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Fingertip Pulse Oximeter
User Manual

Jiangsu Konsung Bio-Medical Science And Technology Co., Ltd
NO.8, Shengchang West Road, Danyang Development Zone, Jiangsu Province, 212300, P.R. China
Tel: 86-511-86375968
WhatsApp: 0086-18952012596
E-mail: info@ konsung.com
Website: www.konsungmedical.com

EC REP **Shanghai International Holding Corp. GmbH (Europe)**
Eiffestrasse 80, 20537 Hamburg
Germany
Tel: +49-40-2513175
Fax: +49-40-255726
E-mail: shholding@hotmail.com

Statement

Thanks for your purchasing Fingertip oximeter of Jiangsu Konsung Bio-Medical Science And Technology Co., Ltd. (hereinafter called **Konsung**). Before using the pulse oximeter, please read this manual carefully for understanding the operation and maintenance of the oximeter.
Konsung holds the rights to modify, update, and ultimately explain this manual.
Konsung owns the copyrights of this manual. Without prior written consent of Konsung, any materials contained in this manual shall not be photocopied, reproduced or translated into other languages.
Materials protected by the copyright law, including but not limited to confidential information such as technical information and patent information are contained in this manual, the user shall not disclose such information to any irrelevant third party.
This manual will help you understand the operation and maintenance of the product better. It is reminded that the product shall be used strictly complying with this manual. User's operation failing to comply with this manual may result in malfunction or accident for which Konsung cannot be held liable.
Fingertip Pulse Oximeter is Class 1 LEDs product. It must be serviced by specified trained personnel.

Responsibility of the Manufacturer

Konsung only considers itself responsible for any effect on safety, reliability and performance of the equipment if:

- Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by Konsung, and
- The electrical installation of the relevant room complies with national standards, and
- The instrument is used in accordance with the instructions for use.

Upon request, Konsung may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which Konsung may define as user serviceable.

Part 1 Safety

1.1 Safety Information

The user should pay attention to and abide by the basic safety information which was referred to in this Part.

WARNING

ℓ A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

CAUTION

ℓ A **CAUTION** label advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure.

NOTE

ℓ A **NOTE** provides useful information regarding a function or a procedure.

WARNING

1 **The pulse oximeter is not intended for treatment.**
2 **Do not open the shell of pulse oximeter. Otherwise you may damage the pulse oximeter. All servicing and future upgrades must be carried out by the personnel trained and authorized by Konsung only.**
3 **Do not use the pulse oximeter with the defibrillator or other high-frequency equipment.**
4 **Explosion hazard: Do not use the pulse oximeter in an explosive atmosphere.**
5 **Check and change the applied site according to the different circumstances of the user while using the pulse oximeter for long-time continuous monitoring. It is recommended to check the finger after 2 hours.**
6 **Misapplication of pulse oximeter probe with excessive pressure for prolonged periods can induce pressure injury.**
7 **The measuring data displayed on the pulse oximeter are for reference only and cannot be directly used for diagnostic interpretation.**
8 **The pulse oximeter is not intended to use of infant and neonate.**
9 **The presence of high ambient light may cause inaccurate SpO_2 measurements.**
10 **Do not use the oximeter in situations where alarms required. The oximeter does not support alarms.**
11 **FUNCTIONAL TESTER cannot be used to assess ACCURACY.**
12 **The skin temperature is initially at 35°C for each PULSE OXIMETER, the APPLIED PART temperature cannot exceed 41°C.**
13 **The material that the pulse oximeter contacted to body is Non-toxic silica gel which meet the ISO 10993 requirements, so can be safety used. But to some natural rubber latex sensitive user, there may be some allergic reactions.**
14 **Disposal of the pulse oximeter and its accessories and packaging (plastic bags, foam and cartons, etc.) are subject to local laws and regulations.**

