



Radical-7 Pulse CO-Oximeter



Touch Screen Training

Learning Objectives

Upon completing this course, the participant will be able to:

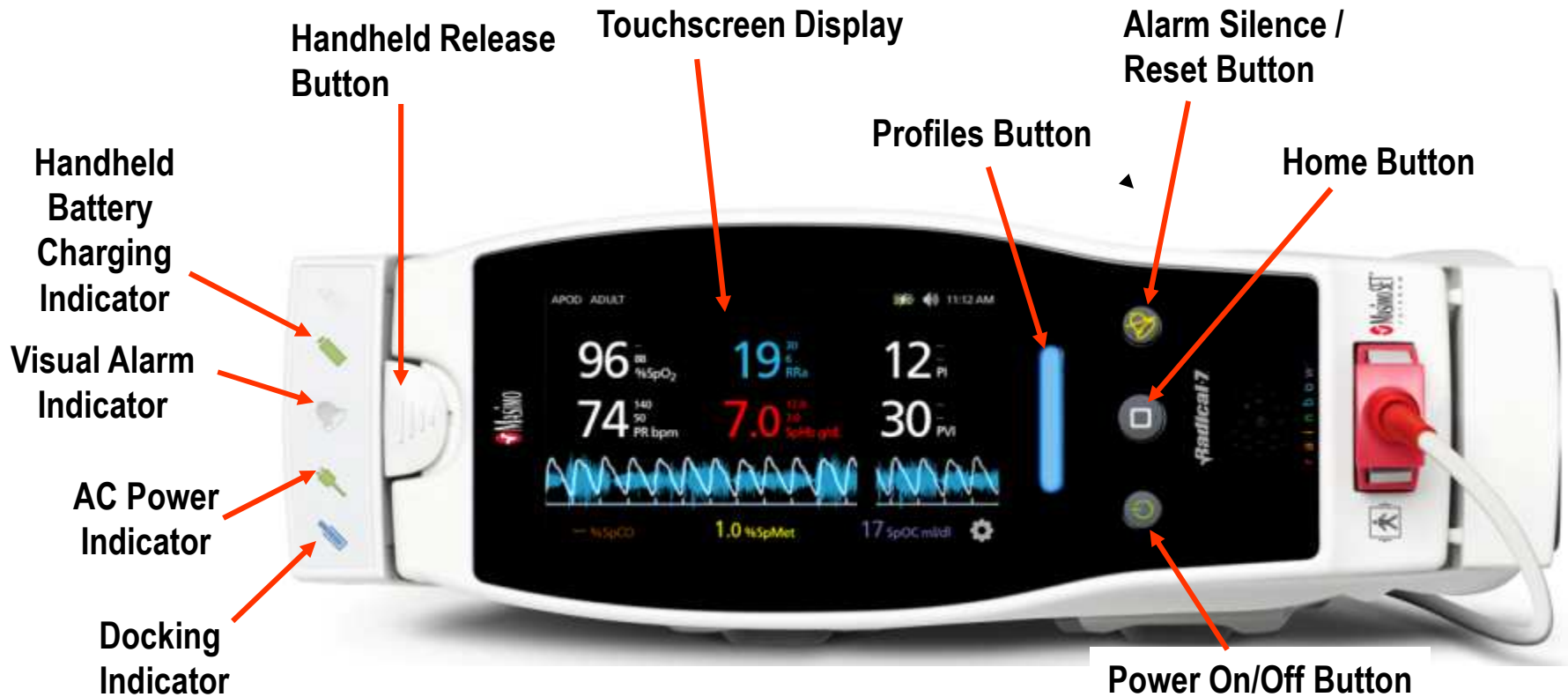
- > Identify the key features, components, and controls of the Radical-7 Pulse CO-Oximeter**
- > Describe and navigate the touch screen menu structure of the Radical-7**
- > Describe how to check the software versions on the Radical-7**
- > Describe how to use PI and SIQ to identify unreliable measurements and to troubleshoot common pulse oximetry challenges**
- > Identify other key troubleshooting concepts**
- > Identify components on the rear panel of the Radical-7 docking station**
- > Describe the cleaning process for the Radical-7**

Screen Lock Feature



- > When turned on, any interaction with the Display View triggers the Screen Lock feature, which may prevent unintentional interaction with Display View
- > To bypass Screen Lock when it appears, press and hold the Lock icon until it unlocks

Radical-7 Controls



Radical-7 Controls



Power On / Off button – To turn on the Radical-7, press the power button. To turn off, press and hold the button for more than 2 seconds.



Home Button – The Home button provides instant access to the Display View screen.



Alarm Silence button – The Alarm Silence button temporarily silences alarms.



Profiles Button – The Profile Button provides instant access to the Profile screen.



Touchscreen Display – The Touchscreen Display refers to the interactive area on the Handheld. There are different Display Views that can appear in this area.

Radical-7 Controls



Handheld Release Button – Press down the Handheld Release Button to pull the handheld device off the Docking Station.



Handheld Battery Charging Indicator – Illuminated when the handheld battery is charging and blinks just prior to charging. Does not illuminate when battery is fully charged or not present.



Visual Alarm Indicator – Illuminated when an alarm condition is active and the Alarm Status Indicator is shown.



AC Power Indicator – Illuminated when the Radical-7 Docking Station is plugged into AC line power.



Docking Indicator – Illuminated when the handheld instrument is turned on and properly interfaced to the Docking Station. If handheld is not replaced into the Docking Station correctly, this will not illuminate and the battery will not be charging.

