

Ohmeda Biox 3700 Pulse Oximeter



Operating / Maintenance Manual

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P/N 380-0900-001
(1118-300)
Revision F

All specifications subject
to change without notice.

BOC Health Care

Printed in USA

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS.....1-2

DEFINITIONS.....3-5

 * Warnings.....3

 * Cautions.....4-5

USER RESPONSIBILITY/TRACEABILITY.....6

INTRODUCTION/GENERAL DESCRIPTION.....7

PRINCIPLES OF OPERATION.....8-12

DEFAULT SETTINGS.....13

PREOPERATIVE CHECKLIST.....14-16

GENERAL OPERATION GUIDELINES (**Quick Start Up**)17-19

FEATURES AND CONTROLS OF THE FRONT PANEL AND REAR PANEL.....20-25

HANDLE POSITIONING.....26-27

SPECIFICATIONS.....28-31

SIGNAL AND DATA VALIDITY.. (**IMPORTANT:READ THIS SECTION**)32-34

SET UP.....35-36

PREPARING THE PATIENT.....37-49

 * Attachment of the Ear Probe.....37-38

 * Attachment of the Finger Probe.....39-40

 * Attachment of the Flex Probe.....41-49

 Adult Application.....41-44

 Removing the Flex Probe.....45-46

 Neonatal Application.....47-49

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS.....1-2

DEFINITIONS.....3-5

 * Warnings.....3

 * Cautions.....4-5

USER RESPONSIBILITY/TRACEABILITY.....6

INTRODUCTION/GENERAL DESCRIPTION.....7

PRINCIPLES OF OPERATION.....8-12

DEFAULT SETTINGS.....13

PREOPERATIVE CHECKLIST.....14-16

GENERAL OPERATION GUIDELINES (**Quick Start Up**)17-19

FEATURES AND CONTROLS OF THE FRONT PANEL AND REAR PANEL.....20-25

HANDLE POSITIONING.....26-27

SPECIFICATIONS.....28-31

SIGNAL AND DATA VALIDITY.. (**IMPORTANT:READ THIS SECTION**)32-34

SET UP.....35-36

PREPARING THE PATIENT.....37-49

 * Attachment of the Ear Probe.....37-38

 * Attachment of the Finger Probe.....39-40

 * Attachment of the Flex Probe.....41-49

 Adult Application.....41-44

 Removing the Flex Probe.....45-46

 Neonatal Application.....47-49

TABLE OF CONTENTS

STRESS AND EXERCISE TESTING.....	50-54
* Set-up Patient.....	50-54
* Set-up Oximeter.....	54
MESSAGES.....	55-63
* Status Messages Description.....	55-58
* Alarm Messages Description.....	59-63
Patient Alarm Limit Condition.....	59
Probe Alarm Condition.....	59
Device Failure Alarm Condition.....	59
TREND 20/60.....	64-66
* Description.....	64-65
* Restoring Previous Trend Data.....	65-66
OHMEDA SINGLE OR DUAL CHART RECORDER CONNECTION.....	67-70
CONNECTION WITH CHART RECORDERS, POLYGRAPHS AND OTHER RECORDING EQUIPMENT.....	71
ANALOG OUTPUT OF TREND DATA.....	72-73
DIGITAL INTERFACE.....	74
COMPUTER INTERFACE.....	75-82
* Connection with an IBM PC ®	75-79
* Auto-Dump Mode.....	80
* Trend-Dump Mode.(Digital Output).....	81
* Slave Mode.....	81-82
* Control Mode.....	82
MAINTENANCE.....	83-86
* Cleaning and Sterilization.....	83-84
* Recharging the Battery.....	85
* Calibration Procedure.....	86

TABLE OF CONTENTS

PARTS LIST.....87

REPAIR POLICY AND PROCEDURE.....88

APPENDIX OF MESSAGES.....89-91

TABLE OF KEYS.....92-93

INDEX.....94-98

WARRANTY.....99

LIST OF ILLUSTRATIONS

TRACEABILITY REGISTRATION CARD.....6

EXTINCTION V.S. WAVELENGTH GRAPH.....9

FRONT PANEL.....20, 23, 24

GRAPHIC DISPLAY.....20

DIGITAL DISPLAY.....22

REAR PANEL.....25

OXIMETER POSITIONED ON FLAT SURFACE.....26

FRONT OF OXIMETER RAISED.....26

HAND CARRY.....26

HOOKED ON TO BED RAIL.....27

TYPICAL PHOTO-PLETHYSMOGRAPHIC WAVEFORM.....32

NOISY PHOTO-PLETHYSMOGRAPHIC WAVEFORM.....33

NOISY PHOTO-PLETHYSMOGRAPHIC WAVEFORM.(Noise Spikes).....33

PLACEMENT OF EAR PROBE ON THE EAR LOBE.(Side View).....37

CORRECT FINGER PROBE ATTACHMENT.....39

FLEX PROBE ATTACHMENT.(ADULT).....41-44

REMOVING THE FLEX PROBE.....45

FLEX PROBE ATTACHMENT.(NEONATAL).....47-49

ATTACHMENT OF STABILIZER TO EAR PROBE.....50

PLACEMENT OF THE EAR PROBE ON THE EAR LOBE.(Side View).....51

PLACEMENT OF THE EAR PROBE ON THE EAR LOBE.(Back View).....51

STRESS TESTING - PATIENT SET-UP.(Side View).....52

STRESS TESTING - PATIENT SET- UP.(Side View).....52

20 MINUTE TREND GRAPH.....64

LIST OF ILLUSTRATIONS

60 MINUTE TREND GRAPH.....65
20 MINUTE TREND GRAPH OF RESTORED TREND DATA.....66
OHMEDA CHART RECORDER CONTROL PANEL.....67,69
REAR PANEL.....71
CHART PAPER WITH TICK MARK.....73
DIGITAL INTERFACE CONNECTOR.....74

WARNINGS

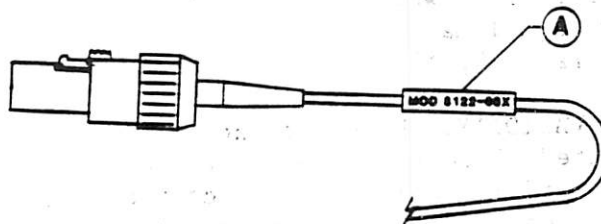
A WARNING INDICATES A POTENTIALLY HARMFUL SITUATION.

- * ELECTRICAL SHOCK HAZARD: Do NOT remove top cover. Refer to qualified personnel.
- * FAILURE OF OPERATION: If the oximeter fails to respond as described do NOT use it until the situation has been corrected by qualified personnel. (See Page 14, 18)
- * EXPLOSION HAZARD: Do NOT use in the presence of flammable anesthetics. (See Page 17)
- * DATA VALIDITY: Do NOT expose the probe detector to strong ambient light while it is being used to monitor a patient. A poor signal may result. (See Page 19, 51)
- * DATA VALIDITY: Do NOT attach a probe to the same limb with an inflated blood pressure cuff. Valid data will NOT be received when cuff is inflated. Attach probe to the limb opposite the site used for the blood pressure cuff. (See Page 35)
- * PATIENT SAFETY: Patient condition may require changing the probe test site periodically. This should diminish the possibility of pressure necrosis of the test site. (See Page 35, 47-48)
- * PATIENT SAFETY: Exercise extreme care to assure continued circulation distal to probe site after application. (See Page 47)
- * ELECTRICAL SHOCK HAZARD: Always turn the power OFF before cleaning the oximeter. (See Page 83)

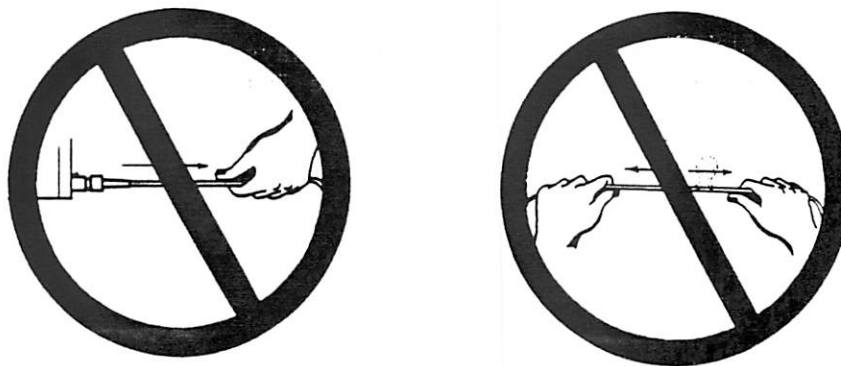
CAUTIONS

A **CAUTION** INDICATES A CONDITION THAT MAY LEAD TO EQUIPMENT DAMAGE OR MALFUNCTION.

- * Federal law in the U.S.A. and Canada restricts this device to sale by or on the order of a licensed medical practitioner. (See Page 6)
- * Use only the probes supplied for this model of Oximeter. Check the Identification Number/Serial Number Tag (A) which is located on the cable near the connector. The model number must read: MOD 8122-00X or 8121-00X (X represents a digit from 1 through 5). (See Pages 15, 17, 22, 36)



- * Do NOT apply tension to the probe cable. (See Pages 18, 36, 38, 40, 44, 46, 49, 51, 53)

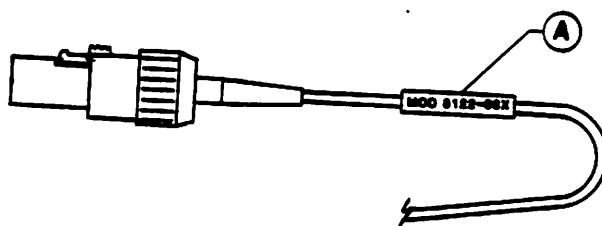


- * Check rear panel voltage setting before connecting the Oximeter to AC mains power (USA 120 VAC). (See Page 25)
- * Avoid storing the Oximeter and probes at temperatures exceeding -20 degrees C (-4 degrees F) to 60 degrees C (140 degrees F).

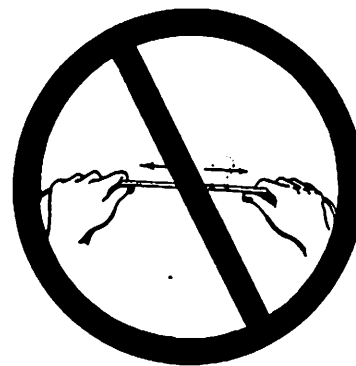
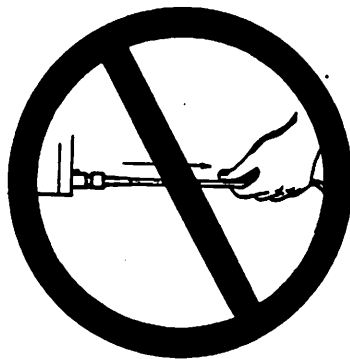
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- * Do NOT apply tension to the probe cable. (See Pages 18, 36, 38, 40, 44, 46, 49, 51, 53)



- * Check rear panel voltage setting before connecting the oximeter to AC mains power (USA 120 VAC). (See Page 25)
- * Avoid storing the oximeter and probes at temperatures exceeding -20 degrees C (-4 degrees F) to 60 degrees C (140 degrees F).

USER RESPONSIBILITY

This product conforms to its operation and design specifications as described in this manual and any accompanying labels and/or inserts, when operated, maintained, and repaired in accordance with the instructions provided. Do NOT use a defective product. Replace parts that are broken, missing, plainly worn, distorted or damaged in any way immediately. This product or any of its components should be repaired by Ohmeda trained personnel. Any exceptions to this recommendation must be made according to the written instructions provided by Ohmeda. When service is not provided by Ohmeda Customer Service Personnel, the user of this product shall have the sole responsibility for any losses incurred during unauthorized maintenance, as a result of improper repair, damage, or alteration.

TRACEABILITY

Federal law in the U.S.A. requires traceability of this equipment. Please fill out the self-addressed traceability registration card included with this product and return it to Ohmeda Boulder. If additional cards are required, order stock number 380-0900-005.

SAMPLE CARD

Traceability Registration/Warranty Information	
Federal law requires traceability of this equipment.	
Federal regulations require us to obtain this information in order to maximize our response to you in the event of a recall.	
Facility Name:	METHODIST HOSPITAL
Contact Name:	JOHN DOE Dept: RESP
Address:	1234 SOUTH MAIN ST.
City:	YOUR TOWN State: CO Zip: 80301
Country:	USA Serial No.: 1118-70000
Operator's Manual Part No. & Revision:	1118-300/D
Service Manual Part No. & Revision:	1118-302/E
Date Received:	M / D / Y
Signature:	<i>John Doe</i> Date: M / D / Y

Complete Info. Remove String and Mail.
1000-205

CAUTION Federal law in the U.S.A. and Canada restricts this device to sale by or on the order of licensed medical practitioner.

NOTE: The Oximeter serial number is located on the rear panel.

INTRODUCTION

This manual describes the proper operation and maintenance for the Ohmeda Biox 3700 Pulse Oximeter. Operators, please read this manual before using the Pulse Oximeter, paying attention to all details of correct operation along with precautionary measures recommended. All maintenance procedures in this manual are designed to be performed by the operator of the oximeter.

GENERAL DESCRIPTION

The Ohmeda Biox 3700 Pulse Oximeter is a stand alone, noninvasive, arterial oxygen saturation monitor. Ear, finger or flex probes connect the monitor to the patient, and provide continuous oxygen saturation (SaO_2) and pulse rate readings.

The oximeter determines a patient's arterial oxygen saturation and pulse rate by measuring the absorption of selected wavelengths of light. The light generated in the probe passes through the tissue and is converted into an electronic signal by the photodetector. The electronic signal passes to the oximeter and is amplified. Analog and digital signal processing converts the light intensity information into SaO_2 and pulse rate values. Two liquid crystal displays (LCD) present patient data and status information. The numeric digital LCD displays SaO_2 and pulse rate, while the graphic LCD displays the plethysmographic waveform, trend data, status messages and alarm messages.

PRINCIPLES OF OPERATION

THEORY

The functioning of the Ohmeda Biox 3700 Oximeter is based on the assumption that hemoglobin exists in two principle forms in the blood:

- * oxygenated (with O₂ molecules loosely bound) or HbO₂
- * reduced (with no molecules bound) or Hb.

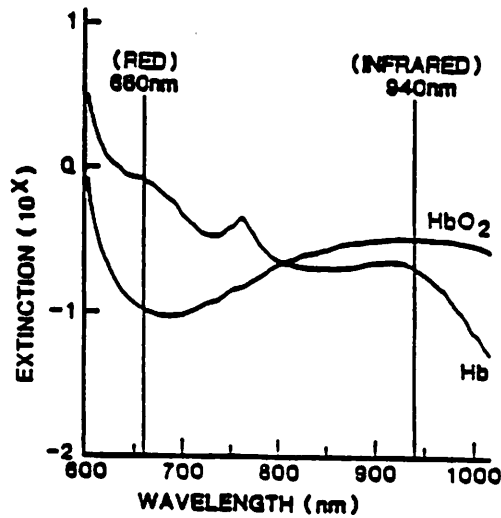
Arterial oxygen saturation (SaO₂) is defined as the ratio of oxygenated hemoglobin (HbO₂) to total hemoglobin [HbO₂ + Hb (+ other forms of hemoglobin present in arterial blood)]:

$$SaO_2 = \frac{HbO_2}{HbO_2 + Hb (+ \text{ other forms of hemoglobin present in arterial blood})}$$

An oximeter measures the absorption of selected wavelengths of light passing through a living tissue sample. Since oxygenated hemoglobin and reduced hemoglobin absorb light as known functions of wavelengths, the relative percentage of these two constituents, and SaO₂ are calculated. The central problem in translating oximetry theory into medical device is differentiating between the absorption due to oxygenated and reduced hemoglobin and the absorption due to all other tissue constituents.

