probe is in use. The Monitor's display must show "OrL" prior to the initiation of a temperature measurement.
3. Load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, being careful not to hold or press the ejection button.

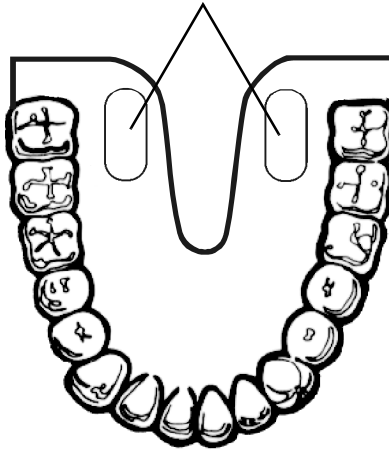


Loading the probe cover.

4. Insert the probe tip gently into the patient's slightly opened mouth. Carefully slide the probe under the tongue on either side of the mouth to reach the sublingual pocket (see illustration

below). Accurate temperatures can only be obtained in this location. Temperatures in other mouth locations can vary by as much as 2°F or 1°C.

Location of the sublingual pockets.



5. The probe should be held by the clinician during the entire temperature measurement process to ensure the probe tip maintains tissue contact.
6. During the temperature measurement cycle the TEMPERATURE display will show a series of LED segments in a box - shaped formation. This indicates that the temperature measurement is in process.
7. When the final temperature has been reached a tone will sound and the temperature will be displayed on the Monitor.
8. After the temperature measurement is complete, remove the probe from the patient's mouth and eject the probe cover by firmly pressing the ejection button on the probe. Properly dispose of the used probe cover.
9. Insert the probe into the probe holder before attempting to take another temperature measurement.
10. The current temperature is displayed for one minute after the probe is replaced in the holder, after which time the display will go blank. The most recent temperature can be recalled by pressing the REVIEW button once.

NOTE: If a probe position error occurs during the temperature determination, the temperature display will alternate between the final predicted temperature and the letter "P" in the display.

Taking an Axillary Temperature

NOTE: Normal mode axillary temperatures are accurate only for children under the age of four. In Normal mode the Monitor cannot take accurate axillary temperatures for older children or adults. If an axillary reading is desired for a patient age four and older, the oral probe must be used in Monitor mode.

The Welch Allyn Vital Signs Monitor is not intended to be used on Neonatal patients.

To take a axillary temperature (in either Normal or Monitor mode) follow this procedure:

Vital Signs Monitor

1. Ensure that the oral probe is connected to the Monitor. The oral probe has a BLUE tip. Accurate axillary temperatures can only be obtained by using the blue-tipped temperature probe.
2. Remove the probe from the probe holder. A short self-test mode will be initiated where every LED segment on the TEMPERATURE display is illuminated briefly. Following this self-test, the display will show "OrL". OrL=Oral Probe indicating that the oral probe is in use.
3. Press the SET-Arrow Up button once. The display will now show "ALY" indicating that the Monitor is ready to take an axillary temperature reading. Note that subsequent presses of the SET-Arrow Up button allows the Monitor to toggle between the oral and axillary modes of operation. The Monitor's display must show "ALY" prior to the initiation of a temperature measurement.
4. With the TEMPERATURE display showing "ALY", load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, being careful not to hold or press the ejection button.
5. Lift the patient's arm so that the entire axilla is easily visualized. Place the probe as high as possible in the axilla. Do not allow the probe tip to come into contact with the patient until it is deliberately placed in the measurement site. Any tissue contact before this time will activate the probe position error message and may cause inaccurate temperature readings.
6. Be sure that the probe tip will be completely surrounded by axillary tissue. Clothing or other material touching the probe tip may cause inaccurate readings.
7. Place the arm snugly at the patient's side. Hold the arm in this position without movement of the arm or probe during the measurement cycle. Movement of the arm may cause inaccurate readings.
8. In Normal Mode the Monitor will produce an audible tone and display the temperature reading when a final temperature has been reached. This generally takes about 10 seconds. In Monitor Mode the operator must allow the temperature readout to stabilize for 5 minutes to accurately display a final temperature reading.
9. After the temperature measurement is complete, remove the probe from the patient's axilla and eject the probe cover by firmly pressing the ejection button on the probe. Properly dispose of the used probe cover.
10. Insert the probe into the probe holder before attempting to take another temperature measurement.

When in Normal mode, the current temperature is displayed for one minute after the probe is replaced in the holder, after which time the display will go blank. The most recent temperature can be recalled by pressing the REVIEW button once.

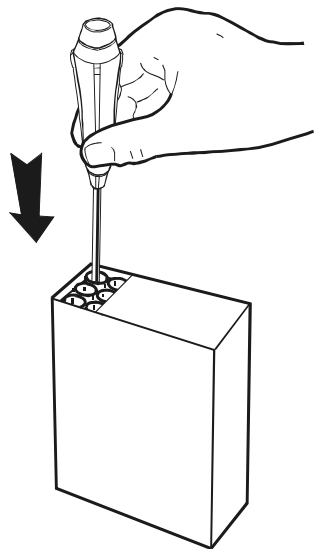
NOTE: If a probe position error occurs during the temperature determination, the temperature display will alternate between the final predicted temperature and the letter "P" in the display.

Taking a Rectal Temperature

To take a rectal temperature (in either Normal or Monitor mode) follow this procedure:

1. Ensure that the rectal probe is connected to the unit. The rectal probe has a RED tip. Accurate rectal temperatures can only be obtained by using the red temperature probe.

2. Remove the probe from the probe holder. A short self-test mode will be initiated where every LED segment on the TEMPERATURE display is illuminated briefly. Following this self-test the display will show "rEC". "rEC" = Rectal Probe indicating that the rectal probe is in use. The Monitor's display must show "rEC" prior to the initiation of a temperature measurement.
3. Load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, being careful not to press the ejection button.



Loading the probe cover.

4. Separate the buttocks with one hand. Apply a thin coat of water-based lubricant when necessary. Using the other hand, gently insert the probe ONLY 1cm (3/8 inch ONLY) inside the rectal sphincter. Extreme caution should be used to avoid risk of bowel perforation in children.
5. Tilt the probe to ensure good tissue contact and continue to keep the buttocks separated while the measurement is in process.
6. During the temperature measurement cycle, the TEMPERATURE display will show a series of LED segments in a box-shaped formation. This indicates that the temperature measurement is in process.
7. When the final temperature has been reached, a tone will sound and the temperature will be displayed on the Monitor.
8. After the temperature measurement is complete, remove the probe from the patient's rectum and eject the probe cover by firmly pressing the ejection button on the probe. Properly dispose of the used probe cover.
9. Insert the probe into the probe holder before attempting to take another temperature measurement.
10. The current temperature is displayed for one minute after the probe is replaced in the holder, after which time the display will go blank. The most recent temperature can be recalled by pressing the REVIEW button once.

NOTE: If a probe position error occurs during the temperature determination, the temperature display will alternate between the final predicted temperature and the letter "P" in the display.

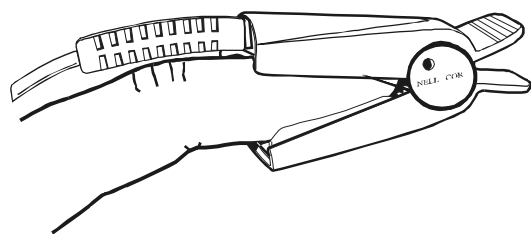
Measuring SpO₂

SpO₂ Operation Mode

The Welch Allyn Vital Signs Monitor incorporates the Nellcor Puritan Bennett™ pulse oximetry module. The pulse oximeter determines arterial oxyhemoglobin saturation (SpO₂%) by measuring the absorption of red and infrared light passed through the tissues. Changes in absorption caused by pulsation of blood in the vascular bed are used to determine arterial saturation and pulse rate.

Oxygen saturation percent is calculated with each pulse detected, and thus the Monitor display is continually updated. The pulse signal bar graph is an indicator of the strength and quality of the detected pulses.

SpO₂ is generally measured via pulses detected using a finger clip sensor. There are several sizes of fingerclip sensors, and they come in both reusable and disposable styles. Sensors come in sizes for adults and children. There are also sensors available that use the toes, forehead, ear or nose as the measurement sites. To obtain optimal performance, use an appropriate sensor and apply it as described in the sensor's directions for use.



The Nellcor Finger Clip Sensor

WARNING: Only Nellcor brand SpO₂ sensors and accessories should be used with Welch Allyn Vital Signs Monitors configured with the Nellcor pulse oximetry option.

Taking an SpO₂ Measurement

Prior to taking an SpO₂ measurement, ensure that the SpO₂ mode of the Welch Allyn Vital Signs Monitor is functional. See “Choosing Operating Modes” on page 18. The operator should follow this procedure for taking an SpO₂ measurement:

1. Properly attach the appropriate sensor to the patient. Verify the cable to the sensor is attached properly to the SpO₂ connector.

WARNING: Do not place the fingerclip sensor on an arm that is also being used for blood pressure monitoring. Blood pressure cuff inflation during SpO₂ measurement will cause inaccurate SpO₂ results and false alarms.

NOTE: Avoid excessive ambient light, which can affect sensor performance, by keeping the fingerclip sensor and sensor site covered with an opaque material.

2. The pulse signal bar graph will illuminate, indicating the relative strength and quality of the patient's pulses at the sensor site. The sensor takes approximately 10 seconds to determine the

initial SpO₂% value and pulse rate. When the initial values are determined they will be shown in the SpO₂ display and the Pulse Rate display respectively.