Radical-7 Display View – Status Bar Section



- > The Status Bar includes touch indicators for Sensitivity Modes, Profiles, WiFi, Battery, Sounds, and Time Setting
- > Messages will also appear in the Status Bar section

Status Bar Features



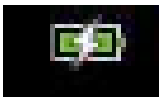
Sensitivity Adjustment – Changes from APOD to Normal to Maximum Sensitivity modes



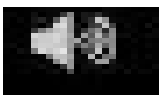
Profiles allows the user to customize different settings for different patient populations Adult, Neonatal, or Custom



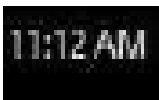
WiFi – when the Radical-7 is connected to a WiFi network, the WiFi icon conveys the strength of the WiFi connection



Battery – conveys remaining battery charge as a green color

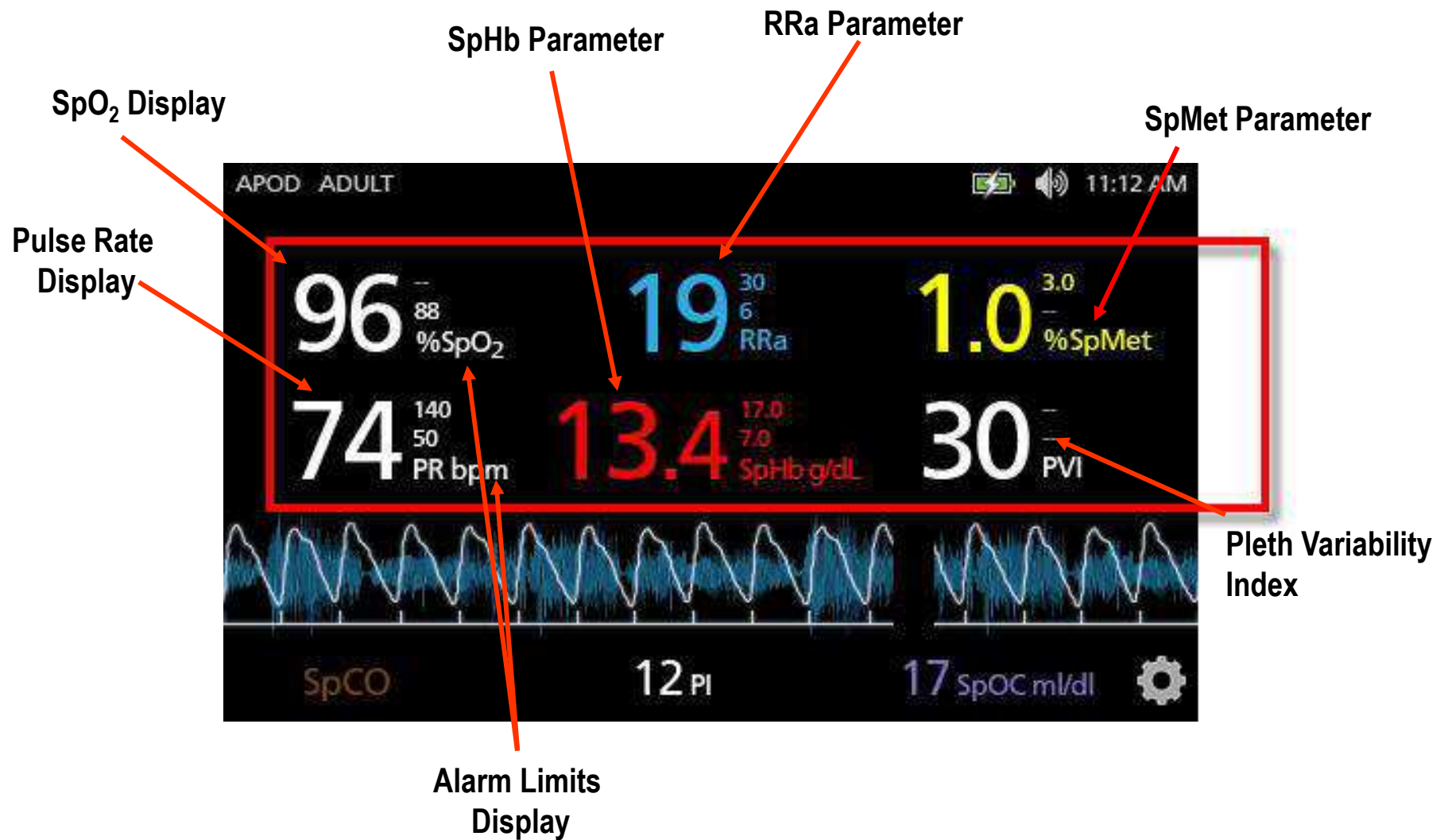


Sounds – From the Sounds screen, change Alarm Volume, Pulse Tone Volume, and Alarm Silence Duration



Time – enters the Localization menu where user can adjust Current Date, Current Time, Language, Time Zone, Date Format, Time Format, Line Frequency, Date and Time Manual set

Radical-7 Display View – Parameter Display



Radical-7 Display – Parameters



SpO2 Display – Displays functional arterial hemoglobin Oxygen saturation in units of percentage SpO2