The Ohmeda Biox 3700 solves this problem with a patented two wavelength, pulsatile system. The pulsation of arterial blood flow present at a particular test site modulates the light the oximeter's probe detects. Since other fluids and tissues present at the test site generally do not pulsate, they do not modulate the light passing through the test site area. Therefore, the attenuation of light energy due to arterial blood flow can be detected and isolated, thus providing the basis for the necessary calculations, by using the pulsatile portion of the incoming signal.

Two wavelengths of light, red and infrared, are utilized to gauge the presence of oxygenated and reduced hemoglobin.



EXTINCTION versus WAVELENGTH GRAPH

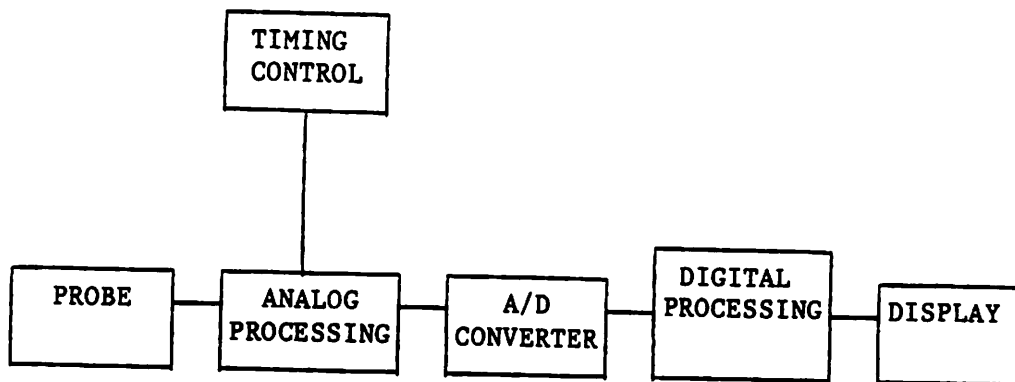
Oxygenated hemoglobin (HbO₂) exhibit markedly different absorption (extinction) characteristics to red light @ 660nm and infrared light @ 940 nm.

The probe's photodetector converts the light, which is partially absorbed and modulated as it passes through the tissue sample, into an electronic signal. Since HbO₂ and Hb allow different amounts of light to reach the photodetector at the selected wavelengths, the electronic signal varies depending on which light source is "on" and the oxygenation of the arterial hemoglobin. The oximeter amplifies the electronic signals received. Analog and digital signal processing converts the light intensity information into SaO₂ and pulse rate values and displays them on the oximeter front panel.

FUNCTIONAL COMPONENTS

The Ohmeda Biox 3700 uses electrical components in signal processing. This discussion explains the function of:

- * the probe
- * the analog and digital electronics
- * the calculations the microprocessor makes.



PROBE

The probe consists of: the light source, and the photodetector.

Two light emitting diodes (LEDs) compose the light source of the Ohmeda Biox 3700 oximeter:

- * one Red (R)
- * one Infrared (IR).

The photodetector is a photodiode: An electronic device that produces an electrical current proportional to incident light intensity.

The photodetector sees only light energy and does not distinguish between light wavelengths. The timing circuitry sequences the Red and Infrared light sources on and off. The established timing sequence is:

- * red LED on
- * infrared LED on
- * both LEDs off.

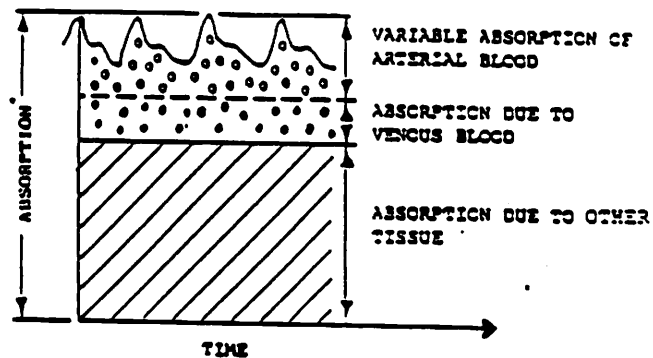
This sequence repeats itself. This cycling occurs 480/400 (60/50 Hertz) times per second allowing the photodetector to quantify the light energy at the appropriate wavelengths by producing a current at appropriate points in the cycle. The on/off LED cycling also determines the effect of ambient light hitting the photodetector. The off point or "dark" portion in the light sequence is measured and utilized to eventually cancel the effects of the ambient light. The photodetector produces current and an operational amplifier in the oximeter converts it to voltage for further processing.

ANALOG PROCESSING

The cycling routine takes many measurements and two separate voltage "channels" emerge:

- * one for Red light
- * one for Infrared light.

The actual signal generated, as it relates to light absorption, is represented below:



The photodetector detects changes in light intensity indicating absorption.

This "pulsatile" signal composite is generated, amplified and filtered simultaneously for both red and infrared light. Filtering the signals reduces the "noise" present due to motion of the probe, ambient lighting, electrical interference, etc., and discards constant signal levels (non-pulsating). The pulsatile voltage levels (one for red and one for infrared) are left to pass "downstream" for further processing.

The A/D Converter takes the pulsatile signals from the filters and converts them to digital signals. A microprocessor performs complex calculations determining the saturation of measured arterial blood.

DIGITAL PROCESSING

The microprocessor performs mathematical processes comparing the data from the red and infrared channels to each other. A ratio of the change in voltage in the red channel (ΔRED) to the change in voltage of the infrared channel (ΔIR) over some small interval of time is used to calculate SaO_2 . This "instantaneous" oxygen saturation is calculated 30/25 (60/50 Hz) times per second.

A. From theory, oxygen saturation calculates as:

$$\text{SaO}_2 = K1R^2 + K2R + K3$$

$$\text{where } R = \frac{\Delta \text{RED}}{\Delta \text{IR}} \quad \text{and } K1, K2, K3 \text{ are constants}$$

where oxygen saturation at any point in time is a function of the change in the red channel divided by the change in the infrared channel.

The physical optical characteristics of hemoglobin are the basis of the calibration coefficients: $K1$, $K2$, and $K3$. The oximeter processes the instantaneous oxygen saturation values to produce the "average saturation values." This value appears on the oximeter's digital display.

One key digital processing function is to properly average the instantaneous oxygen saturation values. A running average gives a reasonable, but not excellent result. A weighted average of instantaneous values provides for a much more acceptable result. Perfusion at the test site and the current average saturation are the basis for the weight assigned to each instantaneous calculation. For example, movement at the probe site can create signal distortion, thus creating some erroneous instantaneous oxygen saturation values.

Since there are many saturation measurements per second, it is possible to discard bad values away and the displayed saturation remains stable. The weighting function provides a stable reading, with low sensitivity to motion while retaining the capability of responding quickly to saturation changes. This running, weighted average uses data over a six/three (Slow Mode/Fast Mode) of data and is updated every 0.67/0.33 (Slow Mode/Fast Mode) seconds.

DEFAULT SETTINGS

A DEFAULT PARAMETER refers to a Volume Level or High/Low Alarm Limit automatically set by the oximeter when it is turned on.

<u>PARAMETERS</u>	<u>DEFAULT SETTINGS</u>	<u>RANGES</u>
High SaO ₂ Limit	OFF indicated by "----"	70 - 100%
Low SaO ₂ Limit	90%	50 - 100%
High Pulse Rate	OFF indicated by "----"	70 - 250 BPM*
Low Pulse Rate	50 BPM	40 - 200 BPM
Alarm Volume	4	1 - 10
Pulse Volume	4	OFF - 10

* B.P.M. = Beats Per Minute

PREOPERATIVE CHECKLIST

Perform the following tests daily to assure proper operation of the oximeter. Do NOT use the oximeter if it fails any test. Remove it from use until the situation has been evaluated, and the product repaired and checked for correct operation.

WARNING FAILURE OF OPERATION: If the oximeter fails to respond as described, do NOT use it until the situation has been corrected by qualified personnel.

OXIMETER

VISUAL INSPECTION

1. Inspect the oximeter case for damage.
2. Ensure the display windows are clean. (See page 83)

FUNCTIONAL INSPECTION

1. Connect a probe to the oximeter. Attach the probe to either finger or ear.
2. Turn the oximeter on. Verify that the oximeter displays "OHMEDA-BIOX 3700 REVISION: X SYSTEM CHECK IN PROCESS" during the diagnostic self-test. Verify that the Status Message "SYSTEM OPERATIONAL" appears on the Graphic Display after the diagnostic self-test. Adjust the displays with the Viewing Angle Thumbwheel Adjustment if necessary.
3. Verify that high and low SaO₂ and pulse rate alarm limits and readings appear on the Digital Display.
4. Verify that the Patient Alarms are functional. Set the high and low SaO₂ and pulse rate alarm limits beyond the patient readings. Ensure the alarm tone sounds, and the violated alarm limit and reading flashes on the Digital Display.

PREOPERATIVE CHECKLIST

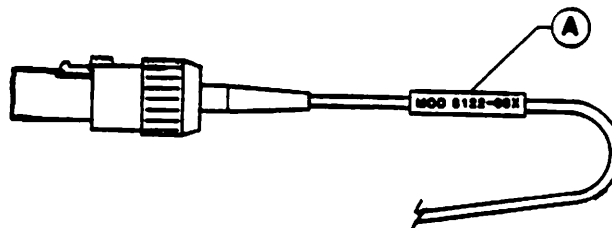
5. Verify the Probe Alarms are functional:
 - A. Remove the probe from the finger or ear. Ensure the Alarm Message "PROBE OFF PATIENT" appears on the Graphic Display and the alarm tone sounds.

NOTE: The "PROBE OFF PATIENT" Alarm Message occurs with the finger probe and the ear probe.
 - B. Unplug the probe from the oximeter. Ensure the Alarm Message "NO PROBE CONNECTED TO UNIT" appears on the Graphic Display and the alarm tone sounds.
6. Depress POWER/STANDBY to turn the oximeter off. No displays should be visible.

PROBES

1. Check probes for foreign material such as tape or cotton. Remove any substances present that may interfere with transmission of light between the emitter and detector.
2. Verify that the probes open and close smoothly. If there is any unevenness or variations in the closing motion, replace the probe.
3. Check that the probe is the correct model before connecting it to the oximeter.

CAUTION Use ONLY the probes supplied for this model of oximeter. Check the Identification Number/Serial Number Tag (A) which is located on the cable near the connector. The model number must read: MOD 8122-00X or MOD 8121-00X (X represents a digit from 1 through 5).



PREOPERATIVE CHECKLIST

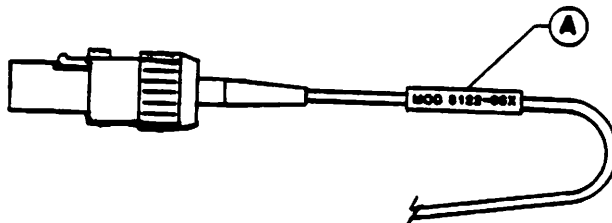
4. Check that the probe connector makes a firm connection with the oximeter.
5. Check that the cable is not bent or twisted.
6. Turn the oximeter on.
7. Check that the red LED is lit upon turning the oximeter on.

GENERAL OPERATION GUIDELINES
(Quick Start Up)

WARNING EXPLOSION HAZARD: Do NOT use in the presence of flammable anesthetics.

1. Plug oximeter into AC mains power (USA 120 VAC) or use battery power.

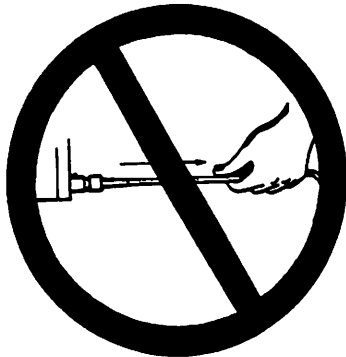
CAUTION Use ONLY the probes supplied for this model of oximeter. Check the Identification Number/Serial Number Tag (A) which is located on the cable near the connector. The model number must read: MOD 8122-00X or MOD 8121-00X (X represents a digit from 1 through 5).



2. Determine which probe to use and plug it into the probe connector. (See Pages 35-36)
3. Prepare the patient. (See Pages 37-49)
4. Attach the probe to the patient. (See Pages 37-49)

GENERAL OPERATION GUIDELINES

CAUTION Do NOT apply tension to the probe cable.



5. Depress POWER/STANDBY to turn the oximeter on. Adjust the displays with the Viewing Angle Thumbwheel Adjustment if necessary. (See page 24)

The following is displayed:

- * "8"'s appear on the Digital Display
- * The message "OHMEDA-BIOX 3700, REVISION:X SYSTEM CHECK IN PROCESS" appears on the Graphic Display.

NOTE: "X" represents an alphanumeric value.

During this time the system goes through a complete diagnostic self-test (electronics, battery status, calibration accuracy), and sets the default parameters. This self-test takes approximately 10-15 seconds.

6. If no errors are found, the Status Message "SYSTEM OPERATIONAL" appears on the Graphic Display momentarily. Then if the oximeter is operating on battery power, the message "BATTERY IN USE" will appear momentarily. Next, the plethysmographic waveform appears on the Graphic Display.

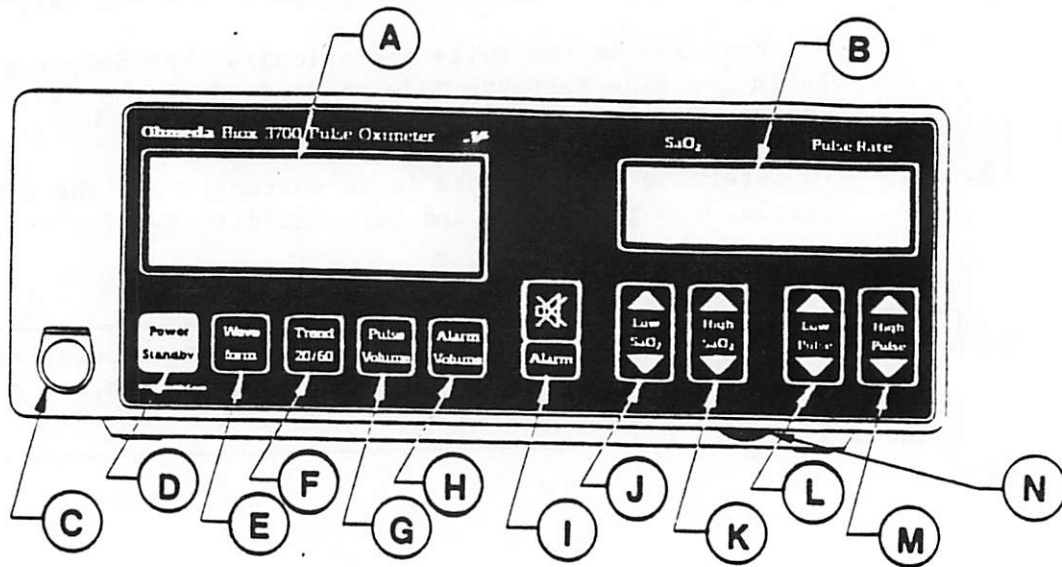
WARNING FAILURE OF OPERATION: If the oximeter fails to respond as described, do NOT use it until the situation has been corrected by qualified personnel.