CAUTION

1 **Carefully read this manual about all safety information, operation and specifications before using the pulse oximeter.**
2 **To ensure patient safety, only use accessories and parts produced or recommended by Konsung. Otherwise, damage to the pulse oximeter can occur.**
3 **Keep the operating environment clean, no vibration, no corrosion or combustible material and avoid too high or too low temperature and humidity.**
4 **Do not use the pulse oximeter near by the source of electromagnetic interference, such as mobile phones or radio transmitter.**
5 **Do not spill liquid on the oximeter. Do not immerse the oximeter in liquid. Condensation can occur from changes in temperature or exposure to humidity.**
6 **Always install or carry the pulse oximeter properly to avoid damage caused by drop, impact, strong vibration or other mechanical force.**
7 **Do not use the pulse oximeter if the pulse oximeter cannot achieve satisfactory results.**

NOTE:

1 **Too cold or too thin finger may affect the measurements; thicker finger (recommended index finger, middle finger, or ring finger) should insert into the cover fully.**
2 **SpO_2 waveform is not proportional to the pulse volume. The waveform is normalized.**
3 **Avoid placing the sensor on extremities with an arterial catheter, or intravascular venous infusion line.**
4 **Check the pulse oximeter before using. Do not use it if there is significant damage.**
5 **The pulse oximeter is calibrated to display functional oxygen saturation. It is not necessary to have a SpO_2 calibration when the pulse oximeter is in use.**
6 **The pictures and interfaces in this manual are for reference only.**
7 **Fingernail polish or false fingernails may cause inaccurate SpO_2 readings.**
8 **Never incinerate batteries or expose them to high temperatures.**

1.2 Symbols

Symbols	Definition of symbols
	Refer to instruction manual/booklet
	Caution
	No alarm
	Type BF Applied Part
	Power on/off
	Battery indication
SpO_2	Oxygen saturation of arterial hemoglobin
PR	Pulse Rate
	WEEE symbol
CE 1639	The symbol indicates that the device complies with the European Council Directive 93/42/EEC concerning medical devices.
EC REP	Authorized representative in the European community
SN	Serial Number
P/N	Part Number
LOT	Batch number
	Manufacturer
	Date of manufacture
IPX1	Degree Protection Against Ingress of Liquids and dust

Part 2 The Basics

2.1 Introduction

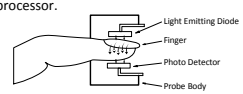
This fingertip pulse oximeter is a kind of innovated detection device with non-invasive and continuous features for artery SpO_2 and PR detection. It is portable and easy to measure the SpO_2 and PR value quickly and precisely.
The oximeter is suitable for family, clinic, oxygen bar, sports health (use before and after exercise is not recommended for use during exercise), community health and other ranges. It's for ages from 15 to 60 years old users.
The oximeter is not suitable for continuous monitoring of patients.
The pulse oxygen saturation is the percentage of HbO_2 in the total Hb in the blood, so-called the O_2 concentration in the blood. It is an important bio-parameter for respiration. A number of diseases relating to the respiratory system may cause the decrease of SpO_2 in the blood, furthermore, some other causes such as the malfunction of the human body's self-adjustment, damages during surgery, and the injuries caused by some medical checkups would also lead to the difficulty of oxygen supply in human body. The corresponding symptoms would appear as a consequence, such as vertigo, impotence, vomit etc. Some symptoms may be serious enough to cause significant harm. Therefore, prompt information concerning the patients SpO_2 can help doctors discover potential problems, and is of great importance in the clinical and medical field.

2.2 Intended Use and Contraindication

Intended use: The fingertip pulse oximeter is intended to measure the pulse oxygen saturation of arterial hemoglobin and pulse rate of adults and pediatrics in home care and medical outpatient environment.
Contraindication: none

2.3 Principle

The Principle of the oximeter is as follows: an experience formula of data process is established making use of the Lambert Beer law according to Spectrum Absorption Characteristic of Reductive hemoglobin (Hb) and oxyhemoglobin (HbO2) in glow & near-infrared zones. The operation principle of the device is: Photoelectric Oxyhemoglobin Inspection Technology is adopted in accordance with Capacity Pulse Scanning Recording Technology, so that two beams of different wavelengths of light can be focused onto human nail tip through perspective clangs finger-type sensor. Then measured signal can be obtained by a photosensitive element, information acquired through which will be shown on two groups of LED through process in electronic circuits and microprocessor.