Pulse Rate Display – Shows the patient's pulse rate in beats per minute



SpHb Parameter – Displays total Hemoglobin Concentration in g/dL or mmol/L



RRa Parameter – Displays the Acoustic Respiration Rate



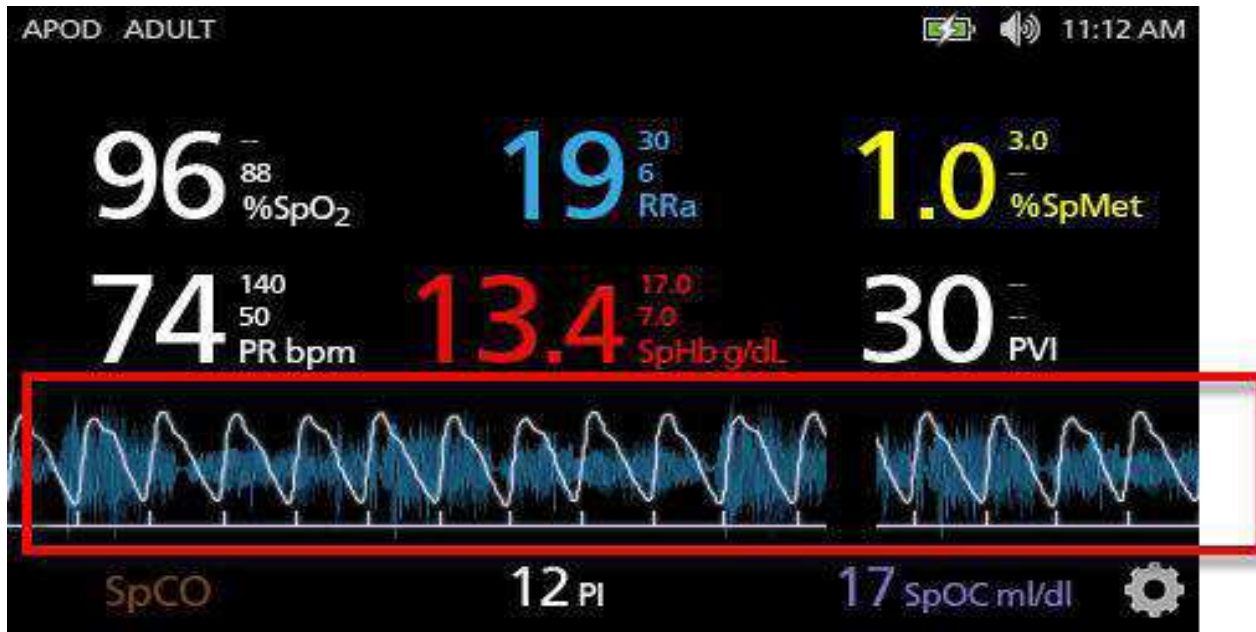
SpMet Parameter – Displays the levels of Methemoglobin concentration in units of percentage SpMet



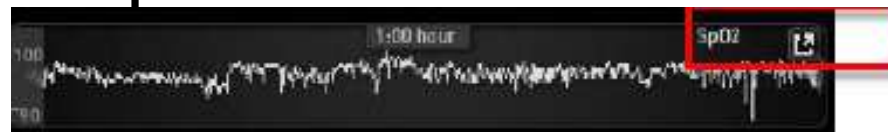
PVI Parameter – Displays a measure of the dynamic changes in the perfusion index that occur over a respiratory cycle as a percentage

Alarm Display Limits – Displays low and high limits next to each parameter

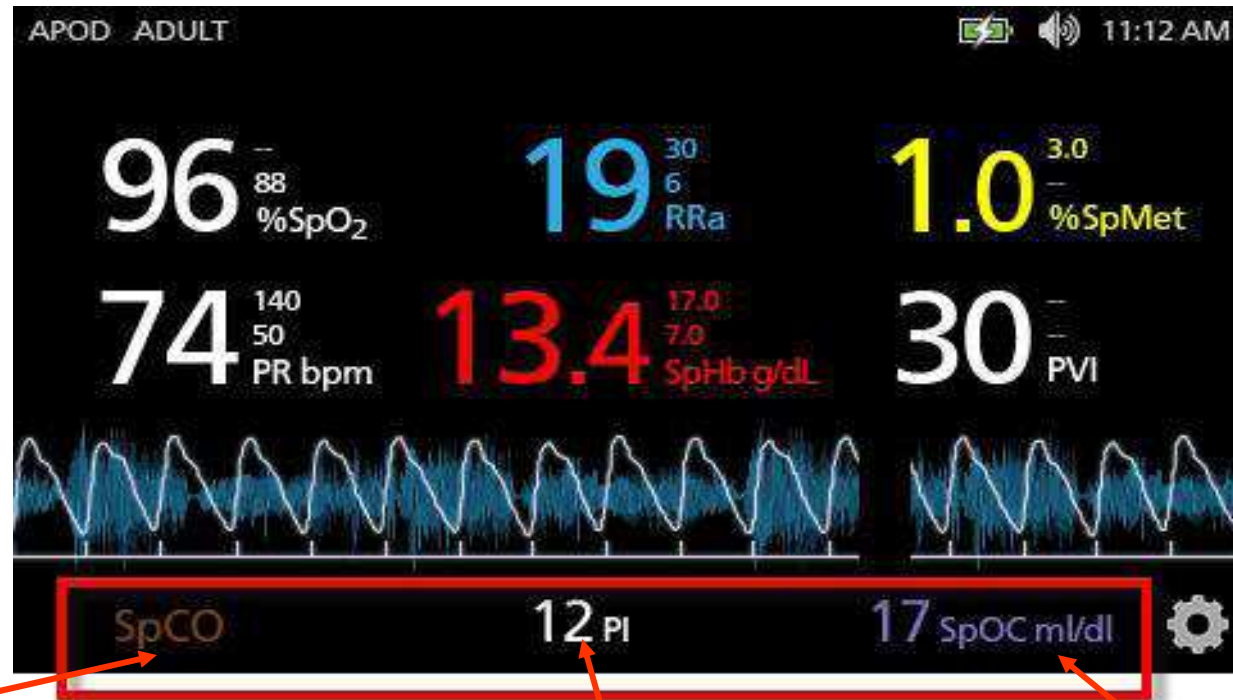
Radical-7 Display View – Trend Field



- > User can change waveform and trend views by touching this section and selecting between Pleth+Sig IQ view, Acoustic, PVI Pleth+Sig IQ, or PVI Pleth+Sig IQ+Acoustic
- > Individual Parameter quick trends and full trend view also available