7. Dashes ("---") appear on the Digital Display until the SaO₂ and pulse rate readings have stabilized. This takes approximately 5 to 10 seconds.

GENERAL OPERATION GUIDELINES

8. SaO₂ and Pulse Rate readings appear on the Digital Display.
9. The oximeter is now fully operational. The SaO₂ response time is in the Slow Response Mode as denoted by the "S" on the Graphic Display.
10. To determine if the probe is on correctly and the data is verifiable, see the Signal and Data Validity Section (pages 32-34).

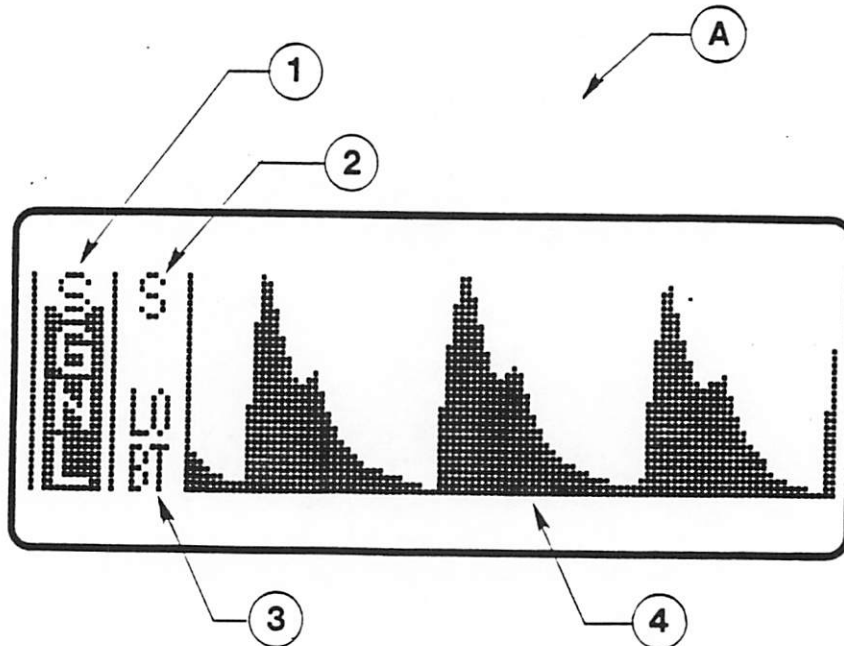
WARNING DATA VALIDITY: Do NOT expose the probe detector to strong ambient light while it is being used to monitor a patient. A poor signal may result.



FRONT PANEL

FRONT PANEL:

- A. **GRAPHIC DISPLAY** -- This displays the Signal Strength Indicator, Plethysmographic Waveform, Trend Information, Status Messages and Alarm Messages.



GRAPHIC DISPLAY

1. **"SGNL" SIGNAL STRENGTH INDICATOR** -- The Signal Strength Bar Graph provides a visual indication of the received pulsatile signal. The higher the bar, the stronger the signal is. The height of the bar is determined by several factors including tissue perfusion at the probe site, and the capability of the tissue under test to pass the incident light. If the bar falls to a height less than half scale, the Alarm Message "LO QUALITY SGNL" appears above the waveform on the Graphic Display and the SaO₂ may not be accurate. For example, the probe may be improperly attached to the patient. Perfuse (massage) the test site and reapply the probe, or select an alternate test site.

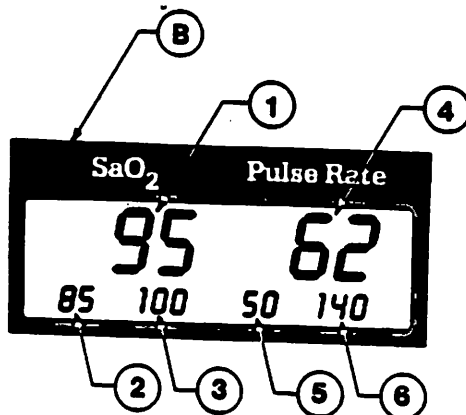
2. **"S" SLOW RESPONSE** -- The oximeter is automatically in the Slow Response Mode (6 second averaging SaO₂ time) when it is turned on. Hold the WAVEFORM key for 3 seconds and the Status Message "FAST RESPONSE SELECTED" momentarily appears on the Graphic Display. The letter "F" appears in place of the letter "S" alongside of the plethysmographic waveform, and the oximeter is now in the Fast Response Mode (3 second averaging SaO₂ time). To return to the Slow Response Mode, hold the WAVEFORM key for 3 seconds. The Status Message "SLOW RESPONSE SELECTED" momentarily appears on the Graphic Display. The letter "S" appears in place of the letter "F" on the Graphic Display.

3. **"BT" BATTERY** -- This Status Message is displayed when the oximeter operates on battery power. The oximeter runs for approximately one and a half hours on battery power.

"LO BT" LOW BATTERY -- This Status Message is displayed when the battery is getting low. Approximately 5 to 10 minutes of operation time is left when this Status Message appears on the Graphic Display. See page 85 for recharging instructions.

4. **Plethysmographic Waveform** --
The "photo-plethysmographic" waveform is displayed after the Status Message "SYSTEM OPERATIONAL" appears on the Graphic Display. It is a representation of the blood volume change of the hemodynamic system assuming no other factors (e.g. motion artifact) are present. The plethysmographic waveform auto-scales or automatically adjusts according to the size of the signal.

- B. **DIGITAL DISPLAY** -- This displays the SaO₂ and Pulse Rate alarm limits and the SaO₂ and Pulse Rate readings. The display dashes (---) during power up directly after the "SYSYEM OPERATIONAL" Status Message, and during recovery from certain conditions where normal data collection has been interrupted. The dashes remain on the display until data collection of SaO₂ and Pulse Rate readings are valid (approximately 5 to 10 seconds).

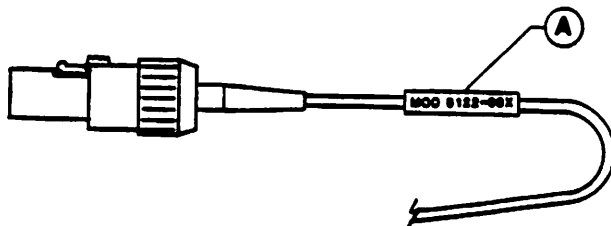


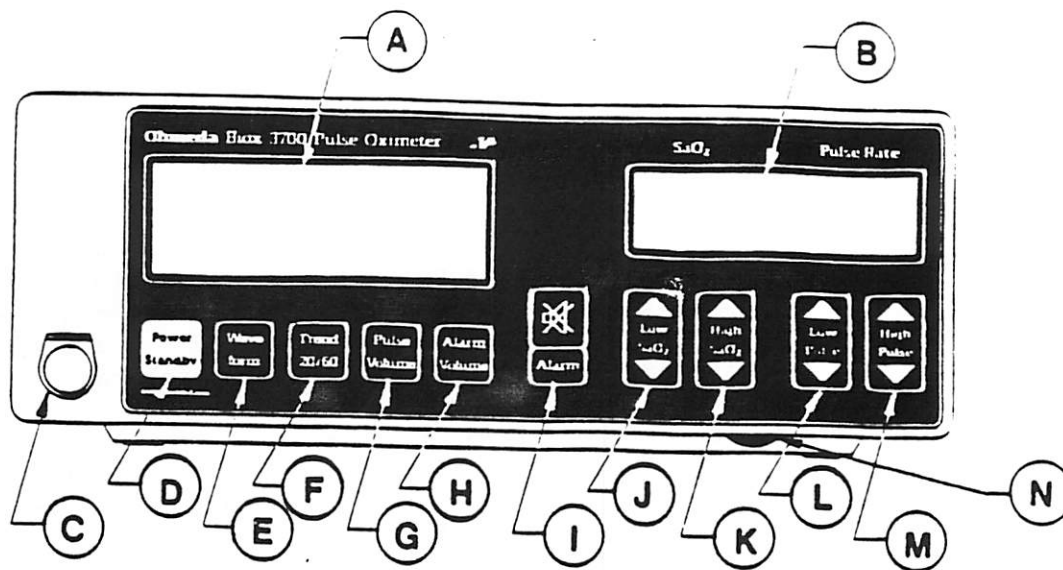
DIGITAL DISPLAY

1. SaO₂ Numeric Display -- calculated SaO₂
2. Low SaO₂ Alarm Limit -- threshold for low SaO₂ alarm
3. High SaO₂ Alarm Limit -- threshold for high SaO₂ alarm
4. Pulse Rate Numeric Display -- calculated pulse rate
5. Low Pulse Rate Alarm Limit -- threshold for low pulse rate alarm
6. High Pulse Rate Alarm Limit -- threshold for high pulse rate alarm

- C. **PROBE PLUG CONNECTION** -- The probes supplied with this model oximeter plug into this nine hole connector.

CAUTION Use ONLY the probes supplied for this model of oximeter. Check the Identification Number/Serial Number Tag (A) which is located on the cable near the connector. The model number must read: MOD 8122-00X or MOD 8121-00X (X represents a digit from 1 through 5).

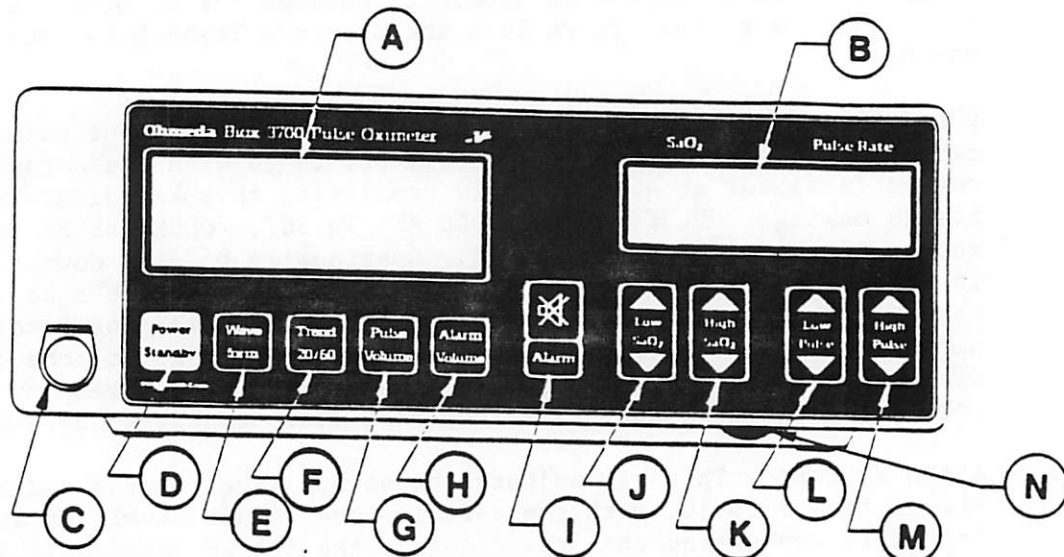




FRONT PANEL

- D. **POWER/STANDBY** -- Depress this key to turn the oximeter on or bring the oximeter into the OPERATIONAL MODE. Depress it a second time, and the oximeter is placed in the STANDBY MODE or OFF. While in the Standby Mode, the battery charges (if the unit is plugged into AC mains power (USA 120 VAC) and the Trend Data is maintained. No displays are visible during this time.
- E. **WAVEFORM** -- The plethysmographic waveform display is initiated after the diagnostic self test. Depress this key to restore the plethysmographic waveform when in the Trend Display Mode or change modes from Fast Response to the Slow Response.
- F. **TREND 20/60** -- Depress this key once to display the calculated SaO₂ values from the previous 20 minutes. Each depression of this key causes the Trend Display to alternate between the 20 minute graph and the 60 minute graph. To restore the previous Trend Data, see pages 65-66.
- G. **PULSE VOLUME** -- This key adjusts the tone volume for the pulse indicator. Sound levels may be set from Off to 10 with the default tone volume level set at 4. Initially depressing this key displays the Status Message "PULSE VOLUME, HOLD KEY TO SET, VOLUME LEVEL IS OFF" and drops the tone volume to Off. Continually holding down this key increases the tone volume in steps, with a beep at each step until the maximum level is reached. As the patient's SaO₂ reading becomes higher or lower, the pitch of the pulse indicator audio tone changes with the reading. For example, as the patient's SaO₂ reading becomes lower, the pitch of the pulse indicator audio tone also becomes lower.
- H. **ALARM VOLUME** -- This key adjusts the volume level of the audible alarms from 1 to 10, with the default tone volume level set at 4. Initially depressing this key displays the Status Message "ALARM VOLUME, HOLD KEY TO SET, VOLUME LEVEL IS 1" and drops the tone volume level to 1. Continually holding down this key increases the volume in steps, with a beep at each step until maximum level is reached.

- I. **ALARM SILENCE** -- Once this key is depressed it temporarily silences all audible alarms for 30 seconds even when an active alarm condition exists. If an alarm condition still exists after 30 seconds, the audible tone will resume.
- EXCEPTION:** In the case of a "PROBE OFF" or "NO PROBE" alarm, the alarm silence key will silence the audible alarm until either the specific alarm condition is remedied or a different alarm condition is detected, or a different message is displayed on the front panel other than Trend.
- J. **LOW SaO₂** -- To set this alarm, depress and hold the arrow key to raise or lower the Low SaO₂ Alarm threshold. This threshold changes in increments of 1 between 50% SaO₂ and 100% SaO₂ as indicated on the Digital Display. The default level is set at 90% SaO₂.
- K. **HIGH SaO₂** -- To set this alarm, depress and hold the arrow key to raise or lower the High SaO₂ Alarm threshold. This threshold changes in increments of 1 between 70% SaO₂ and 100% SaO₂ as indicated on the Digital Display. The default level is set at Off "---" (dashes).
- L. **LOW PULSE** -- To set this alarm, depress and hold the arrow key to raise or lower the Low Pulse Alarm threshold. This threshold changes in increments of 5 between 40 and 200 Beats Per Minute as indicated on the Digital Display. The default level is set at 50 Beats Per Minute.
- M. **HIGH PULSE** -- To set this alarm, depress and hold the arrow key to raise or lower the High Pulse Alarm threshold. This threshold changes in increments of 5 between 70 and 250 Beats Per Minute as indicated on the Digital Display. The default level is set at Off "---" (dashes).
- N. **VIEWING ANGLE THUMBWHEEL ADJUSTMENT** -- This control adjusts the viewing angle (approximately 50 degrees) of the Graphic and Digital Displays simultaneously. This adjustment allows the displays to be seen from different viewing angles.