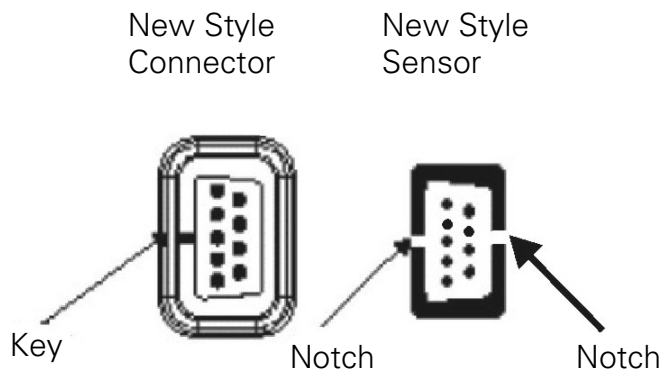
NOTE: If you fail to see any SpO₂ or pulse signal bargraph readings, check that you have properly inserted the sensor into the Welch Allyn Vital Signs Monitor.

3. The SpO₂% and pulse rate are updated approximately every second.
4. Removing the SpO₂ sensor from the patient ends the monitoring period and immediately blanks the pulse signal bar graph. The SpO₂ display will flash 2 dashes "- -" and a repetitive audible alarm will sound. To reset the sensor removal alarm, press the SILENCE button on the Monitor's display.

NOTE: If the programmable alarms for low SpO₂%, high pulse rate and low pulse rate are turned off, no sensor removal alarm will occur when the SpO₂ sensor is removed from the patient.

NOTE: Prolonged use of the pulse oximetry probe may require you to change the location of the probe. Move it to another finger every few hours. Monitor skin condition and circulation in the finger. Refer to the directions for use provided with each sensor for specific instructions on application and use.

NOTE: Older style Nellcor sensors and extension cables are not compatible with the connector on the Nellcor option with motion tolerance and must not be plugged into it. However, new style Nellcor sensors and extension cables can be used with all Nellcor options and can be plugged into either the old or new style connectors. The new style sensor and connectors are illustrated below.



Many factors may degrade the performance of the pulse oximeter, as indicated by a lowered rise of the Plethysmograph display. These include:

- Excessive ambient light, particularly fluorescent light
- Excessive patient movement
- Excessive duration on one finger
- Cold hands/digits or hypothermia
- Electrosurgical interference
- Arterial catheters, blood pressure and fusion lines
- Moisture in the sensor
- Improperly attached sensor
- Incorrect sensor for the patient

- Poor patient perfusion
- Venous pulsations
- Anemia or low hemoglobin concentrations
- Cardiovascular dyes, such as methylene blue
- Fingernail polish
- Strongly pigmented skin
- Arterial occlusion proximal to the sensor
- Hypotension
- Severe vasoconstriction
- Cardiac arrest or shock

Using the SpO₂ Pulse Tone

All Welch Allyn Vital Signs Monitors with pulse oximetry capability are equipped with a pulse tone. This audible tone beeps in synchronization with each beat of the patient's heart. In addition, the frequency of the tone will vary based on the patient's oxygen saturation value. The higher the tone's frequency, the higher the patient's oxygen saturation value.

The volume of the pulse tone may be adjusted to any of 5 volume settings, as well as a "volume off" setting. To change the volume of the SpO₂ pulse tone, follow these procedures:

When the SpO₂ sensor is attached to a patient, press the VOLUME button. With each subsequent press of the button the volume of the pulse tone will increase, until the "Off" setting is reached. Subsequent presses of the VOLUME button will again cycle through the five volume settings. When the desired volume setting is reached, refrain from pressing the button for three seconds and the setting will be saved. In all settings except "volume off" the pulse tone indicator light will be illuminated. There is no visual indicator of the volume level.

When the SpO₂ sensor is NOT attached to a patient, press the VOLUME button. With each press of the button a sample pulse tone will sound, and the SpO₂ Pulse Signal Bar Graph will provide a visual indicator of the volume setting. Subsequent presses of the VOLUME button will cycle the unit through each of the five volume settings until the "Off" setting is reached. Alternatively, the user can press the SET (arrow up and arrow down) buttons to cycle through the volume choices. When the desired volume setting is reached, refrain from pressing the button for three seconds and the setting will be saved. In all settings except "volume off" the pulse tone indicator light will be illuminated.

Printer Operation

The Welch Allyn Vital Signs Monitor may be configured with an optional integrated thermal printer.

The operator may control the printer using the two buttons (FEED, PRINT) located on the top rear face of the Monitor.

Pressing the FEED button advances the paper.

The PRINT button will generate the printout of all the stored blood pressure, temperature, pulse rate and SpO₂ data in the Monitor. The unit will store and print a maximum of 99 data sets.

The following criteria are applied for saving and printing measurement data:

Blood Pressure Data: is saved for both MANUAL and AUTOMATIC cycles.

Predictive Temperature Data: is always saved.

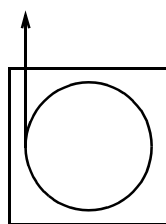
Monitor Mode Temperature Data: is saved only if concurrent with a blood pressure cycle.

SpO₂ Data: is saved only if concurrent with a blood pressure cycle, or a predictive temperature measurement. Is saved if the START button is pressed and the BP mode has been disabled. Is also saved (one data set per minute) if a patient alarm condition occurs.

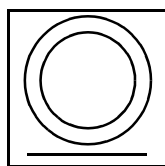
Pulse Rate Data: Is saved with every blood pressure and SpO₂ data set.

NOTE: If no data is stored in the Monitor, pressing the PRINT button will cause only the printout header to be printed.

NOTE: The printer uses thermal paper, which has a tendency to fade over time, especially when exposed to heat and light. For more permanent records, it is recommended that the printout be photocopied.



Feed



Print

Printing Options: batch print or streaming print mode

The operator may choose to print all stored data in either batch print mode (all stored data printed simultaneously) or streaming print mode (data printed automatically at the time it is stored). Batch print mode is the default setting for the Welch Allyn Vital Signs Monitor.

To change the print mode, press both the START button and the POWER button simultaneously. This activates the Monitor's internal configuration mode. After all of the current software versions are displayed on the Monitor, press the REVIEW button 8 times. The current print mode will appear in the systolic and diastolic displays as either "bAt Pr" (batch print mode) or "Str Pr" (streaming print mode). Press the SET (arrow up and arrow down) buttons to toggle between the two print mode choices. When the desired print mode is displayed, press the REVIEW button again, then turn the Monitor off. Turn the Monitor on by pressing the POWER button. The desired printing mode will now be operational.

If batch print mode is chosen, all data in the Monitor's memory will be printed whenever the PRINT button is pressed.

If streaming print mode is chosen, the printer must be activated after the Monitor is turned on. Press the PRINT button and “Pr Str On” will appear in the systolic, diastolic and pulse rate displays as the print header is printed. Patient information will now automatically print whenever data is stored into the memory of the Monitor. To turn the streaming print function off, press the PRINT button again. “Pr Str Off” will appear in the systolic, diastolic and pulse rate displays.

A batch printout may be initiated while in streaming print mode. First turn the streaming print function off by pressing the PRINT button. “Pr Str Off” will appear in the systolic, diastolic, and pulse rate displays. Next, press and hold the PRINT button for 3 seconds. A batch printout will be printed.

Using the RS232 Computer Interface

The Welch Allyn Vital Signs Monitor includes an external RS232 Computer Data Interface Connector. With this option the user has the ability to upload stored data from the Monitor to a computer, network, or Nurse Call system. Also, any user programmable options may be programmed via the computer.

For more detailed information on using the RS232 computer interface, contact Welch Allyn Customer Service.

“Nurse Call” Interface

All configurations of the Welch Allyn Vital Signs Monitor are capable of interfacing to a Nurse Call system via two pins on the RS232 communications port. This allows alarm conditions to be recognized at a central monitoring location, as well as at the Monitor itself. Both patient alarm conditions and system alarm conditions are communicated to the Nurse Call System. See “Alarm Indications and Interpretation” on page 25 of the Operator Manual for information on patient alarm conditions and interpretation.

WARNING: It is the user’s responsibility to implement the interface between the Nurse Call system and the Welch Allyn Vital Signs Monitor. It is also the user’s responsibility to adequately test the interface between the Monitor and the Nurse Call system to ensure that the desired functionality is operational.

WARNING: It is the operator’s responsibility to set the Monitor’s programmable alarm limits as appropriate for each individual patient. See “Setting the Programmable Alarms” on page 22 for complete information.

The interface between the Monitor and the Nurse Call system will always be active whenever an alarm condition occurs. Canceling or resetting an alarm on the Monitor itself will also cancel the alarm signal to the Nurse Call System. Note that while the alarm sound will “flash” on and off during an alarm condition, the Nurse Call output will be continuously ON until the alarm condition is removed. Reference “APPENDIX B: Nurse Call Interface Wiring Diagram” on page 63.

Mean Arterial Pressure (MAP)/Data Send Mode/Data Stream Mode

The operator has the ability to activate the SET (Arrow Up) button to perform additional functions. These functions are mutually exclusive, and include:

- The ability to display the Mean Arterial Pressure (MAP) when the SET- Arrow Up button is pressed.
- The ability to send patient data to the Monitor's serial port when the SET- Arrow Up button is pressed.
- The ability to stream patient data to the Monitor's serial port whenever patient data is stored into the Monitor's memory.

To activate the additional functionality of the SET- Arrow Up, press both the START button and the POWER button simultaneously. This activates the Monitor's internal configuration mode. After the current software versions are displayed on the Monitor, press the REVIEW button 7 times. The current functionality of the SET- Arrow Up button will appear in the systolic and diastolic displays. Use the SET- Arrow Up button to toggle through the four choices.

When the desired functionality is displayed, press the REVIEW button, then turn the Monitor off. To turn the Monitor on, press the POWER button. The desired functionality of the SET- Arrow Up button will now be operational.