Radical-7 Display View – Small Parameter View



SpCO Parameter
(inactive when SpHb
parameter active)

Perfusion Index

SpOC Parameter

- > On the Small Parameter view, touch and hold any parameter until it dims, shakes, and grows in size, then drag and drop it above the trend field to place it in the Parameter Display area

Radical-7 Display – Parameters

A black rectangular icon with the text "SpCO" in a yellow, monospace-style font.

SpCO Parameter – Displays the levels of Carboxyhemoglobin concentration in the blood in percent SpCO.

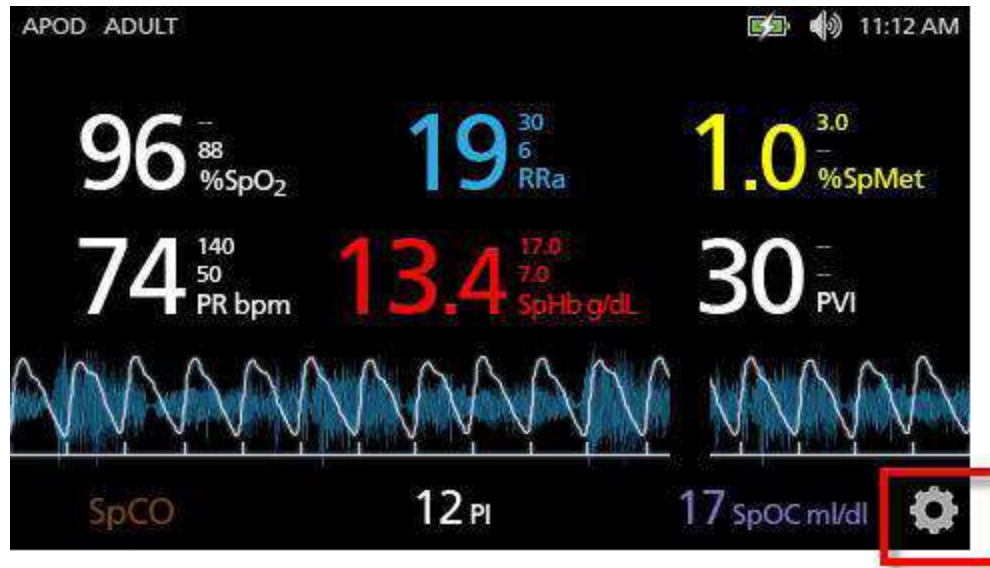
A black rectangular icon with the text "12 FI" in a white, monospace-style font.


Perfusion Index – Displays the ratio of the pulsatile blood flow to the non-pulsatile or static blood in peripheral tissue in percentage. PI represents a non-invasive measure of peripheral perfusion that can be continuously and non-invasively obtained from a pulse oximeter.

A black rectangular icon with the text "17 SpOC mVdl" in a white, monospace-style font.

SpOC Display – Provides a calculated measurement of the amount of oxygen in arterial blood, which may provide useful information about oxygen both dissolved in plasma and combined with hemoglobin.

Main Menu Screen



- > To access the *Main Menu* screen touch the gear icon  at the lower right corner of the display.
- > Main Menu is where users can access additional screens and information. Users can swipe the screen left or right to pan the Menu Icons. Users can touch the arrow icon to return to the *Display View*.

Navigating the Main Menu – Touch Icons



Device Settings – Includes Screen Orientation, Localization, WiFi, Battery, Brightness, Access Control, and Device Output



From the Parameter Settings screen, to access the desired parameter flick the on-screen icons left or right



Profiles – Allows the user to customize different settings for different patient populations



3D Alarms – Include the Desat Index Alarm and the PI Delta Alarm

Navigating the Main Menu – Touch Icons



Trends – Adjust Trend settings, Delete trend data, Manipulate view of trend data, and toggle between Display View and Full Trend



Sounds – Adjust Alarm Volume, Pulse Tone Volume, and Alarm Silence Duration



About – View Serial number, version of instrument board software (MCU), version of technology level software (MX Board), and version of Docking station software if handheld is docked

Sensitivity Adjustment



- > Press the indication on the top left of the Display View to toggle between APOD, NORM, and MAX
- > Alternatively, from the Main Menu (Gear) Icon, touch the Profiles icon and select the desired mode by scrolling up or down and press OK

Sensitivity Setting on the Radical-7™

Selectable Device Sensitivity

APOD (Adaptive Probe Off Detection)

APOD is the recommended sensitivity mode where there is a high probability of the sensor becoming detached. It is also the suggested mode for care areas where patients are not visually monitored continuously. This mode delivers enhanced protection against erroneous pulse rate and arterial oxygen saturation readings when a sensor becomes inadvertently detached from a patient due to excessive movement.

Note: *Device will revert to APOD after power cycle*

NORMAL

Norm is the recommended sensitivity mode for patients who are experiencing some compromise in blood flow or perfusion. It is advisable for care areas where patients are observed frequently, such as Intensive Care Unit (ICU)

MAX

MAX is recommended sensitivity mode for patients with low perfusion or when a low perfusion message displays in APOD or NORM mode. MAX mode is not recommended for care areas where patients are not monitored visually, such as general wards. It is designed to interpret and display data at the measuring site when the signal may be weak due to decreased perfusion. When a sensor becomes detached from a patient, it will have compromised protection against erroneous pulse rate and arterial saturation readings.