FRONT PANEL

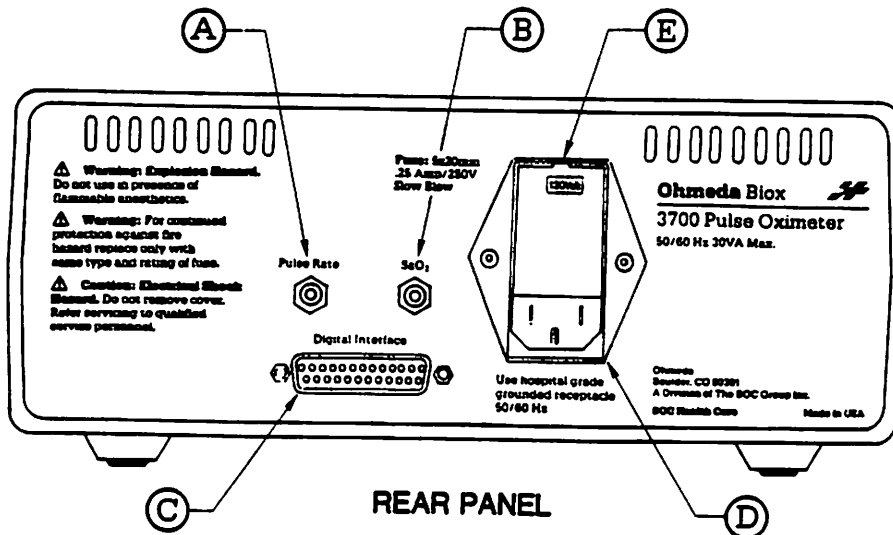
REAR PANEL:

- A. Pulse Rate Connector -- Provides a 0 to 1 Volt linear analog representation of the pulse rate as displayed on the front panel. A zero volt output is equivalent to a pulse rate of zero. A 1.00 volt output is equivalent to a pulse rate of 250 Beats Per Minute (BPM).
- B. SaO₂ Connector -- Provides a 0 to 1 Volt linear analog representation of the saturation displayed on the front panel. A zero volt output is equivalent to a saturation of zero percent. A 1.00 volt output is equivalent to a saturation of 100 percent. See pages 67 - 71 of this manual for connection instructions.

CAUTION Connect only a high impedance device (1K Ohm or higher) to the analog output jack. Improper loading will upset the correspondence between the measured voltage and the intended output voltage.

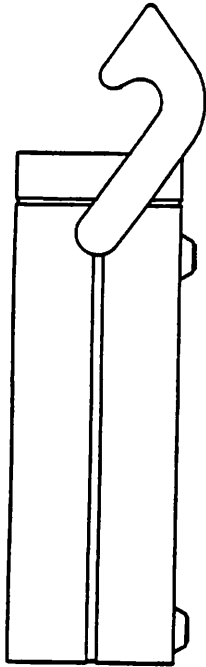
- C. Digital Interface Connector -- Provides serial digital information of SaO₂, pulse rate readings, and alarm limits. This 25 pin connector is compatible with most RS-232C devices capable of accepting a 1200 bits per second input. See page 74 of this manual for hook-up instructions.
- D. Power Connector -- Connects the oximeter to AC power for continuous operation and/or charging of the battery.
- E. Rear Panel Voltage Setting

CAUTION Check rear panel voltage setting before connecting the oximeter to AC mains power (USA 120 VAC).



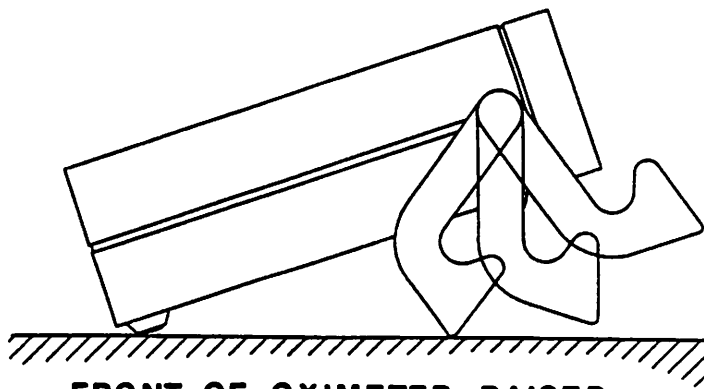
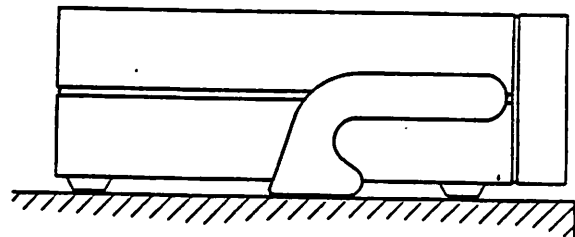
HANDLE POSITIONING

The handle allows the oximeter to be used in a variety of positions. To move the handle, gently pull out on its sides and rotate it to the desired position. The spring-loaded handle automatically snaps into position. The following are suggested handle positions:



HAND CARRY

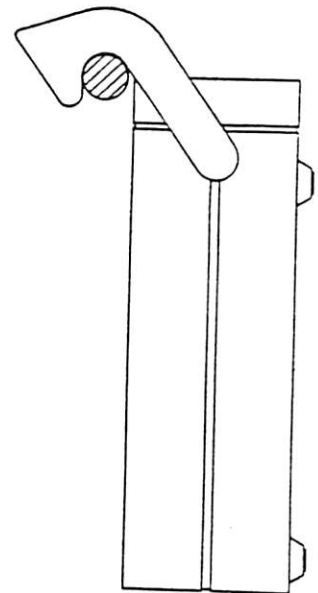
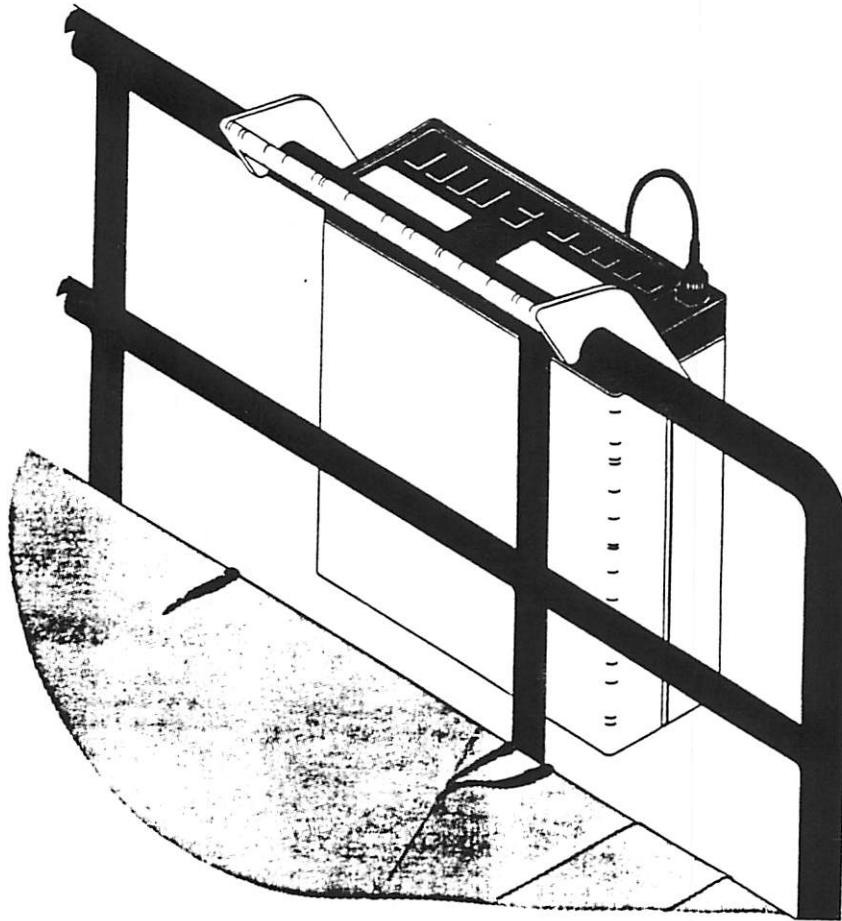
**POSITIONED ON A
FLAT SURFACE**



FRONT OF OXIMETER RAISED

HANDLE POSITIONING

**HOOKED ON TO
BED RAIL**



HOOKED ON TO BED RAIL

SPECIFICATIONS

PHYSICAL SPECIFICATIONS

Ohmeda Biox 3700 Oximeter Assembly

Dimensions:

Height: 10.16 cm - 4.0 inches
Width: 25.4 cm - 10 inches
Depth: 28.7 cm - 11.3 inches
Weight: 3.86 kg - 8.5 pounds

FINGER PROBE

Dimensions:

Height: 2.26 cm - .890 inches
Width: 2.66 cm - 1.05 inches
Depth: 5.08 cm - 2.00 inches
Weight: 53.7 g - 1.9 oz.

Cable Length: 2.44 m - 8 feet
Cable type: 4 Cond, 30 AWG, Shielded
Connector: 9 hole, 7 pin

FLEX PROBE

Dimensions:

Height: 4.77 cm - 1.88 inches
Width: 1.27 cm - .5 inches
Depth: .30 cm - .12 inches
Weight: 36.9 g - 1.3 oz.

Cable length: 2.44 m - 8 feet
Cable type: 4 Cond, 30 AWG, Shielded
Connector: 9 hole, 7 pin

EAR PROBE

Dimensions:

Height: 1.90 cm - .75 inches
Width: 1.14 cm - .45 inches
Depth: 5.23 cm - 2.06 inches
Weight: 67.6 g - 2.4 oz.

Cable length: 2.44 m - 8 feet
Cable type: 6 Cond, 29 AWG, Shielded
Connector: 9 hole, 7 pin

EXTENSION CABLE (380-1500-001)

Length: 2.44 m - 8 feet
Cable Type:
8 Cond, 29 AWG, Shielded

Connector: 9 hole, 7 pin

FINGER PROBE

2.26 cm - .890 inches
2.66 cm - 1.05 inches
5.08 cm - 2.00 inches
53.7 g - 2.4 oz.

3.66 m - 12 feet
4 Cond, 30 AWG, Shielded
9 hole, 7 pin

FLEX PROBE

4.77 cm - 1.88 inches
1.27 cm - .5 inches
.30 cm - .12 inches
48.2 g - 1.8 oz.

3.66 m - 12 feet
4 Cond, 30 AWG, Shielded
9 hole, 7 pin

SPECIFICATIONS

PHYSICAL SPECIFICATIONS

Ohmeda Biox 3700 Oximeter Assembly

Dimensions:

Height: 10.16 cm - 4.0 inches
Width: 25.4 cm - 10 inches
Depth: 28.7 cm - 11.3 inches
Weight: 3.86 kg - 8.5 pounds

EXTENSION CABLE (380-1500-001)

Length: 2.44 m - 8 feet
Cable Type:
8 Cond, 29 AWG, Shielded
Connector: 9 hole, 9 pin

FINGER PROBE

Dimensions:

Height: 2.26 cm - .890 inches
Width: 2.66 cm - 1.05 inches
Depth: 5.08 cm - 2.00 inches
Weight: 53.7 g - 1.9 oz.

Cable Length: 2.44 m - 8 feet
Cable type: 4 Cond, 30 AWG, Shielded
Connector: 9 hole, 7 pin

FINGER PROBE

2.26 cm - .890 inches
2.66 cm - 1.05 inches
5.08 cm - 2.00 inches
68.0 g - 2.4 oz.
3.66 m - 12 feet
4 Cond, 30 AWG, Shielded
9 hole, 7 pin

FLEX PROBE

Dimensions:

Height: 4.77 cm - 1.88 inches
Width: 1.27 cm - .5 inches
Depth: .30 cm - .12 inches
Weight: 36.9 g - 1.3 oz.

Cable length: 2.44 m - 8 feet
Cable type: 4 Cond, 30 AWG, Shielded
Connector: 9 hole, 7 pin

FLEX PROBE

4.77 cm - 1.88 inches
1.27 cm - .5 inches
.30 cm - .12 inches
48.2 g - 1.8 oz.
3.66 m - 12 feet
4 Cond, 30 AWG, Shielded
9 hole, 7 pin

EAR PROBE

Dimensions:

Height: 1.90 cm - .75 inches
Width: 1.14 cm - .45 inches
Depth: 5.23 cm - 2.06 inches
Weight: 67.6 g - 2.4 oz.

Cable length: 2.44 m - 8 feet
Cable type: 6 Cond, 29 AWG, Shielded
Connector: 9 hole, 7 pin

SPECIFICATIONS

AUDIBLE ALARMS:

VOLUME (decibel db) AT 1 METER	LOWEST VOL SETTING (1) MINIMUM	HIGHEST VOL SETTING (10) MINIMUM
	55db	75db

Frequency = 400 - 800 Hertz

OUTPUTS:

Rear Panel

Analog: (SaO₂ and Pulse Rate)

Current at full scale output: 3 milliamps

Voltage output: 1.0 Volt

Impedance at full scale output: 300 Ohms

Connector type: 1/8 inch miniature phone jack

Mating connector plug: 1/8 inch miniature phone plug

Connector plug polarity:

connector tip = signal (+)

connector sleeve = ground (-)

Digital:

Baud Rate: 1200 BPS, ASCII format

Connector type: 25 pin, standard "D" female, RS-232C compatible

Number of Bits per character: 7

Parity: Odd

Number of Stop Bits: 1

Connector Pin Out:

pin 1 = chassis ground

pin 2 = receive data by the oximeter

pin 3 = transmit data from the oximeter

pin 7 = signal ground

POWER:

Voltage Rating:	110, 120 Volts ± 10%	100, 220, 240 Volts ± 10%
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Current:

Maximum:	250 milliamps	250, 250, 250 milliamps
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Frequency:	60 Hertz	50 Hertz
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Frequency is identified when plugged in to AC mains power.

SPECIFICATIONS

SAFETY:

Ground Impedance: less than 0.1 Ohm
(including power cord)
Leakage current:

FORWARD POLARITY

Maximum: 50 microamps

Fusing:

100 V/110 V/120 V/220 V/240 V: 5mm diameter x 20mm long, .25 Ampere
Slow-blo fuse

REVERSE POLARITY

50 microamps

BATTERY:

Type: sealed lead-acid

8 Volt 2.5 Ampere-Hour

Charge Time: (unit not operating)

80% capacity = 4 hours

100% capacity = 16 hours

Low Battery (LO BT) Indicator: when the battery is below 5%
charge/discharge capacity

Operation time = 1.5 hours (with all functions operative from a fully
charged battery)

ENVIRONMENTAL TOLERANCES:

Operating Temp Range: 0 to 50 degrees C (32 degrees to 122 degrees F)

Storage Temp Range: -20 to 60 degrees C (-4 degrees to 140 degrees F)

NOTE: At temperature extremes, the LCD read-out may exhibit reduced contrast, ghosting or darkening. When returning from temperature extremes, allow the oximeter temperature to stabilize before use.

SPECIFICATIONS

ACCURACY:

SaO ₂ %	Accuracy (1 Standard Deviation)	# of Data Points
Overall Range		
60% - 100%	2.4%	616
90% - 100%	1.5%	183
80% - 89.9%	2.1%	197
Below 59.9%	Unspecified	

The accuracy measurements are statistically derived and correlated to simultaneous arterial blood gases (ABG) measured on an Instrumentation Laboratory IL-282 Co-Oximeter.

Pulse Rate: Accuracy is $\pm 1.7\%$ of current reading. Accuracy calculations assume a constant Pulse Rate.

SaO₂ Range: 0% - 100%

Pulse Rate Range: 40 - 235 Beats per Minute

Display can show 0 - 255 Beats per Minute

SaO₂ Alarm Limit Range: High SaO₂ = 70% - 100%

Low SaO₂ = 50% - 100%

Pulse Rate Alarm Limit Range: High Pulse Rate = 70 BPM - 250 BPM

Low Pulse Rate = 40 BPM - 200 BPM

NOTE: Although the accuracy of SaO₂ measurement on neonates via pulse oximetry has not been statistically verified to date, there is no field data contraindicating the use of pulse oximetry.