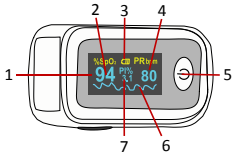


Oximeter Schematic Diagram

2.4 Applications

- This pulse oximeter is suitable for the following people: People with vascular disease, such as: coronary heart disease, hypertension, hyperlipidemia, cerebral thrombosis;
- People with respiratory diseases, such as: asthma, trachitis, chronic bronchitis, chronic cor pulmonale, chronic obstructive pulmonary disease;
- Old people above 60 years old;
- People who works more than 12 hours a day;
- People works on extreme exercise or under the alpine hypoxic environment;
- Long-term alcohol people.

2.5 Appearance



1. Two colors OLED display
2. Oxygen saturation of arterial blood (SpO_2): percentage of oxygenated hemoglobin in relation to the sum of oxyhemoglobin and deoxyhemoglobin.
3. Battery capacity Indicator
   - Full capacity, the middle part indicates the capacity.
   - Capacity is seriously empty, change batteries immediately.
4. Pulse rate (derived from pleth wave): detected pulsations per minute.
5. Power button
   - Press this button to turn on the oximeter.
   - Press this button to adjust the display screen direction according to the users observation data needs.
   - Press and hold this button 2 seconds to enter Setting interface.
   - In Setting interface, press this button once to switch setting items.
   - In Setting interface, press and hold this button 2 seconds to confirm setting.
6. Pleth waveform: visual indication of patient's pulse.
7. Perfusion index (PI): gives the numerical value for the pulsatile portion of the measured signal caused by arterial pulsation.
   PI is an indicator of the pulsatile strength. You can also use it to assess the quality of SpO_2 measurement. Above 1 is optimal, between 0.3 and 1 is acceptable. Below 0.3 indicates low perfusion; reposition the SpO_2 sensor or find a better site. If low perfusion persists, choose another method to measure oxygen saturation if possible.

Part 3 Unpacking and Storage

3.1 Open-case inspection

Before unpacking, examine the packing case carefully for signs of damage. If any damage is detected, contact the carrier or us. Take out all bulk packaging from the carton. If the packing case is intact, open the package and remove the equipment and accessories carefully.
Check whether there is any damage to the surface of the oximeter such as notches, dents, abrasions and so on. Check whether the components are missing according to packing list.

3.2 Storage

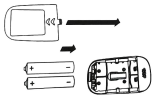
The oximeter is manufactured with precision parts. Do not place the oximeter in the following places:

- Easy to splash;
- With Direct sunlight, high temperature, humidity, dust, and corrosive gas;
- Tilt, generate vibration and impact;
- Store chemicals or corrosive gases.

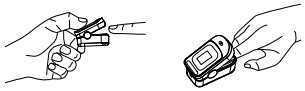
Part 4 Operation Instructions

4.1 Using Oximeter

1. Remove the battery cover, and insert the two AAA batteries following polarity markings indicated inside of the battery compartment, then reposition the cover.



2. Hold the oximeter with the display facing toward you, slide your finger into the opening probe of the device as shown below, until the fingertip touches the built-in stop guide. For best results, make sure the finger is centered within the finger guide.



3. Press the POWER button to turn on the oximeter. The measurement interface will appear in 3 seconds.
4. The measurement result will appear on the screen within 10 seconds.

The pulse oximeter will power off in 15 seconds if no signal in screen, or there is finger for detection and without operation.