NOTE: *In MAX Sensitivity, if the probe becomes detached, the Radical-7 could be more likely to continue to read signals from ambient light or artifact. This is a known limitation of all pulse oximetry.*

LESS SENSITIVE

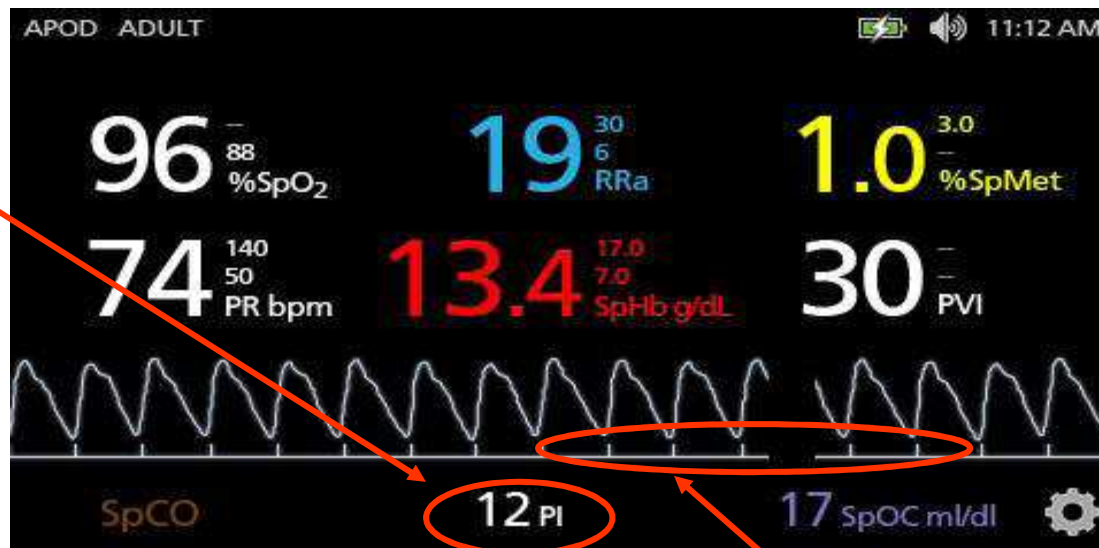
MORE SENSITIVE

Perfusion Index and Signal IQ

Perfusion index (PI) is an assessment of the pulse strength at the monitoring site

Signal IQ is used to indicate confidence level in the measurement

Perfusion Index



Signal IQ

Perfusion Index

>What is PI?

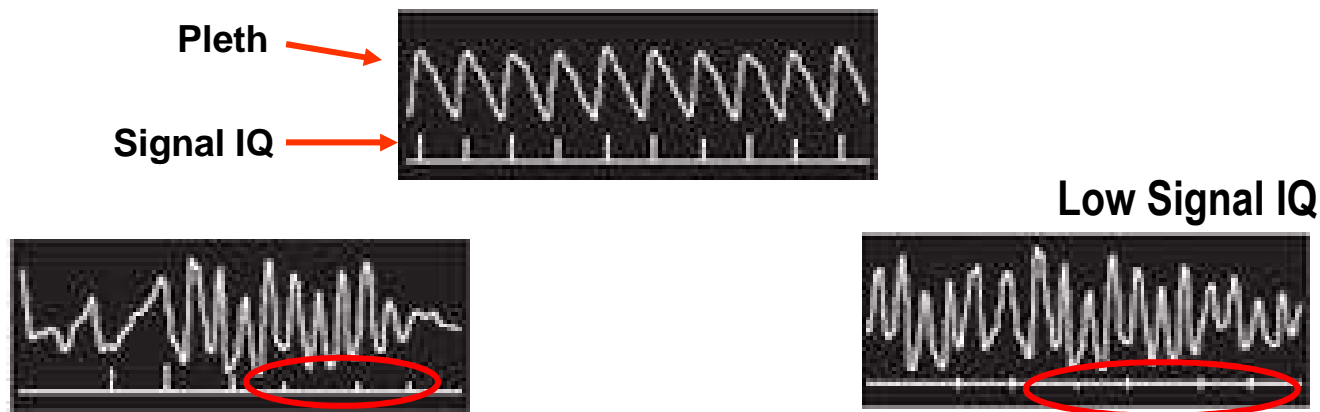
- **Assessment of the pulse strength at the monitoring site**
- **Numerical value between 0.02% and 20%**
- **Lower values indicate lower perfusion**
- **Number that varies between monitoring sites and from patient to patient, as physiologic conditions vary**

>How do I use PI?

- **During sensor placement, use to quickly evaluate site with best PI**
- **Monitor the trend of the PI for changes in physiologic conditions**

Signal IQ

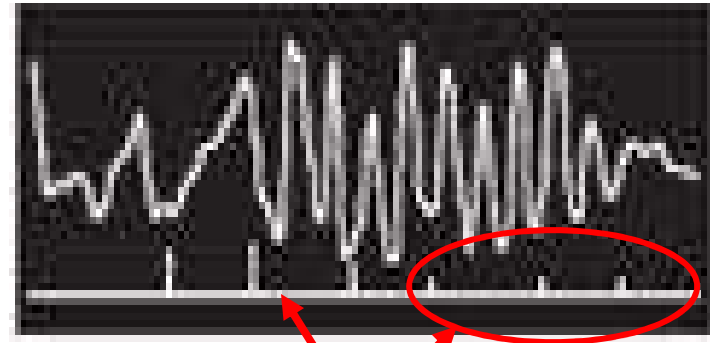
- Displayed as horizontal bar with vertical spikes
- Vertical spikes coincide with the pulsation at the measuring site
- Height of spike indicates confidence



Signal IQ



> Confidence indicated by high level in Signal IQ-Note height of 'spike'.