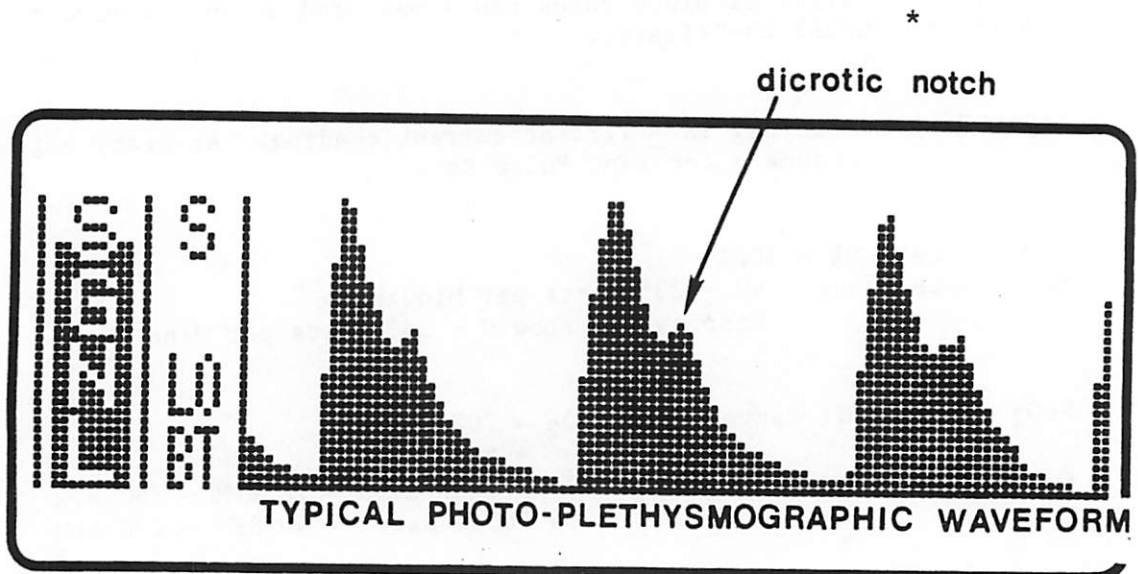
INTERFERING SUBSTANCES:

Carboxyhemoglobin may erroneously increase readings. The level of increase is approximately proportional to the amount of carboxyhemoglobin present less 2 percent.

Dyes, or any substances that contain dyes, that change usual arterial pigmentation may cause erroneous readings.

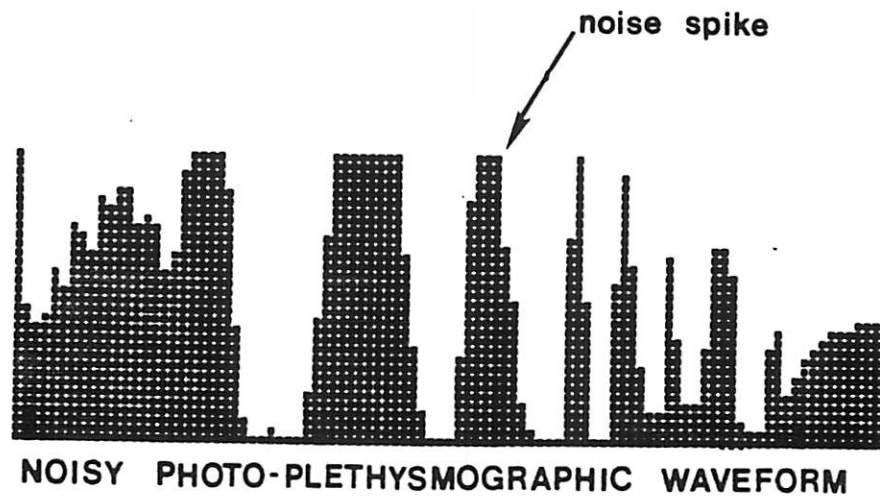
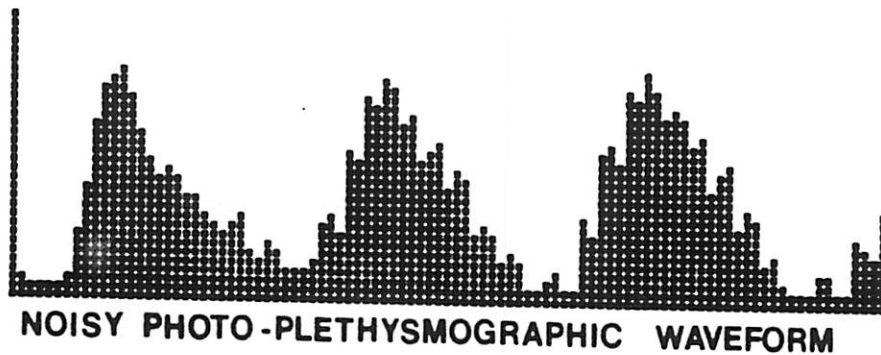
It is of utmost importance to determine that the probe is attached to the patient correctly and the data is verifiable. To make this determination three indicators from the oximeter are of assistance. It is critical to observe all three indicators simultaneously when ascertaining signal and data validity.

1. Three complete passes of the plethysmographic waveform should be easily identified, although the waveform shape may vary from patient to patient. Under normal conditions, the photo-plethysmographic waveform corresponds to the arterial pressure waveform. The typical photo-plethysmographic waveform indicates not only a good waveform, but helps the user find a probe placement with the least noise spikes present.



- * Dicrotic Notch - a notch on the descending limb of the normal arterial pulse tracing, corresponding to aortic valve closure. (Gould Medical Dictionary, 3rd Ed., New York: McGraw Hill Book Co., 1972.)

If noise is seen on the waveform because of poor probe placement, the detector may not be flush with the test site. Check that the probe is secured and the tissue sample is not too thick. Pulse rate is determined from the plethysmographic waveform which can be disrupted by a cough or other hemodynamic pressure disturbances. Motion at the test site is indicated by noise spikes in the normal waveform. It has been noted that letting the patient view the plethysmographic waveform enables them to assist in reducing motion artifact (e.g. stress testing). **If three good passes of the plethysmographic waveform do not occur, check the patient and the oximeter set up.**



SIGNAL AND DATA VALIDITY

2. The Signal Strength Indicator Bar-Graph should be close to full scale. Full scale is the desired height of the bar graph assuring a strong signal. Very dark pigmentation or a large distance between the emitter and the detector can reduce the signal strength and result in a poor signal. In case the signal strength is half scale or less, a test site with a shorter distance between the emitter and the detector might be a possible solution. If the bar graph is less than half scale, the Alarm Message "LO QUALITY SGNL" appears above the waveform on the Graphic Display and the data is questionable. Check the patient and the oximeter set up.

3. The stability of the SaO₂ readings can also be used as an indicator of signal validity. Although stability is a relative term, with a small amount of practice one can get a good feeling for changes that are artifactual or physiological and the speed of each. The stability of the readings over time is affected by whether the instrument is in the fast or slow mode. In the slow mode, the readings have a tendency to be more stable than in the fast mode since the signal averaging is done over a longer period of time (three seconds in the fast mode and six seconds in the slow mode).

I. Determining which Probe to use:

FINGER PROBE:

This is the probe of choice for routine monitoring. The finger probe also is suggested when the patient has a very small ear lobe or poor circulation.

WARNING DATA VALIDITY: Do NOT attach a probe to the same limb with an inflated blood pressure cuff. Valid data will NOT be received when the cuff is inflated. Attach probe to the limb opposite the site used for the blood pressure cuff.

FLEX PROBE:

This is recommended for long term monitoring, or when test sites are difficult to find with the ear probe or the finger probe, mobile monitoring situations, and neonates.

WARNING PATIENT SAFETY: Patient condition may require changing the probe test site periodically. This should diminish the possibility of pressure necrosis of the test site.

IMPORTANT: THIS IS PARTICULARLY OF CONCERN WITH NEONATAL APPLICATION.

EAR PROBE:

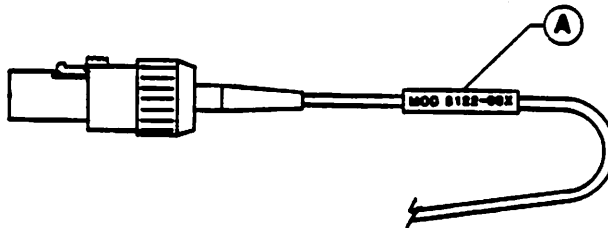
Use of this probe is recommended during surgical procedures when the hand is not accessible to the operator, is positioned by the patient's side, or when significant hand or finger motion is expected. The ear probe is also preferred for sleep and stress/exercise testing. It is recommended to use the stabilizer when using the ear probe.

NOTE: The ear probe should be moved to the opposite ear periodically if it is used for long term monitoring.

SET UP

II. Connecting and disconnecting the Probe:

CAUTION Use ONLY the probes supplied for this model of oximeter. Check the Identification Number/Serial Number Tag (A) which is located on the cable near the connector. The model number must read: MOD 8122-00X or MOD 8121-00X (X represents a digit from 1 through 5).



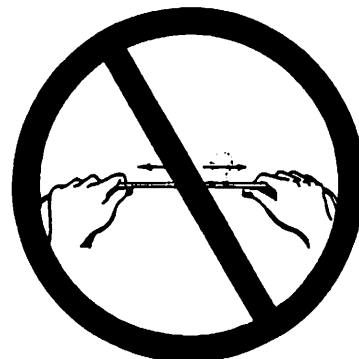
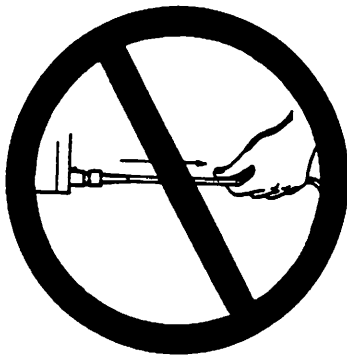
CONNECTING:

- * Insert the probe plug into the probe connector until an audible "click" is heard.

DISCONNECTING:

- * Push down on the connector release button and pull the probe plug away from the connector.

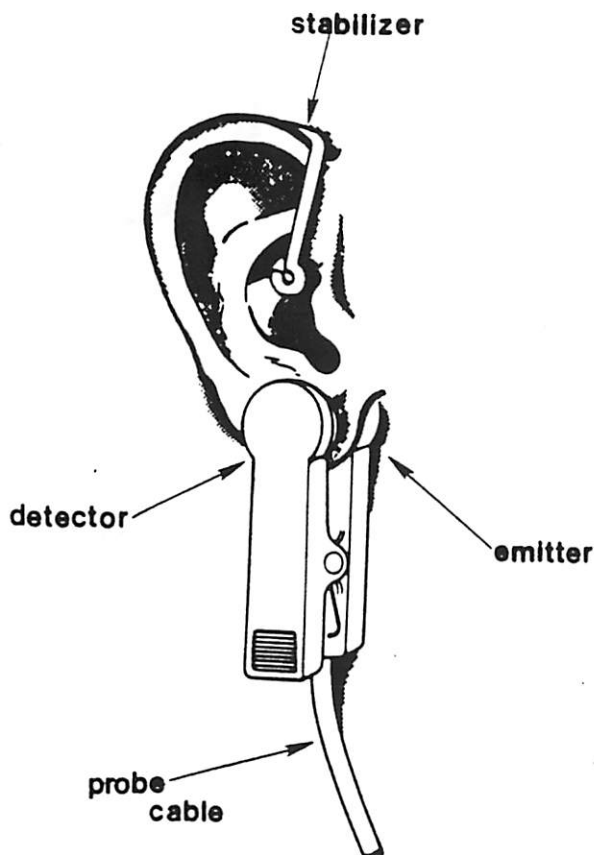
CAUTION Do NOT apply tension to the probe cable.



PREPARING THE PATIENT

ATTACHMENT OF THE EAR PROBE:

1. Clean the surface of the probe before and after each patient use.
(See Page 84)
2. Massage the ear lobe with an isopropyl alcohol (70%) pad or vasodilator cream for 20 - 30 seconds to increase perfusion.
3. Center the ear probe with the rounded emitter (light source) side toward the head on the lower, fleshy part of the lobe. Be certain that the detector window is fully covered by the tissue and NOT exposed to light in the room, otherwise a poor signal results.



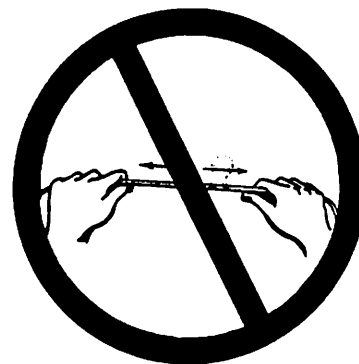
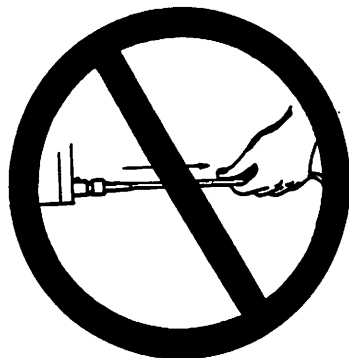
Placement of the Ear Probe on the ear lobe

side view

PREPARING THE PATIENT

ATTACHMENT OF THE EAR PROBE:

CAUTION Do NOT apply tension to the probe cable.



4. Do NOT position the ear probe where cartilage is present nor should it press against the side of the head. Use the ear probe stabilizer to position and secure the probe on the patient. (See Pages 51-52)
5. To determine if the probe is attached correctly and the display data is verifiable, see the Signal and Data Validity Section. (See pages 32-34)

PREPARING THE PATIENT

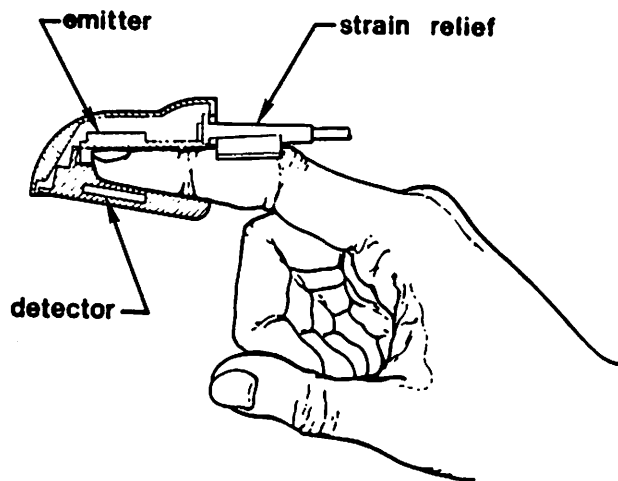
ATTACHMENT OF THE FINGER PROBE:

Be certain that the patient is NOT wearing fingernail polish, artificial (cosmetic) fingernails or has long fingernails. When these situations exist, light levels may be diminished and a poor signal results. Remove fingernail polish BEFORE using the finger probe. When artificial nails or long fingernails are present, it is suggested that the ear probe be used.

Proper coverage of the photodetector is essential. Use the finger which best covers the photodetector and seats properly in the probe lower half housing.

Clean the surface of the probe before and after each patient use. (See Page 84)

To attach the finger probe, insert the patient's finger into the probe housing until it touches the raised finger stop inside the probe. Be certain that the surface of the finger covers the detector window inside the surface of the probe. The hand should be relaxed.

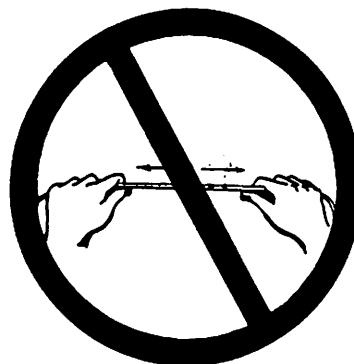
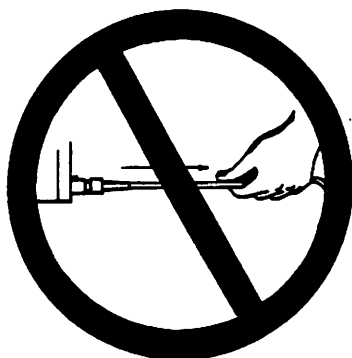


CORRECT FINGER PROBE ATTACHMENT

PREPARING THE PATIENT

ATTACHMENT OF THE FINGER PROBE:

CAUTION Do NOT apply tension to the probe cable.