NOTE:

1 **We recommend using the index finger, middle finger, or ring finger as suitable positions for the monitor. It is intended for spot-checking or attended-care monitoring in home health care and medical facilities.**
2 **The displayed parameters will show invalid indicator as '---' if signal quality is very low.**
3 **The displayed parameters will show invalid indicator as '---' if oximeter fault occurs.**
4 **Finger cannot apply nail polish and other cosmetics.**
5 **Do not shake the finger, hand or body during the measuring.**
6 **Tape or other light obstructions around the applied site may affect the accuracy of SpO_2 and pulse rate.**
7 **The oximeter will shut down if no any actions within 15 seconds after it turning on.**
8 **Battery polarities should be correctly installed, otherwise, damage may be caused to the equipment.**
9 **Please remove the batteries if the oximeter will be stored for more than 30 days.**
10 **Battery may leak or explode if used or disposed of improperly.**

The following factors may influence the accuracy of measurement:

- Ambient light (including photodynamic therapy)
- Physical movement (patient and imposed motion)
- Diagnostic testing
- Low perfusion
- Electromagnetic interference, such as MRI environment
- HF SURGICAL EQUIPMENT
- Dysfunctional hemoglobin, such as carboxyhemoglobin (COHb)and methemoglobin (MetHb)
- Presence of certain dyes, such as methylene and indigo carmine
- Inappropriate positioning of the SpO_2 sensor, or use of incorrect SpO_2 sensor.
- Drop of arterial blood flow to immeasurable level caused by shock, anemia, low temperature or vasoconstrictor.

4.2 Display Description (6 interface diagrams)

Setting interface		
Pulse Oximeter Interfaces	Without detection signal interface diagram	A detection signal interface diagram
Interface 1		
Interface 2		
Interface 3		
Interface 4		
Interface 5		
Interface 6		

Screen Description:
"**%SpO₂**": SpO_2 symbol;
"**PR bpm**": Pulse rate icon;
"PI%": Perfusion index icon;
" ": Bar graph icon;

" ": Pulse intensity histogram.

Part 5 Included Accessories

Use only accessories specified in this manual. Using other accessories may cause damage to the pulse oximeter. Or the performance of pulse oximeter cannot meet the specifications claimed in this specification.
The accessory material that contacts the user or other personnel has undertaken the bio-compatibility test and is verified to be in compliance with ISO 10993-1.

- One lanyard
- One User Manual
- One Quality Certificate

Part 6 Maintenance

6.1 Maintenance

The oximeter's design life expectancy is about two years, keep your equipment and accessories free of dust and dirt, and follow these rules:

1) Please clean the equipment before use according to Part 7; Remove the batteries inside the battery cassette if the equipment will not be operated for more than 30 days.
2) Replace the batteries when the low battery indicator says it is necessary.
3) It is recommended that the equipment should be kept in a dry environment with no corrosive gases and good ventilation. Storing the pulse oximeter improperly will affect its lifespan and damage the equipment.
4) It is best to preserve the product in a place where the temperature is between -20°C to 55°C and the relative humidity is less than 93%.
5) The packed equipment can be transported by ordinary conveyance. The equipment may not be transported with toxic, harmful, or corrosive materials.

If any damage or abnormality is found, please do not use the oximeter and contact local Customer Service Center.

NOTE:

1 **Do not attempt to disassemble the oximeter or repair it unless you are trained personnel.**
2 **No modification of this equipment is allowed.**
3 **Necessary maintenance must be performed by qualified service personal ONLY.**
4 **Users are NOT permitted to maintain the equipment by themselves.**
5 **There are NO replaceable components in the equipment.**

6.2 Disposal

Dispose of the pulse oximeter in accordance with local environment and waste disposal laws and regulations.

Part 7 Cleaning/Disinfection

7.1 Cleaning

The recommended cleaning agent is water.

1. Shut down the pulse oximeter and remove the batteries.
2. Clean the pulse oximeter with cotton or a soft cloth moistened with water.
3. After cleaning, wipe off the water with a soft cloth.
4. Allow the pulse oximeter to air dry.

7.2 Disinfection

The recommended disinfectants include: ethanol (75%), isopropanol (70%).

1. Shut down the pulse oximeter and remove the battery.
2. Clean the pulse oximeter as instructed above.
3. Disinfect the oximeter with cotton or soft cloth moistened with one of the recommended disinfectants.
4. After disinfection, be sure to wipe off the disinfectant left on the oximeter with a soft cloth moistened with water.
5. Allow the pulse oximeter to air dry.