> Height of 'spikes' decreasing- confidence in resulting measurement diminishing.

Alarms Menu



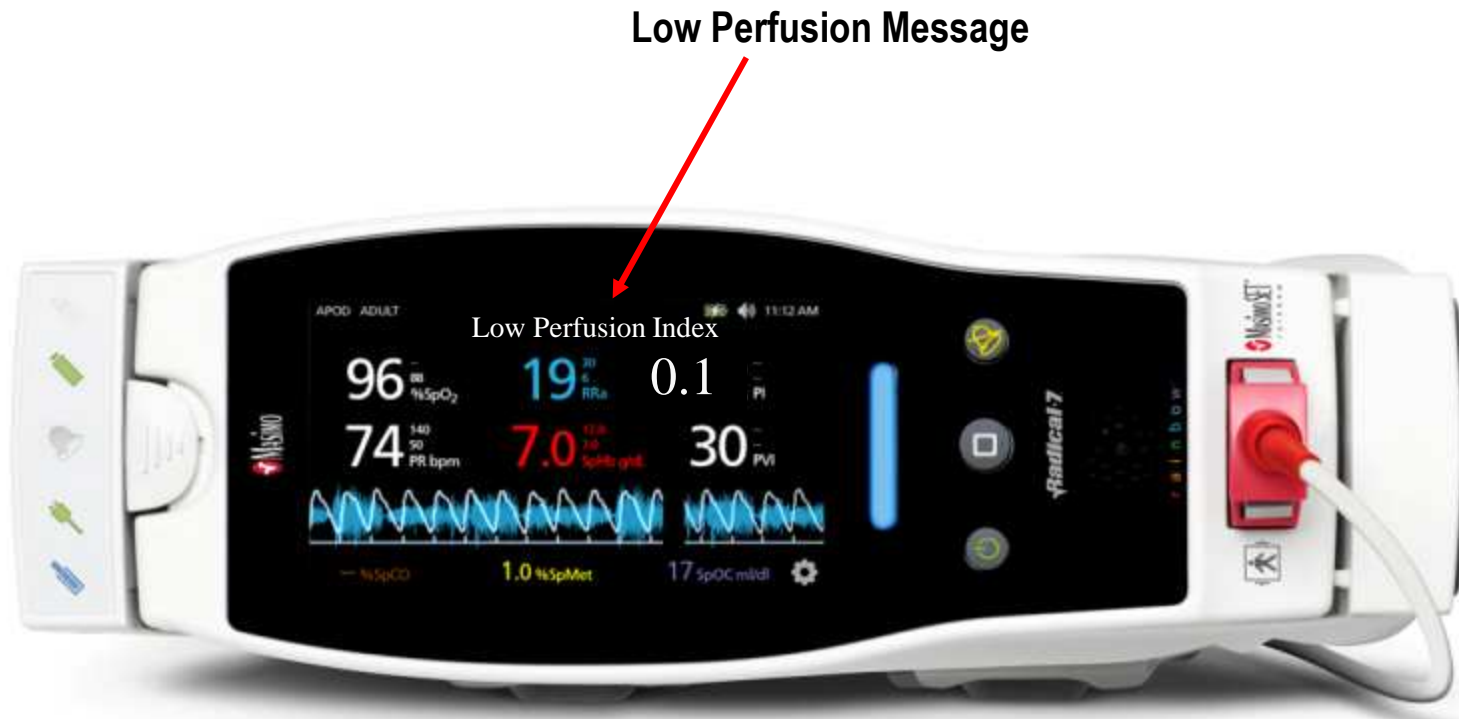
- > To access alarm limits, touch the desired parameter and touch Alarms. Touch the limit to be adjusted and scroll until desired setting is selected. Press OK to confirm setting.
- > Alternatively, touch Parameter Settings in the main menu and select the alarm parameter to be adjusted and Alarms.