To additionally secure the probe on the finger, wind a piece of tape such as 3M Transpore Tape® around the strain relief and finger once. **DO NOT CUT OFF THE CIRCULATION.**

To determine if the probe is attached correctly and the display data is verifiable, see the Signal and Data Validity Section. (See pages 32-34)

PREPARING THE PATIENT

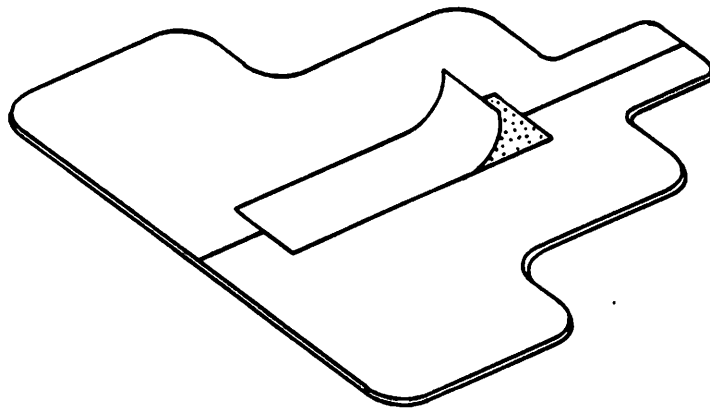
ATTACHMENT OF THE FLEX PROBE

ADULTS:

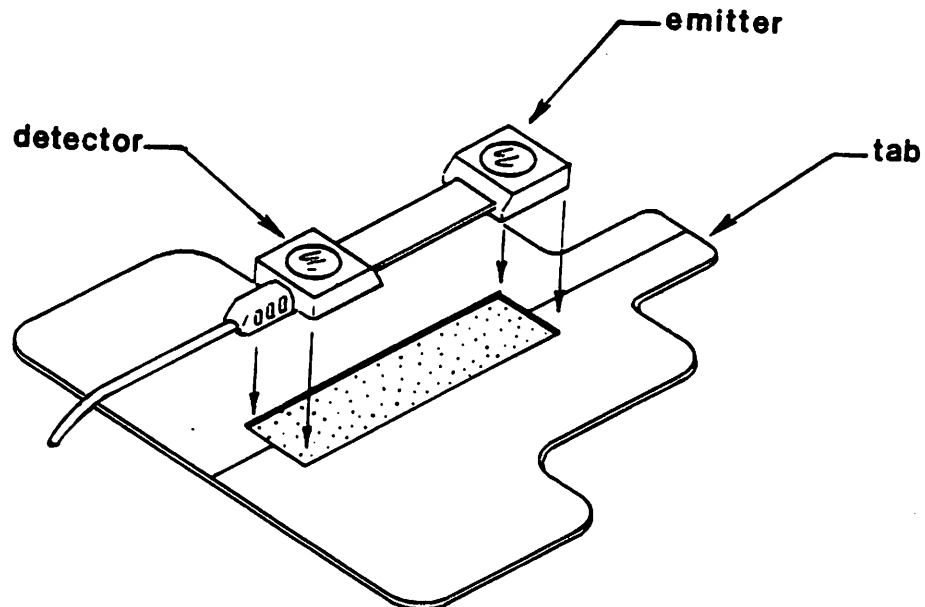
SELECTING A TEST SITE:

The suggested test site is a finger. Proper coverage of the photo-detector is essential. Use the finger which best covers the photo-detector.

1. Clean the surface of the probe before and after each patient use. (See Page 84)
2. Remove the center strip of paper from the Disposable Adhesive Wrap.



3. Gently flatten the probe if necessary. Place the probe on the center of the wrap with the emitter towards the tab.

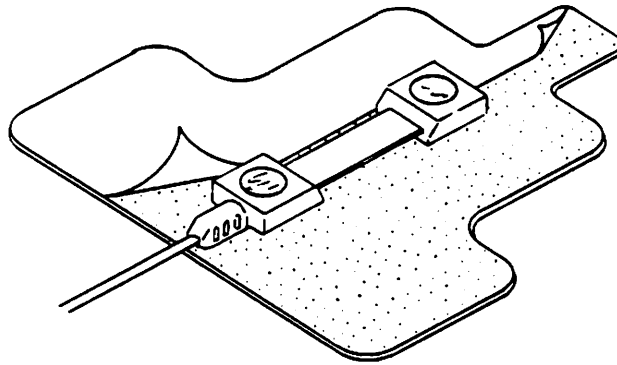


PREPARING THE PATIENT

ATTACHMENT OF THE FLEX PROBE

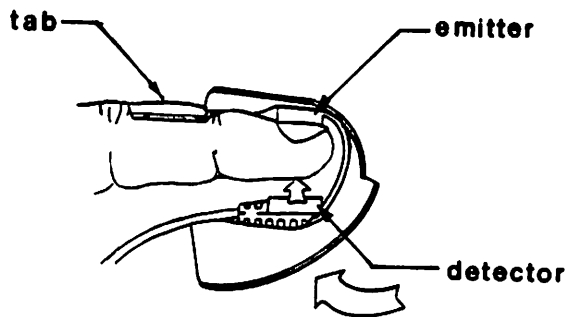
ADULTS:

4. Remove the rest of the paper from the wrap.



5. Center the emitter (end without cable) of the the probe over the fingernail. The tab of the wrap must be secured onto the finger.
6. Place the detector flush against the pad of the finger. Ensure that the probe cable comes out at the bottom of the finger.

Check that the detector and emitter blocks are directly across from each other and have good contact with the finger.

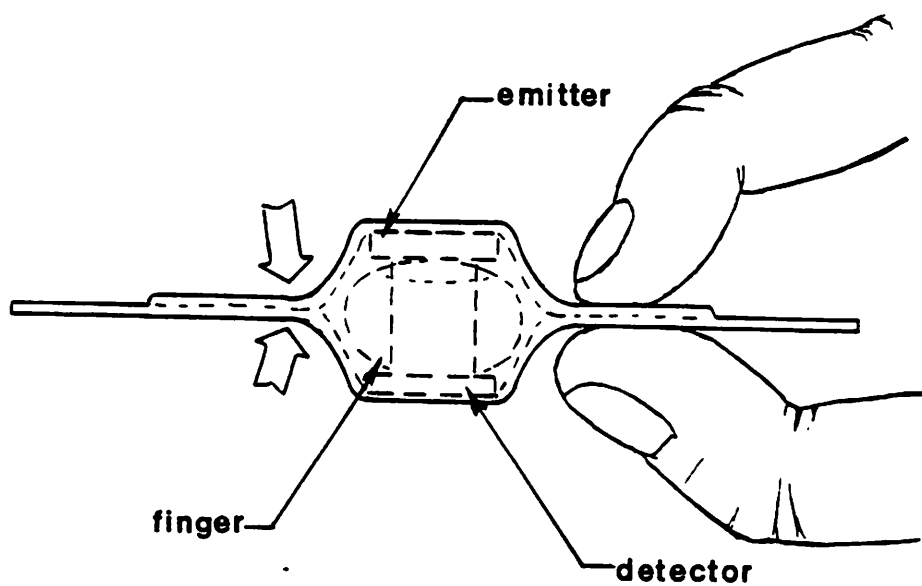
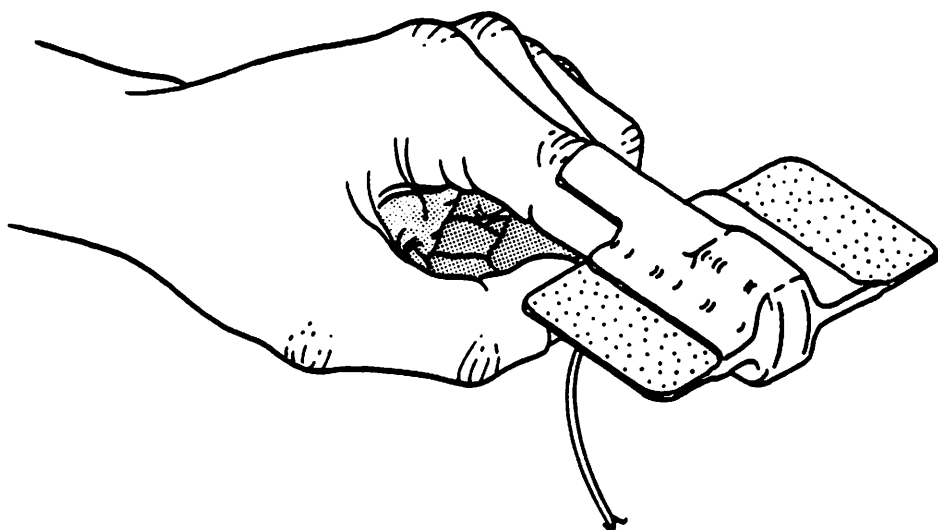


PREPARING THE PATIENT

ATTACHMENT OF THE FLEX PROBE

ADULTS:

7. Pinch the wrap down on the sides of the finger. Do **NOT FOLD** down the sides. This may cause the probe to be too tight and result in a poor signal.



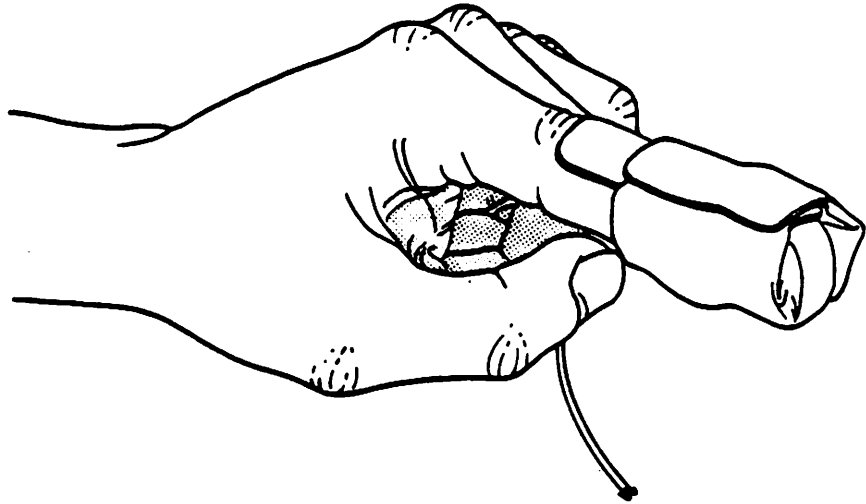
FRONT VIEW

PREPARING THE PATIENT

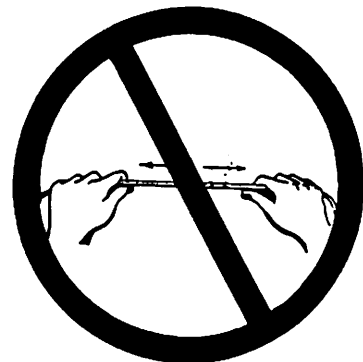
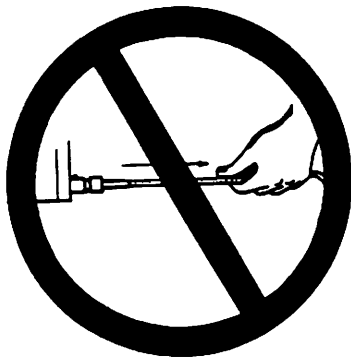
ATTACHMENT OF THE FLEX PROBE

ADULTS:

8. Wrap the bottom sides of the adhesive wrap over the top of the finger (nail side).



CAUTION Do NOT apply tension to the probe cable.

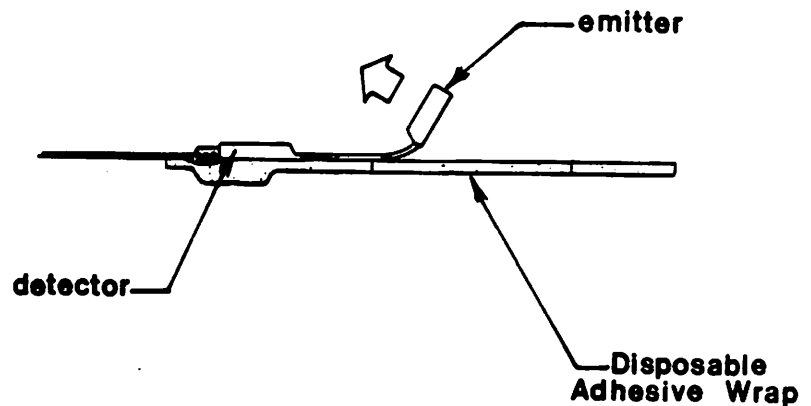
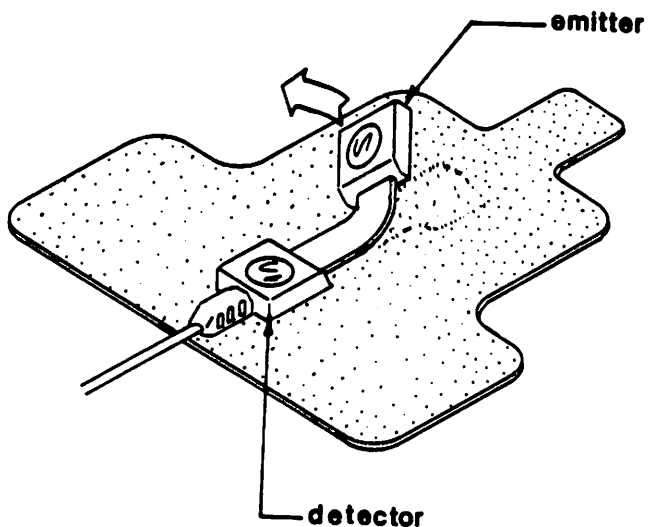


9. To determine if the probe is attached correctly and the display data is verifiable, see the Signal and Data Validity Section. (See pages 32-34)

PREPARING THE PATIENT

REMOVING THE FLEX PROBE

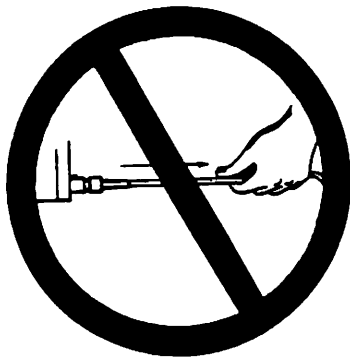
1. Unfold the sides of the Disposable Adhesive Wrap.
2. Lift the tab of the wrap off of the finger.
3. Loosen and gently pull the probe and wrap from the finger.
4. Unfold the wrap.
5. To prolong the probe life, grasp the emitter block to pull the probe off the the wrap. **DO NOT** pull on the cable when separating the probe from the wrap.



PREPARING THE PATIENT

REMOVING THE FLEX PROBE

CAUTION Do NOT apply tension to the probe cable.



6. The adhesive wrap is intended for **ONE TIME USE ONLY**. Apply the probe to new wrap with each successive use.

PREPARING THE PATIENT

ATTACHMENT OF THE FLEX PROBE:

NEONATAL:

WARNING PATIENT SAFETY: Exercise extreme care to assure continued circulation distal to the probe site after application.

WARNING PATIENT SAFETY: Patient condition may require changing the probe test site periodically. This should diminish the possibility of pressure necrosis of the test site.