"MAP" (MAP-Mean Arterial Pressure) indicates that pressing the SET- Arrow Up button will cause the Mean Arterial Pressure (in mmHg), to be displayed and printed while a valid blood pressure measurement is displayed. Mean Arterial Pressure data cannot be sent to the serial port. This is the default mode of the Welch Allyn Vital Signs Monitor.

"nO Op" (no operation) indicates that the SET- Arrow Up button has no additional functionality.

"SEn dAt" (Send data) indicates that pressing the SET- Arrow Up button sends patient data to the Monitor's serial port. In normal mode, the most recent data set is sent to the serial port when the SET- Arrow Up button is pressed. In REVIEW mode, the currently displayed data set is sent to the serial port when the SET- Arrow Up button is pressed.

"Str dAt" (Stream data) indicates that streaming data mode is functional. This mode allows patient data to be sent to the serial port automatically whenever such data is stored into the Monitor's memory. To initiate streaming data mode during normal operation, press the SET- Arrow Up button. "Str On" in the systolic and diastolic displays indicate that streaming data mode is operational. To turn streaming data mode off, press the SET- Arrow Up button again. "Str Off" in the systolic and diastolic displays indicates that streaming data mode is no longer operational.

Troubleshooting

Error Indications and Interpretation

The following table of alarm conditions and error codes is intended to provide the operator with a quick reference to the descriptions and probable causes of the error codes. For service level troubleshooting, refer to the service manual.

When responding to a Monitor alarm, always check the PATIENT FIRST and then proceed to check the Monitor.

Press CANCEL to reset patient alarm conditions.

ERROR CODE	MEASUREMENT MODE	DESCRIPTION	CORRECTIVE ACTION
C01	Blood Pressure	Measurement cycle was cancelled by operator	-----
C02	Blood Pressure	Autozero Failure	Check for air obstruction limit patient movement
C03	Blood Pressure	Inflation too rapid	Check for kinked hose or air obstruction
C04	Blood Pressure	Excessive inflation time	Check for air leaks
C05	Blood Pressure	Excessive noise	Check patient condition, cuff placement, limit patient movement
C06	Blood Pressure	Measurement was out- side of Monitor's measure- ment range	Check patient condition
E10	Blood Pressure	Cuff overpressure condi- tion	Check patient condition
C20	Temperature	Broken/missing probe	Replace probe
C21	Temperature	Probe not ready	Replace probe in holder, wait 15 seconds, retry
E0.0 thru E9.9	Temperature	Internal malfunction	Contact customer service
"P"	Temperature	Loss of tissue contact	Ensure proper probe posi- tioning
"--"	SpO ₂	Sensor Error	Check patient condition, sensor position and con- nection
E7	SpO ₂	Internal Malfunction	Contact customer service
C8	SpO ₂	Bad sensor	Replace sensor
E11	General	Internal safety violation	Adjust temperature or monitor location

ERROR CODE	MEASUREMENT MODE	DESCRIPTION	CORRECTIVE ACTION
E12	General	Ambient temperature out of range	Check patient, contact customer service
E13	General	Battery failure	Use wall transformer
E20 thru E50	General	Internal malfunction	Contact customer service

General Guide to Problems and Corrective Actions

Symptom	Possible Cause	Explanations and Corrective Action
1 Inaccurate Blood Pressure Readings Please Note: Differences of up to 10mmHg is considered normal and will occur for a number of reasons including inpatient BP variability, observer hearing differences, and auscultatory deflation rate.	Incorrect cuff size NOTE: Use Welch Allyn approved cuffs only.	Determine correct cuff size: <ul style="list-style-type: none"> Use reference markings on cuff Measure patient's arm circumference midway between elbow and shoulder (see "Chart for Determining Cuff Size" on page 27 of Operator's Manual to select correct cuff size).
	Patient's arm position	Ensure patient's arm is at heart level.
	Arm movement during blood pressure cycle	Keep arm still during blood pressure cycle: <ul style="list-style-type: none"> Movement may cause inaccuracies from artifact.
	Blood pressure taken over clothing	Blood pressure should be taken on a bare arm.
	Arrhythmia	Check for regularity of heart rate: <i>(palpate pulse or check monitor)</i> <ul style="list-style-type: none"> Moderate to severe heart rate irregularities may make blood pressure difficult to measure.
	Incorrect reference	Use the correct Korotkoff sound to determine diastolic blood pressure. <ul style="list-style-type: none"> Many listeners incorrectly equate diastolic blood pressure with the disappearance of sound only (phase 5). The Welch Allyn Vital Signs Monitor was developed using the American Heart Association recommendations, which state that phase 5 be used unless sound continues to 0 mmHg, in which case the change in the quality of sound (phase 4) is to be used. Deflate cuff no faster than 3 mmHg per second: <ul style="list-style-type: none"> One of the major sources of error in auscultatory blood pressure measurement is deflating the cuff too quickly. The American Heart Association recommends deflation no faster than 3 mmHg per second. Only use a sphygmomanometer that is known to be in calibration: <ul style="list-style-type: none"> Blood pressure taken with an un-calibrated sphygmomanometer may be very inaccurate.
	Change in blood pressure from auscultatory reading to Welch Allyn Vital Signs Monitor reading	Check blood pressure immediately prior to Welch Allyn Vital Signs Monitor Reading.
	Poor auscultatory sound recognition by observer	Use higher quality stethoscope. Have a different observer check patient's blood pressure.

Symptom	Possible Cause	Explanations and Corrective Action
2 CUFF INFLATION & DEFLATION WITH NO BLOOD PRESSURE READING DISPLAYED <i>(or error code in display)</i>	Leak in pneumatic system	Ensure all cuff attachments are tight. Carefully check for tubing leaks in blood pressure cuff and tubing attachment to monitor.
	Arm movement during cycle	Keep arm still during blood pressure cycle: <ul style="list-style-type: none"> movement may cause inaccuracies from artifact
	Tubing movement artifact	Do not contact tubing during blood pressure cycle: <ul style="list-style-type: none"> movement may cause inaccuracies from artifact
3 NO CUFF INFLATION	Connections from monitor to cuff loose	Check all connections. (Do not over tighten).
4 TEMPERATURE MALFUNCTION	Broken probe	Replace probe. Consult Technical Manual. Notify Biomedical department or Welch Allyn Technical Support. Wait for display window to read OrL before placing probe.
	Improper probe placement	Place probe in most posterior sublingual pocket. Notify Biomedical department or Welch Allyn Technical Support.
	Probe not replaced	Replace probe in holder prior to taking another temperature.
5 SpO₂ MALFUNCTION <ul style="list-style-type: none"> Sensor in Place but No SpO₂ on Display Inaccurate SpO₂ Reading 	Improperly attached sensor	Insert the patient's finger completely into sensor
	Cable incorrectly plugged into monitor	Ensure sensor cable is correctly plugged into monitor
	SpO ₂ disabled	Ensure SpO₂ is enabled (check Configuration Mode)
	Incorrect Sensor	Ensure that correct manufacturers sensor is in use <ul style="list-style-type: none"> Nellcor sensors are not interchangeable
6 PRINTER MALFUNCTION	Paper will not advance	Consult Technical Manual Notify Biomedical department or Welch Allyn Technical Support.

Symptom	Possible Cause	Explanations and Corrective Action
7 MONITOR WILL NOT TURN ON	Low battery	Check connections between monitor and transformer, and transformer and wall receptacle.
	Monitor not powering up	Unplug unit from wall receptacle and check for breaks in cord. If connections secure, check electrical outlet <ul style="list-style-type: none"> Charging light will be on if connections are OK and the monitor is plugged into a working outlet Notify Biomedical Department or Welch Allyn Technical Support.
8 CUFF TOO TIGHT <i>(Over inflation)</i>	Pressure Preset too high	Check default Pressure Preset setting: (in Configuration Mode) <ul style="list-style-type: none"> Unless patient has underlying systolic hypertension, set pressure preset at 160 mmHg. (If systolic blood pressure greater than pressure preset, monitor will automatically increase an additional 40 mmHg)
9 CUFF POPPING OFF	Inappropriate size cuff	Determine cuff size with the cuff markings or refer to chart in Operator's Manual for determining cuff size. <ul style="list-style-type: none"> If cuff continues to pop off, notify Biomedical Department or Welch Allyn Technical Support.
	Cuff applied inside out	Re- apply cuff: Make sure Welch Allyn label is facing away from arm.
10 CUFF DEFLATING TOO SLOWLY	Normal operation	Typical time to take a reading is 20 to 45 seconds. 165 seconds is the maximum.
	Pressure Preset too high	Check default Pressure Preset setting. (in Configuration Mode)
	Patient movement	Have patient sit still. Do not have arm tight against chest wall as respirations may affect speed and accuracy of blood pressure measurement.
	Small leak in pneumatic system	Check cuff and tubing for leaks.