Troubleshooting



Low Perfusion Message

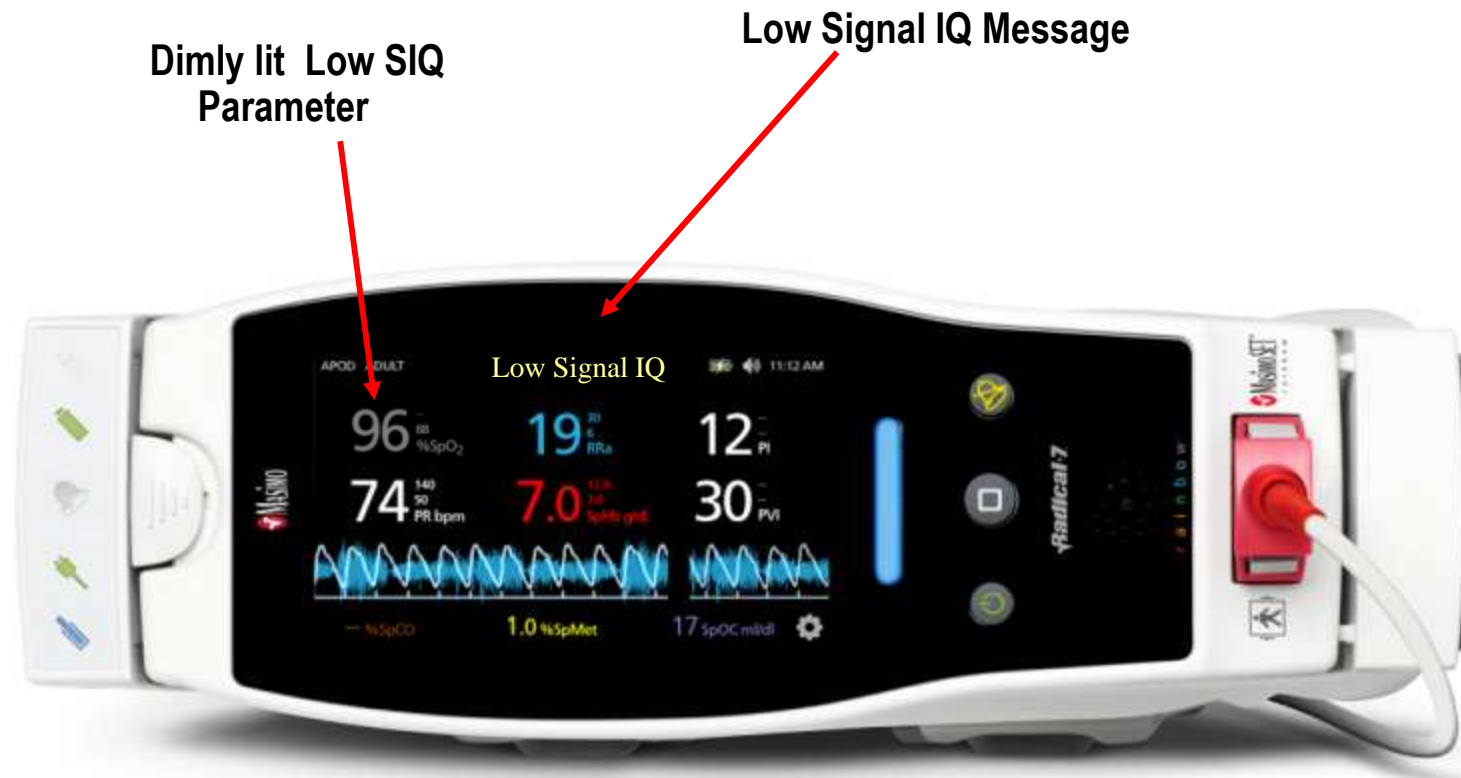


Low Perfusion Message

Low Perfusion Message

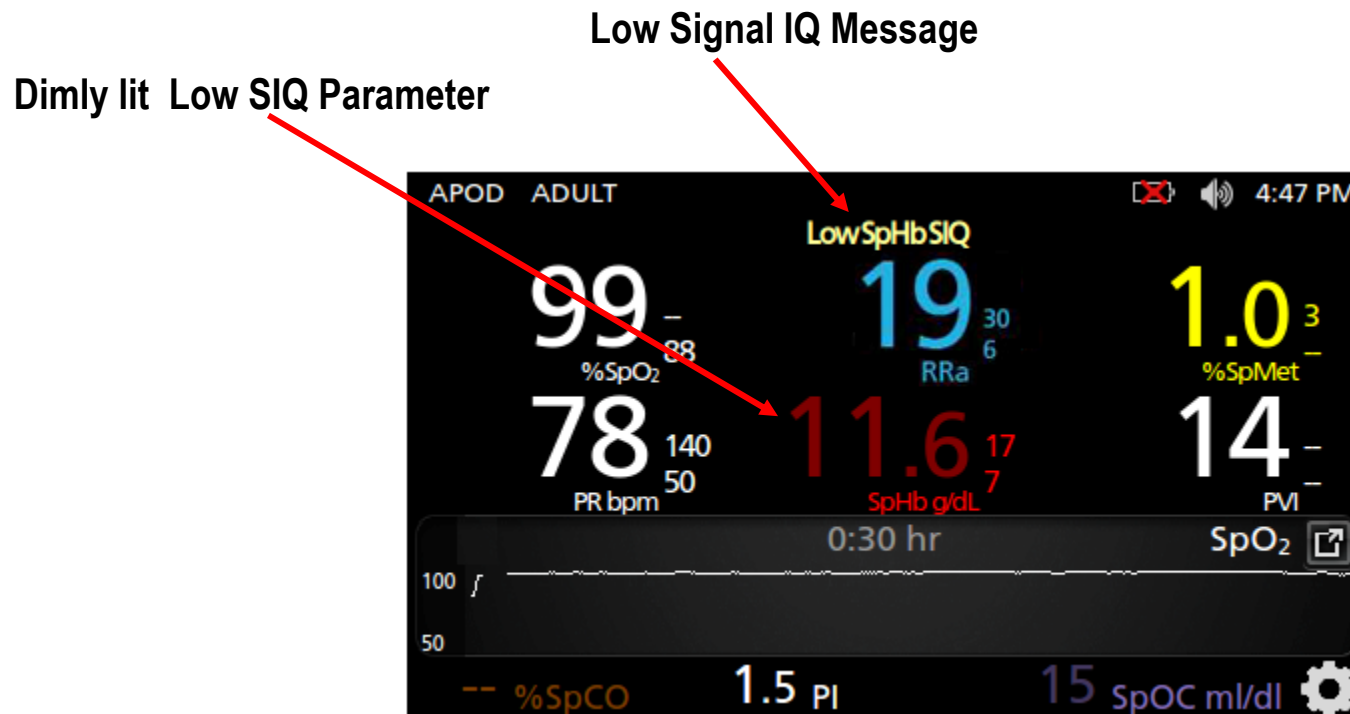
Indication	Perfusion is too weak for the Radical-7[®] to detect an adequate signal
Causes	Improper sensor type or application Sensor applied too tightly Hypothermia Vasoconstriction Hypovolemia Peripheral Vascular Disease
Solutions	Assess patient Rule out occlusion of blood flow Assure that sensor is not attached too tightly Attempt to warm the patient or sensor site Move the sensor to a better perfused site Set the Radical-7 to Max sensitivity