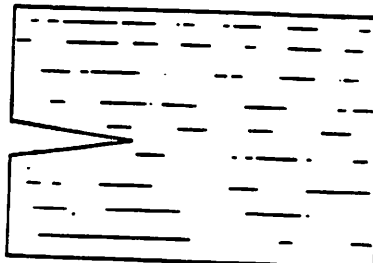
IMPORTANT: THIS IS PARTICULARLY OF CONCERN WITH NEONATAL APPLICATION.

NOTE: Apply the 3M Coban Self-Adherent Wrap® according to manufacturer's instructions supplied with the wrap packaging.

SITES FOR TESTING:

The foot is the site of preference, if it is not severely edematous. If the foot can not be used, put the detector on the palm of the hand. Detector placement might be difficult if the hand is clenched. Other test sites can be used such as the ankle or the lower calf (for smaller patients). On larger infants the finger is recommended as a test site. (See the Signal and Data Validity Section pages 32-34.)

1. Clean the surface of the probe before and after each patient use. (See Page 84)
2. Cut a piece (approximately 6 inches long) of 3M Coban Self-Adherent Wrap® (1 or 2 inch width). The length of the tape should vary upon each patient and test site.
3. Cut approximately a one inch split at the end of the wrap.

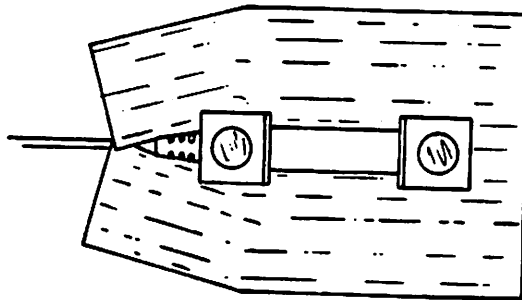


PREPARING THE PATIENT

ATTACHMENT OF THE FLEX PROBE

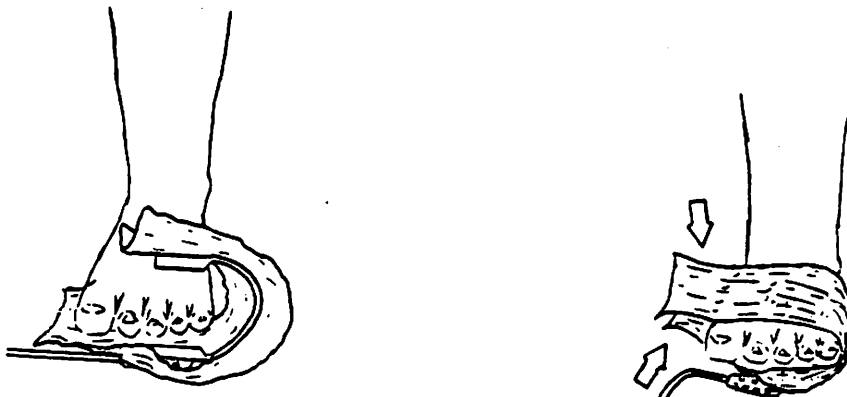
NEONATAL

4. Place the probe on the wrap. Place the detector on the bottom of the foot. The signal strength is best when the probe is placed close to the toes. In case of extremely small feet, place the probe up toward the heel of the foot for good coverage. **The detector should be flush against the test site and fully covered.** Place the split in the wrap at the cable end of the probe, with the emitter/detector blocks parallel.



5. Wind the wrap around the test area **ONLY** once. **DO NOT CUT OFF THE CIRCULATION.**

WARNING PATIENT SAFETY: Patient condition may require changing the probe test site periodically. This should diminish the possibility of pressure necrosis of the test site.

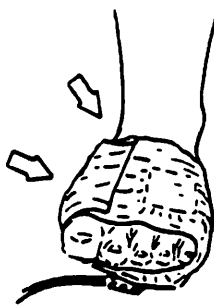


PREPARING THE PATIENT

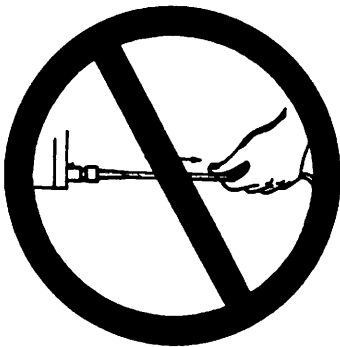
ATTACHMENT OF THE FLEX PROBE

NEONATAL

6. Ensure the detector is flush against the test site for verifiable readings.



CAUTION Do NOT apply tension to the probe cable.



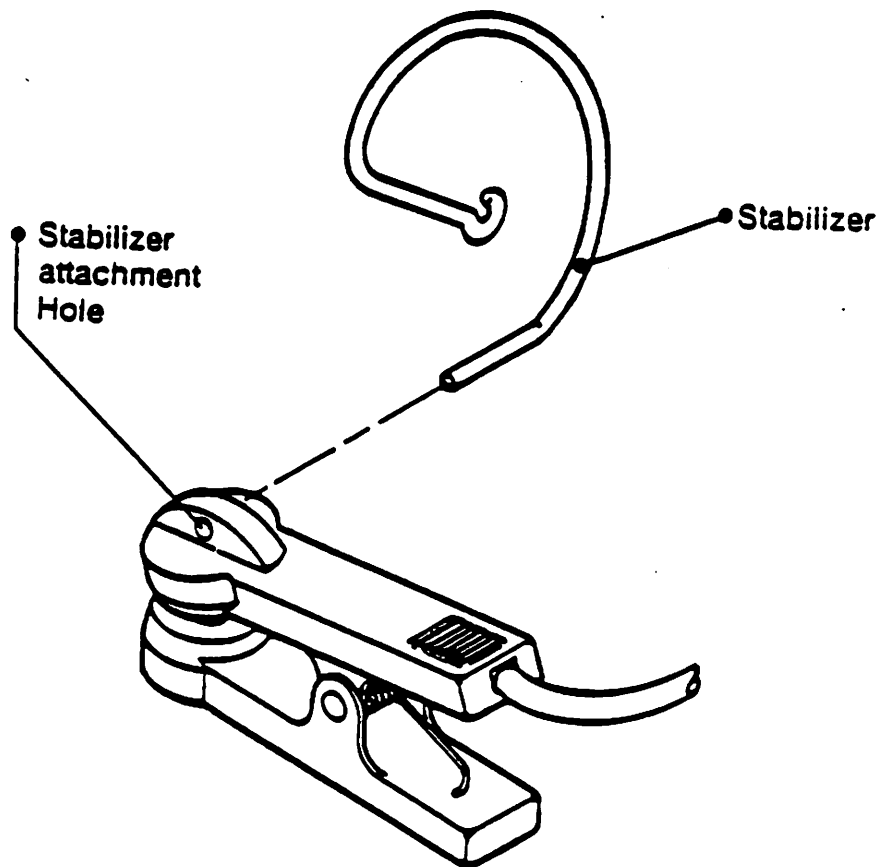
7. To determine if the probe is attached correctly and the data is verifiable, see the Signal and Data Validity Section. (See pages 32-34)

STRESS AND EXERCISE TESTING

Proper patient and oximeter set-up are critical for obtaining accurate data.

Attaching the Ear Probe to the patient:

1. Insert the ear probe stabilizer into the hole on the ear probe housing.
2. Massage the ear lobe with an isopropyl alcohol (70%) pad or vasodilator cream for 20-30 seconds.
3. Place the ear probe stabilizer on the ear.

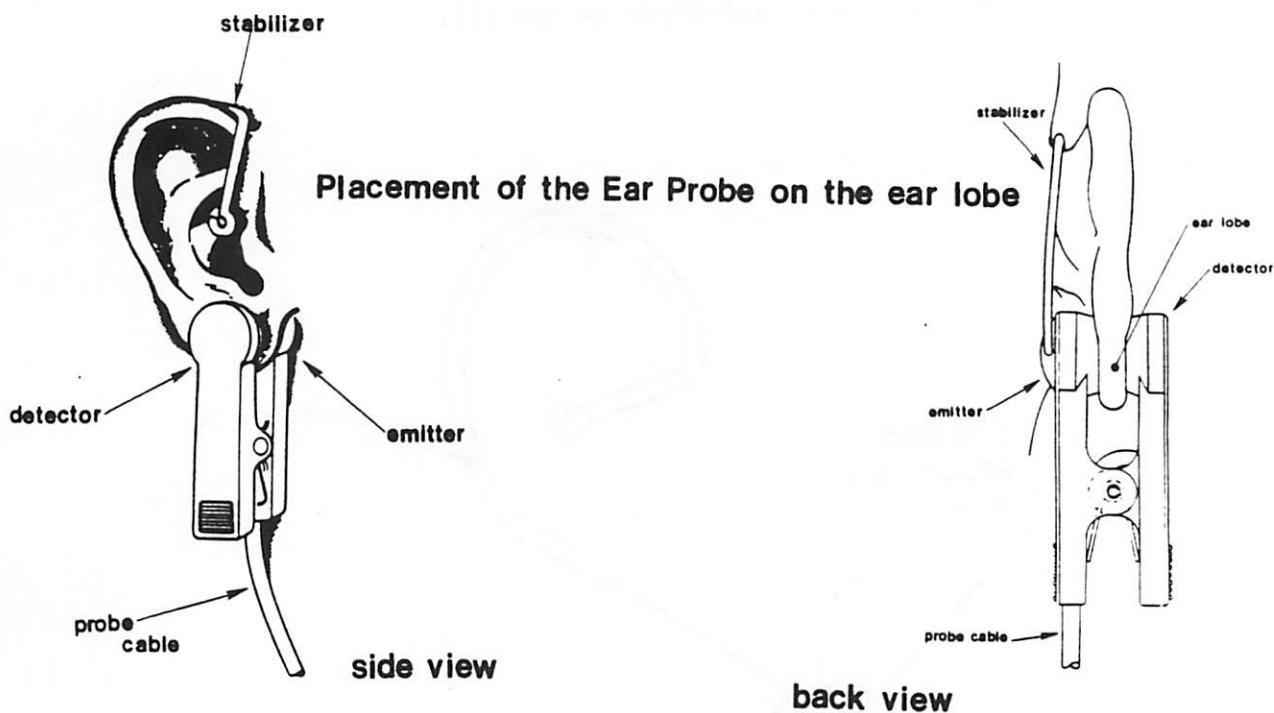


Attachment of Stabilizer to Ear Probe

STRESS AND EXERCISE TESTING

- Center the ear probe with the rounded (emitter) side toward the head on the lower fleshy part of the lobe. Be certain that the photodetector window is fully covered by the tissue.

WARNING DATA VALIDITY: Do NOT expose the probe detector to strong ambient light while it is being used to monitor a patient. A poor signal may result.

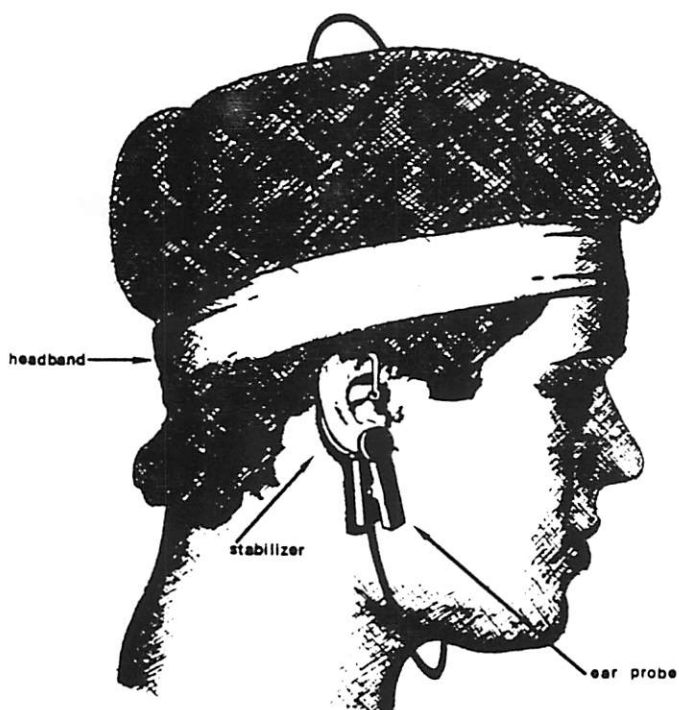


CAUTION Do NOT apply tension to the probe cable.

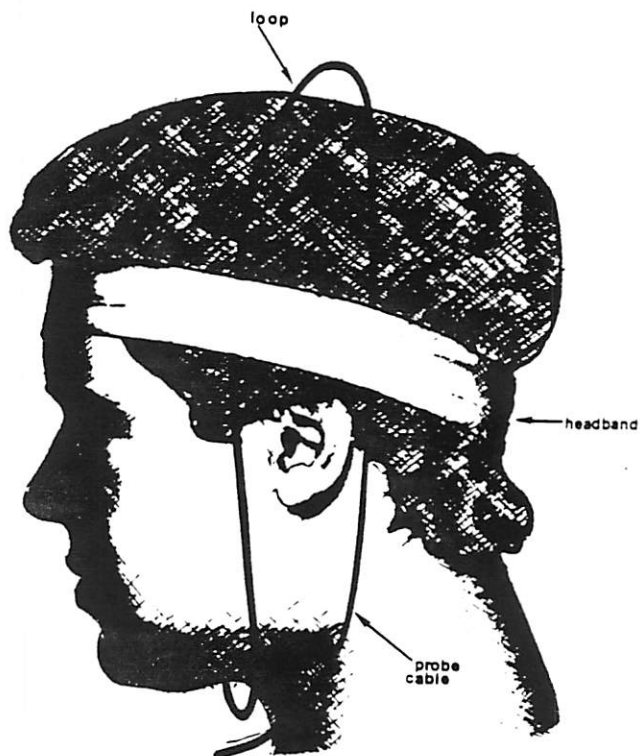


STRESS AND EXERCISE TESTING

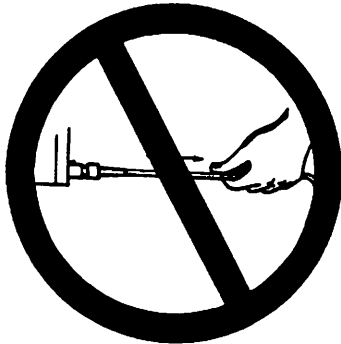
5. Do NOT position the ear probe where cartilage is present, nor allow it to press against the side of the head.
6. Place the elastic headband on the patient's head.
7. Position the ear probe cable underneath the patient's chin.
8. Route the cable up along the opposite side of the patient's head in front of the ear.



STRESS TESTING
PATIENT SET-UP SIDE VIEW



CAUTION Do NOT apply tension to the probe cable.



9. Loop the cable up approximately 3 to 6 inches and tuck it inside the headband.
10. Route the cable down behind the ear.
11. To determine if the probe is attached correctly and the display data is verifiable see the Signal and Data Validity Section. (See pages 32-34)

STRESS AND EXERCISE TESTING

12. It has been noted that letting the patient view the plethysmographic waveform enables them to assist in reducing motion artifact. To test for interference during exercise:
 - A. Have the patient slowly move their head from side to side.
 - B. Next, have the patient slowly move their head up and down.
 - C. The SaO₂ should not fluctuate more than 1%.
 - D. Watch that the ear probe and cable do not move on the ear and the cable does not tug on the probe as the patient's head moves.