Quick Guide to Taking a Manual (Auscultatory) Blood Pressure

	Action	Explanation
1	Collect appropriate equipment. <ul style="list-style-type: none"> • Use a certified accurate sphygmomanometer and quality stethoscope. • Select a blood pressure cuff of a suitable size. Use a blood pressure cuff of the largest appropriate size for patient (see markings on inside of cuff). 	Many sphygmomanometers are inaccurate. Low quality stethoscopes do not transmit sound well enough for blood pressure sounds to be heard accurately. A cuff that is either too large or too small will produce an inaccurate reading.
2	Have the patient assume a comfortable position with the upper arm relaxed at heart level and the lower arm passively supported.	If the arm is not at the proper level, inaccurate readings will result.
3	Expose the area of the brachial artery by removing clothing, or move a sleeve, if not too tight, above the area where the cuff will be placed.	Clothing over the artery hinders the ability to hear and may cause inaccurate readings. Tight clothing may cause vessel congestion and inaccurate readings.
4	Center the cuff bladder so that the lower edge is at least 1 inch (2.5cm) above the bend of inner arm of the elbow.	This places the cuff in the best position for occluding the blood flow through the brachial artery.
5	Palpate the brachial or radial pulse.	Determines the most accurate location for assessment and approximation of systolic pressure.
6	Inflate the cuff until the pulsation disappears. Then continue to inflate until the pressure reads 30 mmHg above the point where the pulse disappeared.	Facilitates identification of Phase One of Korotkoff sounds.
7	Listen carefully with stethoscope over brachial artery while controlling the release of air at a rate of 3 mmHg per second.	One of the major sources of error in auscultatory blood pressure measurement is deflating the cuff too quickly. It is a normal operation of the Welch Allyn Vital Signs Monitor to deflate at the American Heart Association recommended 3 mmHg per second.
8	Systolic is determined by reading the manometer gauge when the first faint but clear tapping sound is heard with the stethoscope.	Follows AHA recommended standards.
9	Diastole, in adults, is determined by reading the manometer gauge to the closest even number when the last sound is heard.	Follows AHA recommended standards. Diastolic blood pressure in children is the point at which the sound becomes muffled.
10	Release the air quickly after at least 10 to 20 mmHg of silence.	

Maintenance

Cleaning

The Welch Allyn Vital Signs Monitor may be wiped clean with a cloth slightly dampened with warm water and a mild detergent solution. Never immerse the monitor in any type of fluid.

Occasionally, as necessary, the unit may be cleaned with appropriately diluted non-staining disinfectant solution.

NOTE: Care should be taken to prevent water or other fluids from entering any connectors. Should this occur, the connectors should be dried with warm air. All monitoring functions should then be checked for proper operation.

The reusable blood pressure cuff should be cleaned by sponging with a damp cloth.

Cabling and the pressure hose can be wiped with a damp cloth moistened in a mild detergent solution. Do not immerse hoses.

The temperature probe should periodically be cleaned by wiping with an alcohol-dampened cloth or wipe, warm water, or properly diluted non-staining disinfectant. Do not immerse the probes.

The Nellcor reusable finger clip SpO₂ sensor may be cleaned with 70% alcohol or 1:10 bleach.

Storage

Whenever possible, the Welch Allyn Vital Signs Monitor should be stored at room temperature in a dry environment.

If it is necessary to store the monitor for an extended period of time, the unit should be packed in its original shipping carton.

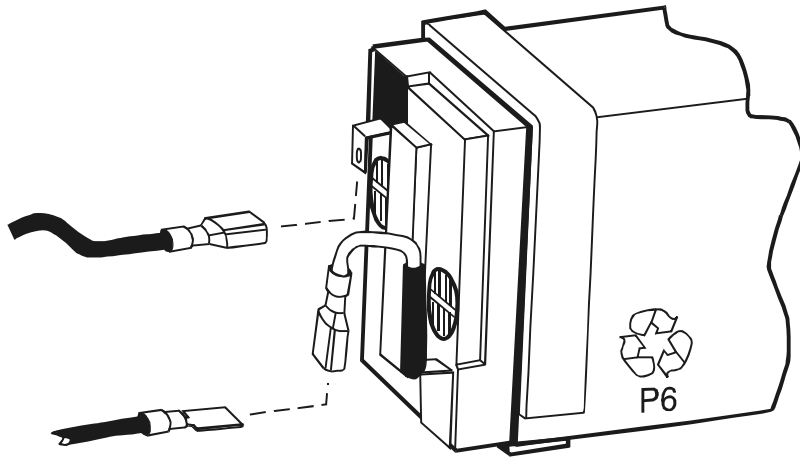
Ensure that the printer is loaded with paper prior to storage.

Battery Removal & Replacement

Occasionally it may be necessary for the internal battery to be replaced. When the battery will no longer take a charge, remove it and replace it as outlined below, with a battery of the same part number.

1. Ensure that the AC power transformer cord is disconnected from the Monitor, and that the Monitor is turned off.
2. Use a Phillips-head screwdriver to remove the four (4) screws holding in the battery door. Remove the battery door exposing the battery.
3. Tip the Monitor and slide the battery out. Disconnect each of the 2 connectors and discard the old battery per local regulations.

4. Attach the battery connectors to the new battery as shown below.



Attaching connectors to the new battery.

5. Slide the new battery into the battery compartment as far as it will go.
6. Replace the battery door, tightening each of the (4) screws.
7. Connect the AC power transformer to the monitor and allow the new battery to charge for approximately 16 hours. The Monitor may be used during this charging period. While charging, the charging indicator will flash a yellow light. When the Monitor is fully charged, the flashing light will be replaced with a solid yellow light.
8. The battery is a non-spillable lead-acid battery. In the USA, call 1-800-SAV-LEAD for instructions on how to recycle. For International users, contact your local authorities on recycling.

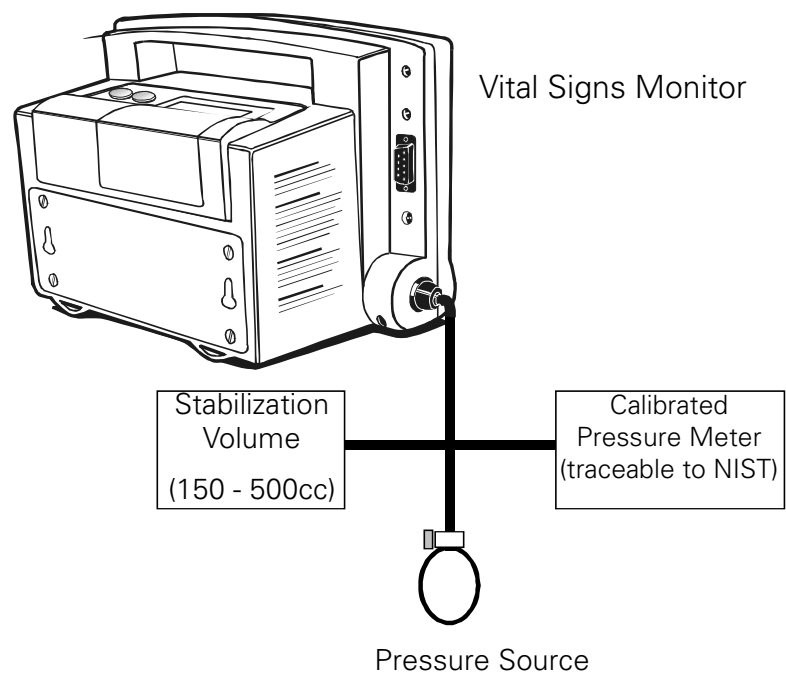
Calibration

Blood Pressure Calibration Check

The Welch Allyn Vital Signs Monitor is manufactured to the highest industry standards for quality and accuracy. The device is manufactured using calibrated pressure standards traceable to NIST (National Institute of Standards and Technology). Welch Allyn recommends that blood pressure calibration for the Vital Signs Monitor is checked on an annual basis using the following procedure.

1. Put the Vital Signs Monitor into its blood pressure calibration check mode. In this mode, the device will continuously display the measured pressure and the pressure release valve is closed.
 - 1.1 Initiate the Vital Signs Monitor's internal configuration settings menu by pressing the **Power** button while continuously depressing the **START** button. Continue to depress the **START** button until the unit software version information is displayed.
 - 1.2 Press the **REVIEW** button repeatedly until "CAL" is shown in the systolic display. The current pressure will be shown in the diastolic and pulse rate displays.
 - 1.3 Press the **START** button to close the Monitor's internal valve so that an external pressure may be applied.
2. Connect the Vital Signs Monitor as shown. **Make sure the pressure meter used to test the Vital Signs Monitor is calibrated and that the calibration certificate for the pressure meter is traceable to the National Institute of Standards and Technology. The pressure meter testing the Vital Signs Monitor must have an accuracy of better than ± 3 mmHg.** Use a fixed volume or a cuff wrapped around a cylinder for the stabilization volume.
3. Pressurize the Vital Signs Monitor to slightly above 250 mmHg and bleed down the pressure no faster than 10 mmHg per second, stopping to **check the pressure at 250, 150, and 50 mmHg.** Record the readings of the device and the pressure measurement standard at each pressure.
4. Calculate the difference between the readings from the Vital Signs Monitor and the pressure measurement standard at each of the specified pressures. Subtract the rated accuracy of the pressure measurement standard from the ± 3 mmHg rated accuracy of the Vital Signs Monitor. This is the **pass/fail criteria** to determine if the device is within calibration or not. If the differences between the Vital Signs Monitor and the pressure measurement standard are within the pass/fail criteria at all specified pressures, then the device is within calibration.

Calibration Check Set-up



If the Vital Signs Monitor is out of calibration, it needs re-calibration. Calibration procedures are included in the Vital Signs Monitor Service Manual. Alternatively, send the device back to Welch Allyn for calibration by contacting Technical Service.

NOTE: The pass/fail criteria for the blood pressure calibration check depends upon the accuracy of the pressure measurement standard used. For example:

- If the pressure measurement standard used is rated with an accuracy of ± 0.1 mmHg, the pass/fail criteria is ± 2.9 mmHg in order to guarantee that the instrument under test is within ± 3 mmHg of NIST.
- If the pressure measurement standard used is rated with an accuracy of ± 1.0 mmHg, the pass/fail criteria is ± 2.0 mmHg in order to guarantee that the instrument under test is within ± 3 mmHg of NIST.