CAUTION

1 **Never immerse or soak the pulse oximeter.**
2 **It is recommended that the pulse oximeter be cleaned and disinfected after every use as determined by your hospital's policy to avoid long term damage to the pulse oximeter.**
3 **Never use cleaning agents/disinfectants other than the types recommended.**
4 **The sensor component is not cleaned and disinfected during testing.**
5 **Do not disinfect the oximeter with methods such as high temperature, high pressure, gas fumigation or liquid immerse. Follow the manufacturer's instructions of cleaning and disinfection for pulse oximeter.**
6 **Oximeter's regular calibration and maintenance should be taken by qualified professionals.**

NOTE:

1 **If you spill liquid on the equipment or accessories, wipe the oximeter immediately and dry the oximeter. If the oximeter cannot work normal please contact us or your service personnel.**
2 **Never use EtO or formaldehyde for disinfection.**

Part 8 Specification

Safety specifications (classified according to IEC60601-1)	
Electric shock protection	Internal power supply device
Degree of protection against electrical shock	Type BF applied part
Degree of protection against ingress of liquid	IPX1, non AP/APG type
Operating mode	Continuous

Measurement Specifications	
SpO_2 Displayed Range	35%-100%
SpO_2 Accuracy[1]	±2% in the range of 70%-100% Other scope is not defined
PR Displayed Range	30bpm - 240bpm
PR accuracy	±3bpm
Data update period	0.25s -2s
SpO_2/PR averaging time	8s
Peak wavelength range[2]	500nm - 1000nm
Maximum optical output power	15mW

[1] **Sensor accuracy was obtained by performing controlled hypoxia studies on healthy, non-smoking adult volunteers (according to ISO 80601-2-61). The SpO_2 readings have been compared to CO-oximeter measurements on arterial blood saturation. To represent the general population, data from at least 10 subjects (male and female) with a wide range of skin color was taken to validate SpO_2 accuracy.**
[2] **The information about wavelength range and maximum optical output power of the light emitted by the oximeter sensor can be especially useful to clinicians, for example, clinicians performing photodynamic therapy.**

Physical Specifications	
Length x Width x Height	64 x 39 x 36 mm
Weight	≤55g (excluding batteries)

Hardware specifications	
Display screen	two color OLED, 0.96"
Display Content	SpO_2%, Pulse rate, Battery indicator, Bar graph, Pulse waveform, PI%

Environmental Specifications	**Working**	**Transport and Storage**
Temperature (°C)	5 ~ 40	-20 ~ 60
Relative humidity (non condensing)	30% ~ 80%	10% ~ 95%
Atmospheric Pressure (kPa)	70 ~ 106	70 ~ 106

Power Requirements	
Specification of alkaline batteries	Two AAA
Operating current	Less than 30mA
Power dissipation	in normal measurement, less than 40mA; in power off state, less than 50μA

Part 9 Troubleshooting

Trouble	**Possible Reason**	**Solution**
The oximeter can't turn to measure mode.	The batteries are completely exhausted.	Please replace the batteries.
	An incorrect battery installation.	Verify and correct the batteries installation.
	The oximeter may be broken.	Please contact local service.
The display is off suddenly.	The device will turn into sleep mode automatically if there is no signal in 15 seconds.	Press the POWER button again to reactivate the oximeter.
	The batteries are completely exhausted.	Please replace the batteries.
The SpO_2 and Pulse Rate readings are unstable.	The luminescent or photoelectric window is sheltered by some object.	Check the luminescent and photoelectric window.
	Excessive movement.	Stop moving finger, hand and body.
	The finger is not placed inside deep enough.	Place the finger properly and try again.
	Finger size is not within the recommended range.	Change to another finger.
	Excessive ambient light.	Avoid the excessive light.
	Pulse rate value of the cyclical fluctuations.	The measurement is normal, and the patient has arrhythmia.
The SpO_2 and PR are not displayed normally.	The finger is not properly positioned.	Place the finger properly and try again.
	The patient's SpO_2 is too low to be detected.	Try again, go to a hospital for a diagnosis if you are sure the device works properly.