Low Signal IQ™ Message



- > When Signal IQ is very low, the parameter may be dimly lit, and the parameter may display dashes instead of a numeric value

Low SpHb SIQTM Message



- > When Signal IQ is very low, the parameter may be dimly lit, and the parameter may display dashes instead of a numeric value

Low Signal IQ Message

Indication	The accuracy of the SpO₂ measurement may be compromised
Causes	Improper sensor type or application Excessive motion relative to perfusion Damaged or non-functional sensor Distortion of the sensor/tissue/blood flow interface – either by excessive motion or clinical care
Solutions	Assess patient Rule out occlusion of blood flow Check sensor type and application Verify that the sensor emitter and detector are parallel to each other and directly opposed Reapply or move the sensor to an alternate site

Pulse Search Message

Indication	Instrument is searching for a pulse
Causes	Disposable sensor, or reusable sensor with exposed components, connected to patient cable with monitor powered on prior to connection to patient Sensor calibrated to ambient light in room Poor perfusion at monitoring site
Solutions	Assess patient Always apply sensor to patient prior to connecting to patient cable If instrument fails to display within 30 seconds, disconnect and reconnect sensor from cable If pulse search continues, move sensor to better perfused site

Sensor Off / No Sensor Messages

Indication	The sensor is not properly attached to the patient or monitor
Causes	Sensor off patient or not fully inserted into connector Sensor disconnected from patient cable Damaged or defective sensor Patient cable disconnected from oximeter Damaged or defective patient cable
Solutions	Assess patient Attach or reattach sensor to patient Connect patient cable and sensor to the oximeter Disconnect and reconnect the sensor to the cable Check to see if sensor LED is flashing Try a different patient cable, then a new sensor

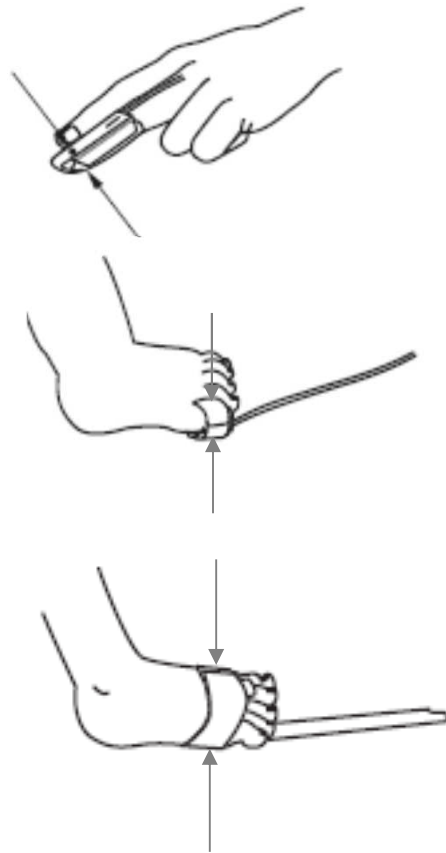
SpO₂ Values Do Not Correlate With Clinical Assessment or ABGs

Indication	During low perfusion states, SpO ₂ may read lower than the actual arterial oxygen saturation
Causes	<p>Misapplied sensor or sensor that becomes partially dislodged may cause either over- or under-reading of actual arterial oxygen saturation</p> <p>Low perfusion</p> <p>Venous congestion may cause under-reading of actual arterial oxygen saturation</p>
Solutions	<p>Assess patient</p> <p>Check for any error messages appearing on the display screen (e.g. <i>Low Perfusion, Low Signal IQ</i>). Follow recommended steps to correct.</p> <p>Rule out occlusion of blood flow</p> <p>Check for sensor displacement</p> <p>Assure sensor is not attached too tightly</p>

Localized Hypoxemia

Indication	SpO₂ reading in a poorly perfused extremity is significantly less than the SaO₂ determined by an ABG
Causes	May be associated with: Significantly increased peripheral vascular resistance. Peripheral vascular disease Multiple pressors (e.g. Levophed) Severe hypovolemia Shock Results in circulatory (stagnant) hypoxemia in the extremity. Localized lactic acidosis and CO₂ accumulation secondary to poor perfusion shifting the oxyhemoglobin dissociation curve to the right.

Proper Sensor Alignment is Key to Pulse Oximetry



**Proper Alignment occurs when
light emitter is directly opposite photodetector**

**Complete coverage of the photodetector
window is needed to insure accurate data**

Cleaning the Radical-7 and Patient Cable

- > **Clean device with 70% Isopropyl alcohol, mild detergent and warm water solution, 3.4% Glutaraldehyde, or 10% bleach solution. Cables should be cleaned with 70% Isopropyl Alcohol.**
- > **Do not spray anything directly onto the Radical-7. Spray the cloth and then wipe the Radical-7, cable, and power cord. Do not allow liquids to enter the interior of the instrument.**
- > **Do not autoclave, pressure sterilize, or gas sterilize the Radical-7 Oximeter.**
- > **Do not soak or immerse the monitor in any liquid.**
- > **Do not use petroleum based or acetone solutions or other harsh solvents to clean the oximeter.**