Welch Allyn recommends using a pressure meter that is as accurate as possible when performing calibration checks. Welch Allyn offers two different pressure measurement standards for use:

- Setra Pressure Meter, calibrated accuracy of ± 0.1 mmHg (part no. 2270-01)
- Nitech Pressure Meter, calibrated accuracy of ± 1.0 mmHg (part no. 200-2000IN)

Use of other pressure measurement standards is acceptable, provided they have an accuracy of better than ± 3 mmHg, are traceable to NIST, and have a current calibration.

NOTE: Do not take more than 3 minutes to take the readings, as the Vital Signs Monitor will open its pressure relief valve as a safety feature. If this occurs, turn the device off and start over.

NOTE: The Vital Signs Monitor has the option to measure pressure in kPa units. If the device is set to kPa instead of mmHg, temporarily set the device to mmHg units or convert all pressures to kPa units.

Temperature Calibration Check

The accuracy of the Welch Allyn Vital Signs Monitor temperature determinations can be verified using the Temperature Calibration Key. The calibration check is a simple yet valuable test to determine that the unit is measuring temperature accurately.

1. Turn the Monitor on by pressing the POWER button.

NOTE: The temperature function will automatically go into Monitor Mode as part of this procedure.

2. Remove the temperature probe completely from the holder and detach the connector, then insert the temperature calibration key.
3. Insert, then remove the probe from the probe holder to reset the thermometer.
4. Wait for the temperature display test to be complete. Observe and record the temperature noted on the temperature display.
5. The recorded temperature should be $97.3^{\circ}\text{F} \pm 0.2^{\circ}\text{F}$ ($36.3^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$) if the Monitor is properly calibrated. If the temperature displayed is out of this range, call your Welch Allyn Technical Service center for assistance.

SpO₂ Calibration Check

The accuracy of the Welch Allyn Vital Signs Monitor's SpO₂ determinations can be verified using an SpO₂ simulator. The calibration check is a simple yet valuable test to determine that the unit is measuring SpO₂ accurately.

Welch Allyn recommends the use of the following simulators:

- NELLCOR PURITAN BENNETT™ Model SRC-MAX for Monitors incorporating the Nellcor brand pulse oximetry module.

Warranty Information

Welch Allyn warrants the Welch Allyn Vital Signs Monitor, when new, to be free of defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of two years from the date of purchase from Welch Allyn or its authorized distributors or agents. Welch Allyn will either repair or replace any components found to be defective or at variance from manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the instrument to Welch Allyn or an authorized distributor, agent or service representative. This warranty does not include breakage or failure due to tampering, misuse, neglect, accidents, modification or shipping. This warranty is also void if the instrument is not used in accordance with manufacturer's recommendations or if repaired by other than Welch Allyn or an authorized agent. Purchase date determines warranty requirements. No other express warranty is given.

Return the Instrument Registration Card

IMPORTANT!

Remember to submit the instrument registration card for warranty validation. Complete the information and mail the pre-addressed card to Welch Allyn.

Service Information

Service Policy

All repairs on products under warranty must be performed or approved by a Welch Allyn Service Center. Unauthorized repairs will void the warranty. Products out of warranty should be repaired by qualified electronics personnel or a Welch Allyn Service Center.

Technical Assistance

If you have an equipment problem that you cannot resolve, call the Welch Allyn Service Center nearest you for assistance. Technical service support is available to you by telephone on normal business days at the phone numbers listed below.

If you are advised to return a product to Welch Allyn for service or repair, schedule the repair with the service center nearest you.

Before returning a product for repair you must obtain authorization from Welch Allyn. An RMA (Return Goods Authorization) number will be given to you by our service personnel. Be sure to note this number on the outside of your shipping box. Returns without an RMA number will not be accepted for delivery.

Welch Allyn Service Centers

For Service or Repair

USA Customers

Welch Allyn Inc.
Technical Service Centers
4341 State Street Road
Skaneateles Falls, NY 13153
Tel: (800) 535-6663
Fax: (315) 685-4653

CANADA Customers

Welch Allyn Canada Limited
Technical Service Centers
160 Matheson Blvd., East
Mississauga, Ontario L4Z 1V4
Tel: (905) 890-0004 or 1 800-561-8797
Fax: (905) 890-0008

INTERNATIONAL Customers

European Customer Service Centre

Welch Allyn Limited
Navan Business Park
Dublin Road
Navan, Co Meath, Republic of Ireland
Tel: 00-353-4667700
Fax: 00-353-4627128

Speidel + Keller GmbH Co. + KG

Technical Service Centers
Zollerstrasse 2-4
D-72417 Jungingen
Germany
Tel: 011497477927173
Fax: 011497477927193

Welch Allyn Australia Pty. Ltd.

Technical Service Centers
38-46 South Street
Rydalmere NSW 2116
Tel: 01161296383000
Fax: 01161296383500

Welch Allyn Ltd. Singapore

#21-09 Golden Mile Tower
6001, Beach Road
Singapore 199589
Republic of Singapore
Tel: 011652910882
Fax: 011652915780

Welch Allyn UK Ltd.

Cublington Road
Aston Abbotts
Buckinghamshire HP22 4ND
Tel: 0207-365-6780
Fax: 0207-365-9694

LATIN AMERICA Customers

MDI International
Technical Service Centers
7324 S.W. 48th Street
Miami, FL 33155
USA
Tel: (305) 669-9003
Fax: (305) 669-8951

Welch Allyn China

Room 708
Central Plaza
227 Huangpi Bei Lu
Shanghai, 200003
P.R.C.
Tel: 8621-6327-9631
Fax: 8261-6327-9632



The CE Mark on this product indicates it has been tested to and conforms with the provisions noted with the 93/42/EEC Medical Device Directive.

European contact for regulatory compliance:

European Regulatory Manager

Welch Allyn LTD.

Navan, Co. Meath

Republic of Ireland

Phone: 353-46-67700

FAX: 353-46-27128

Service Manual/Spare Parts

A service manual is available by request to qualified electronics personnel. The service manual is a comprehensive guide to troubleshooting, service and repair of the Welch Allyn Vital Signs Monitor.

Also included with the service manual is a complete spare parts price list. Spare parts may be ordered from your local Welch Allyn Service Center.

Service Loaners

Service loaners are provided, on request, when repair service is provided by a Welch Allyn Service Center. Loaners for products repaired while under the original warranty, or while under extended warranty or service contract, are provided free of charge and are shipped within 48 hours of notification of need. Shipment charges to the user are paid by Welch Allyn.

For service repairs outside of warranty or contract, loaners will be available for a nominal daily charge and will be shipped subject to availability. Loaners will be shipped pre-paid, however this charge will be added to the service charges.

APPENDIX A: Mounting Accessories & Assembly Instructions

The Welch Allyn Vital Signs Monitor Basket

The mobile stand, IV pole mount and wall mount systems use the same basket.

Attaching the Monitor onto the Basket Assembly

Locate the two "keyhole" slots on the rear of the Monitor and the two circular lugs on the basket assembly, just above the basket. Insert the lugs into the large openings in the keyhole slots and slide the Monitor down until it is secured.

Removing the Monitor from the Mobile Stand

Locate the metal tab underneath and toward the back of the Monitor. With one hand in the handle on top of the Monitor, push on the metal tab and pull up on the Monitor.

Using the Wall Transformer Cord Wrap

On the side of the basket are two hooks which allow the operator to manage the transformer cord. To use the cord wrap, plug the transformer into the Monitor after installing the Monitor onto the basket assembly. Wrap the cord around the two hooks in a counter-clockwise motion until there is just enough cord remaining to allow the transformer plug to rest within the basket.

The Accessory Pack

The accessory pack has the ability to be attached to the mobile stand, the wall mount, the IV pole mount or on the rear of the Welch Allyn Vital Signs Monitor. The accessory pack is easily exchangeable from one mounting accessory to another using the quick-release feature. The accessory pack is designed to hold one box of temperature probe covers, a spare temperature probe or SpO2 sensor. The accessory pack has an integrated cuff clip which can secure any of the cuffs used with the Monitor.

Attaching the Accessory Pack to the Basket

Locate the two keyhole slots on the plate on the side of the basket assembly, and the two circular lugs on the back of the accessory pack. Insert the lugs into the large openings in the keyhole slots and slide the accessory pack UP until it is secured.

Removing the Accessory Pack for the Basket

Locate the metal tab on the bottom of the accessory pack. Push the metal tab away from the basket and pull down on the accessory pack. The accessory pack will release from the basket.

Attaching and Removing the Accessory Pack from the Monitor

Use the preceding instructions for attaching and removing the accessory pack from the basket.

Inserting the Box of Temperature Probe Covers

Open the box of 25 probe covers as directed. Insert the box into the rectangular opening beside the pocket on the Accessory Pack. The box will be tilted slightly to allow probe covers to be readily accessible when the Accessory Pack is mounted either on the basket or the Monitor.

The Mobile Stand

The mobile stand is designed to be rugged and durable. An integrated handle allows the stand to be easily wheeled wherever it is needed. Two of the five wheels on the mobile stand are equipped with a brake. These wheels can be identified by a lever on the outside of the wheel. The brake is engaged by pushing on one end of the lever. The brake may be released by pushing on the opposite end. For best results, use both brakes to ensure that the mobile stand remains stationary.

The IV Pole Mount

The IV Pole Mount kit allows the Welch Allyn Vital Signs Monitor to be attached to an IV pole with a diameter range of 0.75 inches to 1.25 inches. It is recommended that the Monitor be detached from the mounting hardware before attempting to attach or detach the pole mount to the pole. When attaching the pole mounting hardware to the pole, ensure that the hardware is securely fastened to the pole before attaching the Monitor.