Part 10 Warranty and Service Policy

10.1 Warranty

Konsung warrants that **Konsung's** products meet the labeled specifications of the products and will be free from defects in materials and workmanship that occur within warranty period.
The warranty is void in cases of:

- damage caused by mishandling during shipping.
- subsequent damage caused by improper use or maintenance.
- damage caused by alteration or repair by anyone not authorized by Konsung.
- damage caused by accidents.
- replacement or removal of serial number label and manufacture label.

If a product covered by this warranty is determined to be defective because of defective materials, components, or workmanship, and the warranty claim is made within the warranty period, **Konsung** will, at its discretion, repair or replace the defective part(s) free of charge. **Konsung** will not provide a substitute product for use when the defective product is being repaired.

10.2 Contact Information

If any questions in equipment operation, please contact the manufacturer or local agency.
Jiangsu Konsung Bio-Medical Science And Technology Co., Ltd.
Address: No. 8, Shengchang West Road, Danyang Development Zone, Jiangsu Province, China
Tel: +86-511-86375968
Fax: +86-511-86371668
E-mail: info@konsung.com

Part 11 EMC

11.1 Electromagnetic Emissions-for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic emission		
The oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of the oximeter should assure that it is used in such an environment.		
Emission test	**Compliance**	**Electromagnetic environment – guidance**
RF(Radio frequency) emissions CISPR 11	Group 1	The oximeter uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF(Radio frequency) CISPR 11	Class B	The oximeter is suitable for use in all establishments, other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC/EN 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC/EN 61000-3-3	Complies	

11.2 Electromagnetic Immunity-for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration – electromagnetic immunity			
The oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of the oximeter should assure that it is used in such an environment.			
Immunity test	**IEC/EN 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC/EN 61000-4-2	8 kV contact 15 kV air	8 kV contact 15 kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient /burst IEC /EN 61000-4-4	2kV for power supply lines 1 kV for input /output lines	N/A	N/A
Surge IEC / EN 61000-4-5	1 kV differential mode 2 kV common mode	N/A	N/A
Power frequency (50/60Hz) magnetic field IEC /EN 61000-4-8	30A/m	30A/m,50/60 Hz	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC/EN 61000-4-11	0 % U_T, for 0.5 cycle (100% dip in U_T) 0 % U_T, for 1 cycle (100% dip in U_T) 70 % U_T, for 25/30 cycles (30% dip in U_T) 0 % U_T, for 250/300 cycles (100% dip in U_T)	N/A	N/A

NOTE: U_T is the AC mains voltage prior to application of the test level.

11.3 Electromagnetic Immunity-for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration – electromagnetic immunity			
The oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of oximeter should assure that it is used in such an environment.			
Immunity test	**IEC/EN 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Conducted RF IEC/EN 61000-4-6	3 Vrms 150 kHz to 80 MHz	N/A	Portable and mobile RF communications equipment should be used no closer to any part of the Oximeter, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz-800 MHz $d = 2.3\sqrt{P}$ 800 MHz-2.7 GHz Where: Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:
Radiated RF IEC/EN 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m	

NOTE 1 **At 80 MHz and 800 MHz, the higher frequency range applies.**
NOTE 2 **These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.**

a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Oximeter is used exceeds the applicable RF compliance level above, the Oximeter should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Oximeter.
b Over the frequency range 150kHz to 80MHz, field strengths should be less than 3V/m.

11.4 Recommended Separation Distances

Recommended separation distances between portable and mobile RF communications equipment and the oximeter			
The oximeter is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the oximeter can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the oximeter as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter(m)**		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{P}$	**800 MHz to 2.7 GHz** $d = 2.3\sqrt{P}$
0.01	N/A	0.12	0.23
0.1	N/A	0.38	0.73
1	N/A	1.2	2.3
10	N/A	3.8	7.3
100	N/A	12	23
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.			

NOTE 1 At 80MHz and 800MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.