Mounting Accessories Assembly Instructions

Mobile Stand Kit (Model #5200-60 & 5200-61)

(Refer to figure 1 for the following instructions)

1. Lay BASE on floor with wheels down. Assemble POLE into BASE by inserting tapered end into hole in center of BASE. Stabilize BASE. Push down and twist on POLE until POLE is tight and two holes in the top of POLE are aligned between two adjacent legs in the BASE. Check to be sure POLE is secure. Tighten if it is not.

2. Loosen HANDLE BRACKET screws (tool provided) and slide HANDLE over pole as shown. Position approximately 10" from top of POLE. Lightly tighten screws.

3. Insert POLE CAP into the top of the POLE.

4. Assemble BASKET to BASKET plate by inserting (4) #8 x 3/16" long phillips screws through four holes designated "A". Securely tighten screws.

5. Assemble BASKET PLATE to POLE CAP using (1) #8 x 1/2" long phillips flat head screw inserted through top hole "B" in BASKET PLATE and into top threaded hole in POLE CAP. Do not securely tighten screw.

6. Align two "C" holes in BASKET with corresponding holes in POLE and insert (2) #8 x 1/2 long phillips screws. Securely tighten these screws and screw assembled in step 5.

7. Loosen HANDLE BRACKET screws again and slide HANDLE up under basket to desired height and location. Securely tighten screws.

8. For Model #5200-60 only, attach ACCESSORY PACK by orienting as shown in figure 1 and inserting onto side plate of BASKET and pushing up. This will lock ACCESSORY PACK onto BASKET.

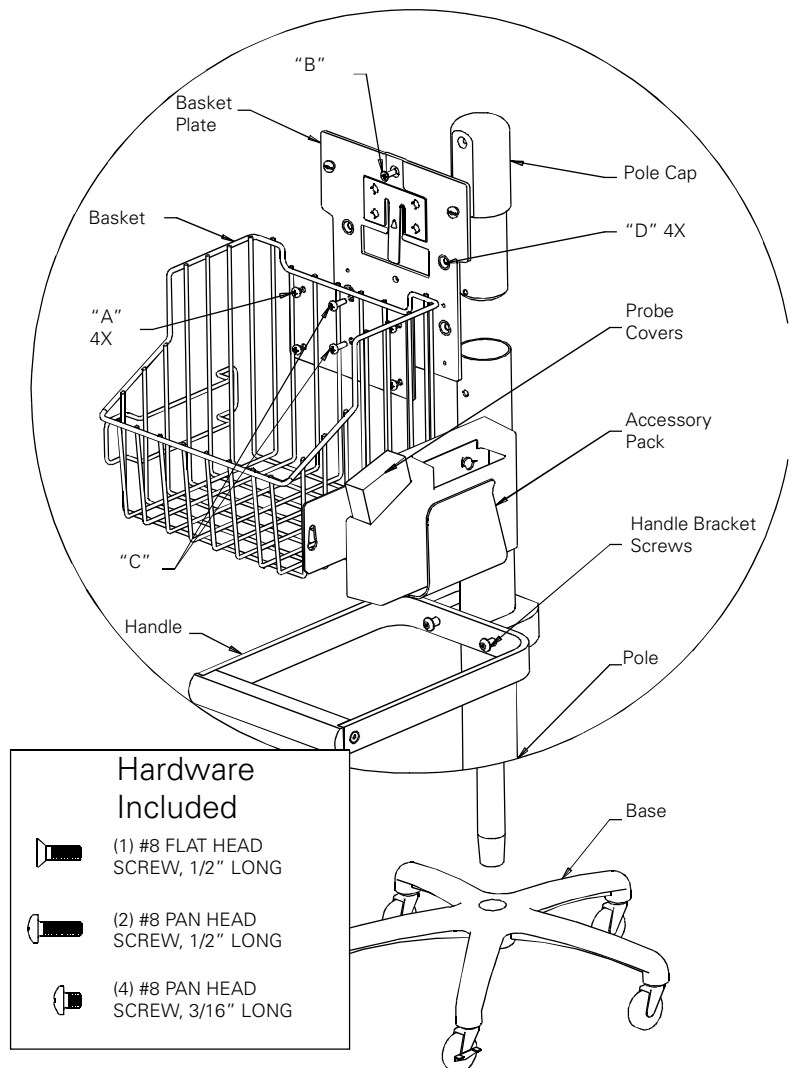


FIGURE 1

Wall Mount Kit (Model #5200-62 & 5200-63)

Refer to figure 2 for the following instructions)

1. Attach BASKET PLATE to wall by inserting (5) #8 flat head screws (not provided) through BASKET PLATE in four "D" holes and one "B" hole. Securely tighten screws.

NOTE: Mounting hardware should be selected according to the wall surface that monitor is being attached to. Welch Allyn is NOT responsible for the integrity of the mounting means. If there is any indecision or uncertainty on what hardware to use, contact a professional service for installation.

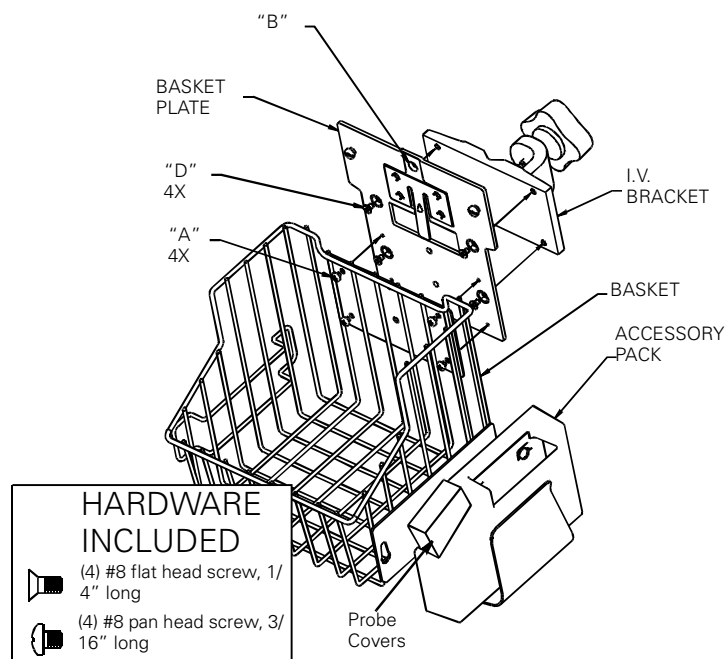


FIGURE 2

2. Assemble BASKET to BASKET PLATE by inserting (4) #8 x 3/16" long phillips screws through basket holes marked "A" and into four threaded holes in BASKET PLATE. Securely tighten screws.
3. For Model #5200-62 only, attach ACCESSORY PACK by orienting as shown in figure 2 and inserting onto side plate of BASKET and pushing up. This will lock ACCESSORY PACK onto BASKET.

I.V. Pole Kit (Model #5200-64 & 5200-65)

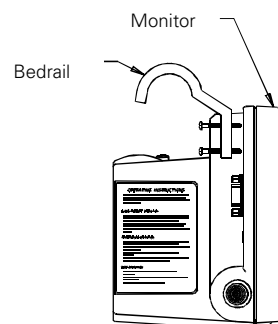
Refer to figure 2 for the following instructions)

1. Attach BASKET PLATE to I.V. BRACKET by inserting (4) #8 x 1/4" long flat head phillips screws through four countersunk holes, designated "D", into four threaded holes in bracket. Securely tighten screws.
2. Assemble BASKET to BASKET PLATE by inserting (4) #8 x 3/16" long phillips screws through basket holes marked "A" and into four threaded holes in BASKET PLATE. Securely tighten screws.
3. For Model #5200-64 only, attach ACCESSORY PACK by orienting as shown in figure 2 and inserting onto side plate of BASKET and pushing up. This will lock ACCESSORY PACK onto BASKET.

Bedrail Kit (Model #5200-66 & 5200-67)

Refer to figure 3 for the following instructions)

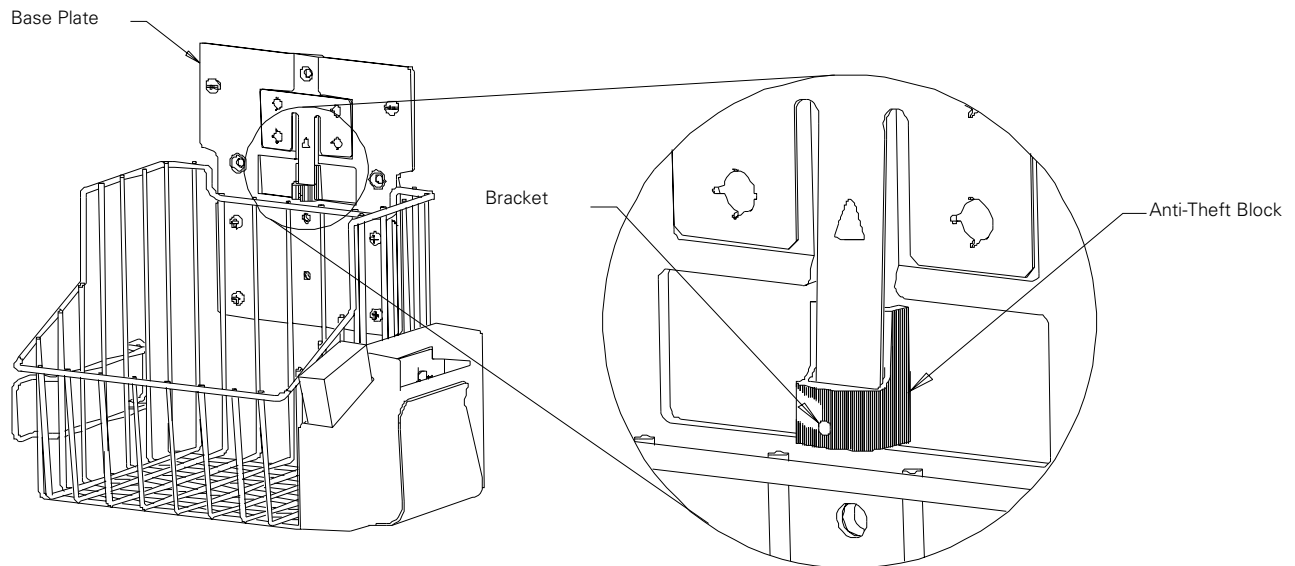
1. Remove top two housing screws on one side of MONITOR only.
2. Orient BEDRAIL as shown and attach using (2) #4 x 1 1/8" long screws supplied. Securely tighten screws.
3. Repeat steps 1 & 2 on other side of MONITOR.



Anti-theft Kit Installation Instructions

Anti-theft Kit (Model #5200-70)

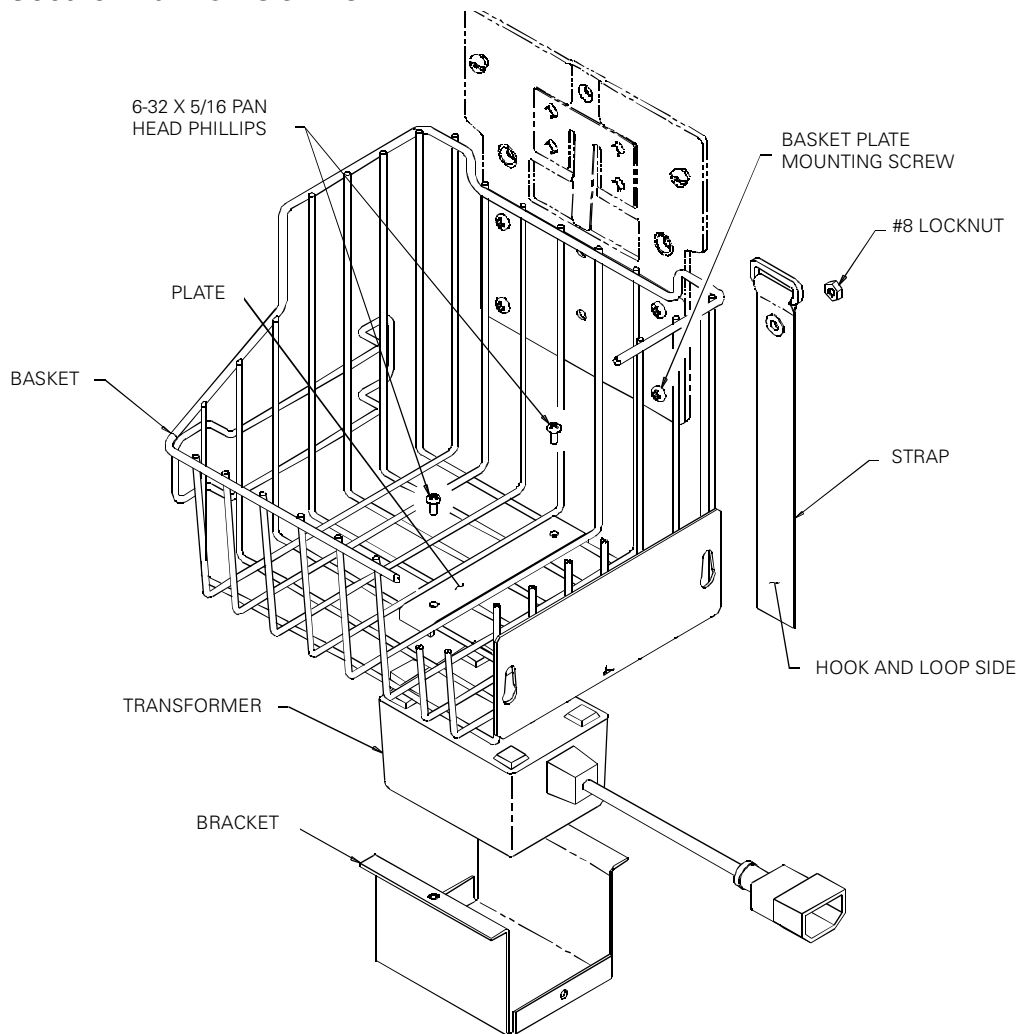
1. With monitor detached, assemble ANTI-THEFT BLOCK onto tab on BASKET PLATE oriented as shown below. Allow ANTI-THEFT BLOCK to rest freely as shown. Do not tighten SET SCREW.
2. Attach monitor to BASKET PLATE.
3. Slide ANTI-THEFT BLOCK up until it seats against bottom of monitor. With allen wrench provided, tighten SET SCREW to secure ANTI-THEFT BLOCK to tab.
4. Retain allen wrench for future use.



Transformer Mounting Instructions

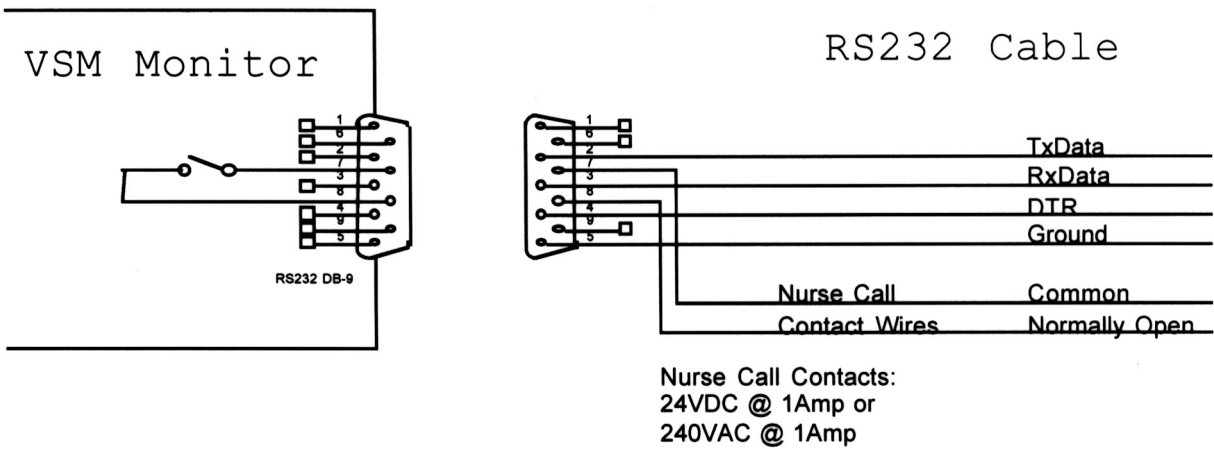
Transformer Mounting Kit (Model #5200-106)

1. Position PLATE in basket as shown.
2. Place TRANSFORMER in BRACKET. With transformer oriented as shown, secure bracket to plate using (2) #6 x 5/16" long pan head phillips screws. Tighten screws to prevent transformer movement.
3. Remove basket plate mounting screw indicated and replace with #8-32 x 1/2" long pan head phillips screw. Tighten securely.
4. Place STRAP over basket plate mounting screw in basket plate with hook and loop side towards basket. Secure with #8 LOCKNUT.



APPENDIX B: Nurse Call Interface Wiring Diagram

NOTE: See “Nurse Call” Interface” on page 40 of the Operator’s Manual for complete information on the Nurse Call interface.



The Welch Allyn Vital Signs Monitor provides a switch closure output between two pins of the serial connector (pins 7 and 8). The output is “universal” in that it is compatible with a wide variety of different systems with no polarity dependence. The Nurse Call output is ohmically isolated from all circuitry. The output is rated for 1 Amp at 240 VAC or 30VDC. During an alarm condition the output is closed, otherwise the output is open. During a power off or power failure condition the output is open.

APPENDIX C: Supplies and Accessories

Blood Pressure Accessories and Supplies - Latex Free

5200-01	Adult Cuff Assembly (cuff, latex-free bladder and connector)
5200-02	Large Adult Cuff Assembly (cuff, latex-free bladder and connector)
5200-03	Small Cuff Assembly (cuff, latex-free bladder and connector)
5200-10	Extra-Large Cuff Assembly (cuff, latex-free bladder and connector)
5200-04	Adult Bladder (latex-free, includes connector)
5200-05	Large Adult Bladder (latex-free, includes connector)
5200-06	Small Bladder (latex-free, includes connector)
5200-11	Extra-Large Adult Bladder (latex-free, includes connector)
5082-59	Adult Cuff
5082-61	Large Adult Cuff
5082-63	Small Cuff:
5082-64	Extra-Large Adult Cuff
5082-203-3	Small child size durable, one piece cuff (includes connectors)
5082-204-3	Child size durable, one piece cuff (includes connectors)
5082-205-3	Small adult size durable, one piece cuff (includes connectors)
5082-206-3	Adult size durable, one piece cuff (includes connectors)
5082-207-3	Large adult size durable, one piece cuff (includes connectors)
5082-208-3	Extra-large adult size durable, one piece cuff (includes connectors)
5082-93-3	Small child size disposable cuff (includes connectors) Box of 5 cuffs
5082-94-3	Child size disposable cuff (includes connectors) Box of 5 cuffs
5082-94P-3	Child size disposable cuff (printed, includes connectors) Box of 5 cuffs
5082-95-3	Small adult size disposable cuff (includes connectors) Box of 5 cuffs
5082-96-3	Adult size disposable cuff (includes connectors) Box of 5 cuffs
5082-97-3	Large adult size disposable cuff (includes connectors) Box of 5 cuffs
5082-98-3	Extra-large adult size disposable cuff (includes connectors) Box of 5 cuffs
5200-19	Straight Pressure Hose (5 feet, latex-free)
5200-12	Straight Pressure Hose (8 feet, latex-free)
5200-08	Calibration "T" Connector

Temperature Accessories and Supplies

5200-20	Oral Temperature Probe
5200-22	Rectal Temperature Probe
05031-101	Disposable Probe Covers (1000 covers, packaged 25 per box)
06137-000	Temperature Calibration Key
01800-210	Model 9600 Temperature Calibration Kit, 110v

Nellcor Puritan Bennett™ Pulse Oximetry Accessories And Supplies

DS-100A	DURASENSOR Adult Oxygen Transducer
DEC-8	Extension Cable (8 ft.)
D-YS	DURA-Y Oxygen Transducer (1 sensor, 40 wraps)
D-YSE	Ear Clip, (use with Dura-Y sensor)
D-YSPD	PediCheck Pediatric Spot-Check (use with Dura-Y sensor)
MAX-A	OxiMAX Adult (single use, case of 24)
MAX-P	OxiMAX Pediatric (single use, case of 24)

MAX-R	OxiMAX Adult Nasal (case of 24)
MAX-I	OxiMAX Infant, (case of 24)
OXICLIQ P	Pediatric Oxygen Transducer, use with OC-3 cable
OC-3	OXICLIQ Sensor Cable
OXI - A/N	OXIBAND Adult/Neonatal Transducer (1 sensor, 50 wraps)
OXI - P/I	OXIBAND Pediatric/Infant Transducer (1 sensor, 50 wraps)
SRC-MAX	Portable Oximetry Tester

Power Transformer Accessories

5200-101A	AC Power Transformer (desktop transformer, line cord not included) - 120V, 60 Hz
5200-103A	AC Power Transformer (desktop transformer, line cord not included) - 240V, 50 Hz
5200-103Z	AC Power Transformer (Australian version, desktop transformer with line cord included) - 240V, 60 Hz
5200-110	Line Cord (US / Canada / Japan version)
5200-111	Line Cord (European Version)
5200-112	Line Cord (United Kingdom Version)
5200-114	Line Cord (Swiss Version)
5200-115	Line Cord (South American Version)
5200-106	Transformer Mounting Kit (use with desktop transformer only)

Mounting Accessories

5200-60	Mobile Stand with Accessory Pack
5200-61	Mobile Stand without Accessory Pack
5200-62	Wall Mount with Accessory Pack
5200-63	Wall Mount without Accessory Pack
5200-64	IV Pole Mount with Accessory Pack
5200-65	IV Pole Mount without Accessory Pack
5200-66	Bedrail Mounts with Accessory Pack
5200-67	Bedrail Mounts without Accessory Pack
5200-68	Cuff Clip
5200-69	Accessory Pack
5200-70	Anti-Theft Kit for Mounting Devices
5200-106	Transformer Mounting Kit (use with desktop transformer only)

Miscellaneous Accessory Items

7052-25	Printer Paper (box of 6 rolls)
5200-84	Lead-Acid Battery (6 volt, rechargeable)
5200-85E	Operator Manual (English Version)
5200-86E	Technical Service Manual
5200-88	Plastic Monitor Covers (pack of 5)
5200-100	Monitor Carrying Case

APPENDIX D: Specifications

Performance Specifications

The performance specifications of the Welch Allyn Vital Signs Monitor are as follows:

Patient Population

The Welch Allyn Vital Signs Monitor is designed for use with adult and pediatric patients. The monitor is not intended for use with neonates. Welch Allyn defines neonates as children 28 days or less of age if born at term (37 weeks gestation or more); otherwise, up to 44 gestational weeks. This definition comes from the AAMI SP10 1992 standard.

Cuff Pressure Range

0 - 300 mmHg

Initial Cuff Inflation

Default cuff inflation pressure is 160 mmHg. Operator may change this default in configuration mode. Options are 120, 140, 160, 180, 200, 240 and 280 mmHg.

Systolic Range

60 - 250 mmHg

Diastolic Range

30 - 160 mmHg

Blood Pressure Accuracy

Blood pressure accuracy meets or exceeds SP10-1992 AAMI standards for non-invasive blood pressure accuracy (AAMI standard: ± 5 mmHg mean error; 8 mmHg standard deviation). Blood pressure accuracy is validated for pressure measurement using the upper arm only, with the patient in a seated position. Blood pressure is validated against manual auscultatory readings for adults and children above the age of 3. For children under age 3 blood pressure is validated against intraarterial readings. The monitor is not validated for use with neonates.

Blood Pressure Determination Time

20 seconds to 45 seconds typical, 165 seconds maximum.

Pulse Rate Range

40 - 200 bpm

Pulse Rate Accuracy (using Blood Pressure Determination)

$\pm 5.0\%$

Pulse Rate Accuracy (using SpO₂ Determination)

Without Motion: ± 3 digits***

With Motion: normal physiologic range (55 - 125 bpm) ± 5 digits

Low Perfusion: ± 3 digits***

*** Specification applies to monitor performance and was validated with Biotek and Nellcor simulators.

Overpressure Cutoff

295 - 330 mmHg

Temperature Range

84.0 - 108.0°F (28.9 - 42.2°C)

Temperature Calibration Accuracy

Calibration Accuracy: $\pm 0.2^{\circ}\text{ F}$ ($\pm 0.1^{\circ}\text{ C}$)

Temperature Determination Time

Normal Mode: ORAL: 4 seconds typical, Axillary: 10 seconds typical

Rectal: 15 seconds typical

Monitor Mode: ORAL/Rectal: 3 minutes, Axillary: 5 Minutes

Oxygen Saturation Range (SpO₂%)

40 - 99% oxygen saturation

SpO₂ Accuracy

Without Motion - Adults: 70 - 99% ± 2 digits*

With Motion - Adults: 70 - 99% ± 3 digits**

Low Perfusion: 70 to 99% ± 2 digits***

<70% unspecified by the OEM

Biocompatibility testing has been conducted on Nellcor sensors in compliance with ISO10993-1, Biological Evaluation of Medical Devices, Part 1: Evaluation and Testing. The sensors have passed the recommended biocompatibility testing and are therefore in compliance with ISO 10993-1.

* Adult specifications are shown for OxiMax MAX-A sensors. Saturation accuracy will vary by sensor type. Refer to the following Sensor Accuracy Grid.

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

*** Specification applies to monitor performance and was validated with Biotek and Nellcor simulators.

Sensor Accuracy Grid

Sensor Models	SpO₂ Range 70% - 99%
OXIMAX Sensor Models Single Patient Use	
MAX-A,* MAX-AL*	± 2
MAX-P*	± 2
MAX-I*	± 2
MAX-R**	± 3.5
OxiCliq Sensor Models Single Patient Use	
OxiCliq A	± 2.5
OxiCliq P	± 2.5
Reusable Sensor Models	
D-YS (Infant to Adult)	± 3
D-YS & D-YSE	± 3.5
DS-100A	± 3
OXI-A/N (Adult)	± 3
OXI-P/I	± 3

* The accuracy specification under motion conditions is + 3. For a definition of motion, contact Nellcor Technical Services or your local Nellcor representative.

**The accuracy specification has been determined between saturations of 80% - 99%.

Accuracy Specifications: Accuracy specifications are based on controlled hypoxia studies with healthy, non-smoking adult volunteers over the specified saturation SpO₂ range. Pulse oximeter SpO₂ readings were compared to SaO₂ values of drawn blood samples measured by hemoximetry. All accuracies are expressed as \pm "X" digits. This variation equals \pm one standard deviation (± 1 SD), which encompasses 68% of the population.

Mechanical Specifications

Dimensions

Height	6.5 inches	(16.5cm)
Length	8.6 inches	(21.8cm)
Depth	5.0 inches	(12.7cm)

Weight

Approximately 6 pounds (2.8Kg)

Color

Oral/Axillary Temperature Probe - Blue

Rectal Temperature Probe - Red

Mounting

Self-Supporting on rubber feet

IV Pole Mountable

Custom Mobile Stand

Wall Mountable

Attaches to Bed Rail

Portability

May be hand carried when held by the recessed handle.

When attached to an IV pole, or mounted on its custom mobile stand, the monitor and accessories can be wheeled from patient to patient.

When attached to the bed rail may be transported with the patient within the hospital environment.

Electrical Specifications

Power Requirements

Patient-Rated isolation transformer is connected to AC mains:

North American Version: 120VAC, 60Hz. 0.20A Input, 8VDC, 0.75A Output

International Version: 240VAC, 50Hz 0.10A Input, 8VDC, 0.75A Output

Australian Version: 240VAC, 50Hz, 13VA Input, 8VDC, 0.75A Output

Battery

Lead acid, with external recharge capability.

Battery will fully charge to at least 90% capacity in 12 hours. Unit will operate and charge battery simultaneously when connected to power source.

A fully charged battery will support 200 "typical" blood pressure determinations taken at 3 minute intervals. Battery is 90-100% charged after 12 hours of charging. The battery automatically charges when the monitor is powered through the AC power transformer. The battery will charge faster when the instrument is not in operation.

Environmental Specifications

Operating Temperature

+10°C to +40°C

+50°F to +104°F

*Exception: Thermometry module will not maintain its performance characteristics below 60°F (16°C).

Operating Altitude

-170m to +4877m

-557ft. to +16,000ft.

Storage Temperature

-20°C to +50°C

-4°F to +122°F

Relative Humidity

15 to 90% (non-condensing)

Welch Allyn Vital Signs Monitor Serial Number: _____

Date of Purchase: _____

Dealer Name: _____

Telephone: _____

Dealer Representative Name: _____

Telephone: _____

Welch Allyn Sales Representative: _____



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