13. If vigorous exercise is anticipated, have the patient quickly move their head. Some readjustment of the cable and headband may be necessary to eliminate motion artifact. (See Signal and Data Validity Section pages 32-34)

Setting up the oximeter:

Ensure that the oximeter is in the Slow Response Mode (6 second average) to decrease the effect of motion artifact on the calculated SaO₂. (See Page 21)

Set the Patient Alarms at the desired limits. (See Page 24)

MESSAGES

STATUS MESSAGES

The Ohmeda Biox 3700 Oximeter acknowledges the user's actions with the instrument by visually displaying STATUS MESSAGES on the Graphic Display. These messages guide and inform the user of the oximeter's operating condition.

IMPORTANT Data is NOT collected when interference is detected. If excessively long periods (12 seconds continuous in the Fast Response Mode and 24 seconds continuous for the Slow Response Mode) of interference exist, the numbers on the SAO₂ and Pulse Rate

Displayed when the input signal is too erratic to be processed. This can be caused by strong RF (radio frequency) interference, sometimes generated by electrocautery.

"INTERFERENCE DETECTED
SAO₂ & PULSE RATE
MAY BE INVALID"

Displayed momentarily when the WAVEFORM control is held for 3 seconds, while entering the Fast Response Mode.

"FAST RESPONSE
SELECTED"

Displayed with the plethysmographic waveform when the oximeter is in the Fast Response Mode.

"F"

Displayed with the plethysmographic waveform when unit is running under battery power.

"BT"

Displayed momentarily by the oximeter upon power-up when the battery is used to operate it.

"BATTERY IN USE"

Displayed momentarily when the oximeter is ready to output the Analog Trend Data.

"ANALOG TREND OUTPUT,
START CHART RECORDER
HIT TREND KEY
TO START OUTPUT"

Displayed when the ALARM VOLUME key is initially depressed. Continually holding down this key increases the volume in steps.

"ALARM VOLUME
HOLD KEY TO SET,
VOLUME LEVEL IS 1"

DESCRIPTION

MESSAGE

STATUS MESSAGES

DESCRIPTION

MESSAGE

displays remain on the display, but do not change. When the interference has stopped, valid readings (aged 12 seconds while in the Fast Response Mode or aged 24 seconds while in the Slow Response Mode) return to the display in approximately 2 seconds, and the oximeter begins collection of Trend Data again. The data is current within 6 seconds in the Slow Response Mode or 3 seconds in the Fast Response Mode.

..LO BT..

Displayed alongside the plethysmographic waveform when approximately 5 to 10 minutes of battery operation is left.

OHMEDA-BIOX 3700
 REVISION: X
 SYSTEM CHECK
 IN PROCESS..

Displayed momentarily when the unit is turned on.
 NOTE: X represents an alphanumeric value.

..OUTPUTTING TREND
 TIME REMAINING X:XX
 HIT TREND KEY
 TO END OUTPUT..

Displayed while the oximeter is outputting the Trend Data via the SaO₂ and Pulse Rate Analog or Digital Output.
 NOTE: "X:XX" represents the hours and minutes left in the trend data output. It also represents the time before trend data output is complete in minutes and seconds.

..PLEASE PLUG UNIT
 INTO WALL OUTLET
 TO DETERMINE
 LINE FREQUENCY..

Displayed at power-up when the oximeter has lost the battery-backed RAM.

..THANK YOU
 UNIT MAY NOW RUN
 ON BATTERY..

Displayed after the unit is plugged in.

STATUS MESSAGES

MESSAGE	DESCRIPTION
"PREVIOUS TREND DATA AVAILABLE"	Displayed when the TREND key is held while the oximeter is turned on. This is necessary for viewing previous Trend Data on the 20 or 60 minute Trend Graph or outputting previous trend data through the Digital and Analog Outputs.
"PULSE VOLUME HOLD KEY TO SET, VOLUME LEVEL IS OFF"	Displayed when the PULSE VOLUME key is initially depressed. Continually holding down this key increases the volume in steps.
"PULSE WAVEFORM SELECTED"	Displayed momentarily when the WAVEFORM key is depressed during a Probe Alarm condition or a Device Failure Alarm condition.
"S"	Displayed with the plethysmographic waveform when the oximeter is in the Slow Response Mode.
"SLOW RESPONSE SELECTED"	Displayed momentarily when the WAVEFORM key is held for 3 seconds, while entering the Slow Response Mode.
"SYSTEM OPERATIONAL"	Displayed after the diagnostic self-test, indicating the oximeter passed all performed tests.
"TREND MODE SELECTED"	Displayed momentarily when the TREND key is depressed during an Alarm condition except a "NO PROBE" or "PROBE OFF" condition or a Patient Alarm condition.

MESSAGES

ALARM MESSAGES

Alarm Messages appear on the Graphic Display alerting the user to conditions which need immediate attention. Check the patient and the oximeter whenever any alarm condition occurs. In a situation where an SaO₂ or Pulse Rate limit is violated, only the Digital Display is affected.

The **PATIENT ALARM LIMIT CONDITION** occurs when the oximeter detects conditions affecting patient status. Trend Data is collected during a Patient Alarm Limit Condition, and the alarm can be silenced for 30 seconds. When this alarm condition occurs:

1. An alarm tone sounds,
2. The red alarm light flashes,
3. The violated alarm limit flashes on the Digital Display,
4. The SaO₂ or Pulse Rate reading which is out of range, flashes on the Digital Display.

The **PROBE ALARM CONDITION** occurs when the oximeter detects conditions affecting the probe or its placement or probe failure. Trend Data is collected during a Probe Alarm Condition, but the readings are set to zero. Alarms can be silenced for 30 seconds. In the case of a "PROBE OFF" or "NO PROBE" alarm, the alarm silence key should silence the audible alarm until either the specific alarm condition is remedied or a different alarm condition is detected, or a different message is displayed on the Front Panel other than Trend. When this alarm condition occurs:

1. An alarm tone sounds,
2. The red alarm light flashes,
3. An Alarm Message appears on the Graphic Display,
4. Dashes appear on the Digital Display.

During the **DEVICE FAILURE ALARM CONDITION** the oximeter is not functional and the Trend Data is NOT collected. The alarm still can be silenced for 30 seconds. In the case of "RECHARGE BATTERY" and "POWER SUPPLY FAILURE" the oximeter automatically shuts off approximately 10 seconds after the message appears on the Graphic Display.

NOTE: Whenever the message "SERVICE UNIT" appears on the Graphic Display, remove the oximeter from use and contact an Authorized Ohmeda Service Representative. (See rear cover of this manual.)

ALARM MESSAGES

ALARM MESSAGE

..A/D CONVERTER FAILURE SERVICE UNIT..

Device unable to complete the Analog to Digital conversion. Turn unit off. Service unit.

..ANALOG SYNCHRONIZATION ERROR SERVICE UNIT..

Software unable to synchronize with the Analog circuitry. Turn unit off. Service unit.

..CALIBRATE UNIT ADJUST POT AT BOTTOM HOLE VALUE = 0 ± .1 HIT WAVEFORM TO END..

Displayed if the calibration is out of specification after the oximeter performs the diagnostic self-test. See Calibration Procedure, p. 86.

..CIRCUIT FAILURE SERVICE UNIT..

Displayed when the oximeter's internal circuitry has failed. Turn unit off. Service unit.

..INSUFFICIENT LIGHT DETECTED CHECK PROBE SITE..

1. Dirt on the probe emitter or detector.
 2. Test site is dirty.
 3. Misaligned or malpositioned probe.
 4. Insufficient amount of light penetrating tissue sample.
 5. Fingernail polish present.
 6. Dark pigmentation.
 7. Detector failure.
1. Clean the probe.
 2. Clean test site.
 3. Reposition the probe or select an alternate test site.
 4. Reposition the probe or select an alternate test site.
 5. Remove polish or use ear probe.
 6. Select an alternate test site.
 7. Replace Probe.

POSSIBLE CAUSES

PROBABLE REMEDY

ALARM MESSAGES

ALARM MESSAGE

POSSIBLE CAUSES

PROBABLE REMEDY

..LO QUALITY SCNL..
NOTE: This is displayed above the plethysmographic waveform.

The SaO₂ & Pulse Rate reading may be invalid due to unreliable data which may be caused by poor perfusion.
Check probe placement, message test site, or select an alternate test site.

..MICROPROCESSOR ERROR SERVICE UNIT..

Displayed during the diagnostic self-test if a microprocessor is operating incorrectly.

..MICROPROCESSOR INTERRUPT ERROR SERVICE UNIT..
Displayed anytime a microprocessor failure occurs.

Turn unit off.
Service unit.

..NO PROBE CONNECTED TO UNIT..

Probe not plugged in or fully inserted into probe connector.

Check the probe model number. Insert probe plug into probe connector.

..PLUG UNIT INTO WALL OUTLET TO RECHARGE BATTERY..

Battery unable to supply proper operating voltage. Unit automatically shuts off in approximately 10 seconds.

Recharge battery per instructions, p. 85, or operate from AC mains power (USA 120 VAC).

..POWER SUPPLY FAILURE SERVICE UNIT..

Displayed when the oximeter's power supply has failed. The unit automatically shuts off in approximately 10 seconds.

Service unit.

..PROBE ID ERROR REPLACE PROBE..

Oximeter can not identify the probe connected to it.

Check the probe model number. Replace probe.

ALARM MESSAGES

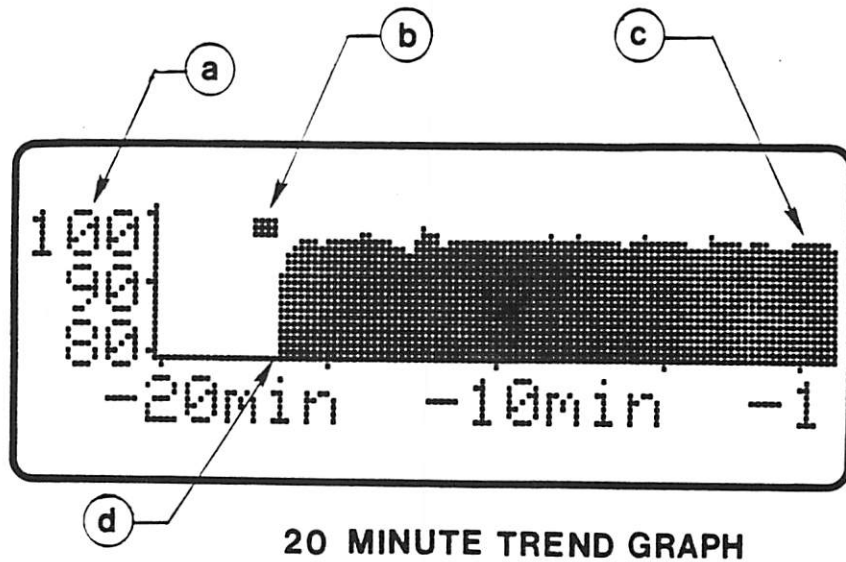
<u>ALARM MESSAGE</u>	<u>POSSIBLE CAUSE</u>	<u>PROBABLE REMEDY</u>
"PROBE FAILURE REPLACE PROBE"	Broken wire in probe cable, inoperative LEDs.	Replace probe.
-----	-----	-----
"PROBE OFF PATIENT"	1. Probe is off patient. 2. Too much light detected by probe photodetector. 3. Extremely thin tissue at test site. 4. Artificial nail tips or long fingernails present.	1. Attach the probe to patient. 2. Shield probe site from ambient light. 3. Select an alter- nate test site. 4. Do <u>NOT</u> attempt to remove the nail. Select an alter- nate probe loca- tion.
NOTE: This occurs with the finger probe and ear probe.		
-----	-----	-----
"RAM CHECK ERROR SERVICE UNIT"	Displayed during operation if an error is found during the periodic RAM test.	Turn unit off. Service unit.
-----	-----	-----
"RAM TEST ERROR HIGH BYTE SERVICE UNIT"	Displayed after the diagnostic self-test if a RAM failure exists.	Turn unit off. Service unit.
-----	-----	-----
"RAM TEST ERROR HIGH & LOW BYTES SERVICE UNIT"	Displayed after the diagnostic self-test if a RAM failure exists.	Turn unit off. Service unit.
-----	-----	-----
"RAM TEST ERROR LOW BYTE SERVICE UNIT"	Displayed after the diagnostic self-test if a RAM failure exists.	Turn unit off. Service unit.

ALARM MESSAGES

<u>ALARM MESSAGE</u>	<u>POSSIBLE CAUSE</u>	<u>PROBABLE REMEDY</u>
"RAM TEST ERROR TREND CHECKSUM SERVICE UNIT"	Displayed after the diagnostic self-test if a RAM failure exists.	Turn unit off. Service unit.
"RAM DATA INVALID RE-INITIALIZING"	Oximeter memory has been erased. The Trend data is lost.	The oximeter automatically re-initializes, and is ready for use.
"ROM TEST ERROR HIGH BYTE SERVICE UNIT"	Displayed after the diagnostic self-test if a ROM failure exists.	Turn unit off. Service unit.
"ROM TEST ERROR HIGH & LOW BYTES SERVICE UNIT"	Displayed after the diagnostic self-test if a ROM failure exists.	Turn unit off. Service unit.
"ROM TEST ERROR LOW BYTE SERVICE UNIT"	Displayed after the diagnostic self-test if a ROM failure exists.	Turn unit off. Service unit.
"STACK ERROR PLEASE NOTE CONDITIONS AND SERVICE UNIT"	Periodic check of system stack area indicates a problem exists.	Turn unit off. Service unit.
"SYSTEM ERROR X, PLEASE NOTE ERROR CODE AND SERVICE UNIT"	Displayed after the diagnostic self-test if a software/hardware failure exists. Displayed during a periodic check of software/hardware during operation if a problem exists.	Note the error #. Turn the unit off. Service unit.
NOTE: "X" represents an alphanumeric value.		
"VOLTAGE REFERENCE FAILURE SERVICE UNIT"	May be displayed during operation if a hardware problem exists.	Turn unit off. Service unit.

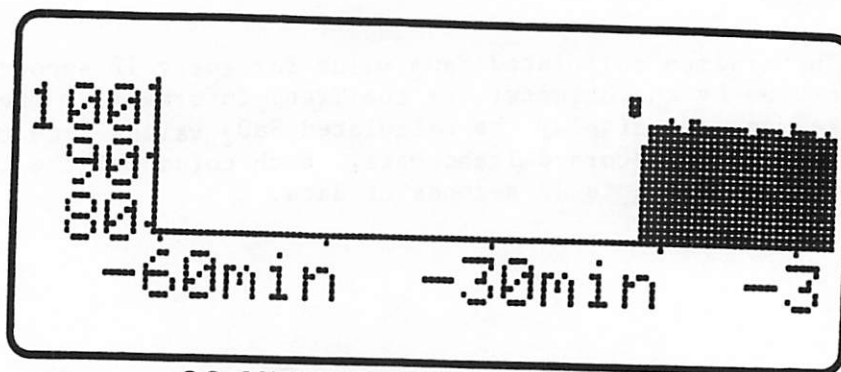
DESCRIPTION

The minimum calculated SaO₂ value for every 12 second period is stored by the oximeter for the Trend Information. Depress the TREND key once to display the calculated SaO₂ values from the previous 20 minutes of recorded Trend Data. Each column of the 20 minute Trend Graph represents 12 seconds of data.



- a. SaO₂ percentage.
- b. A three pixel (dot) column in the 98% - 100% SaO₂ range indicates a Probe Alarm Condition, or a "LO QUALITY SGNL" condition, or an "INTERFERENCE DETECTED" condition.
- c. The Trend Graph continually updates and aligns itself in time, with the most recent Trend Data collected in the right column on the graph.
- d. The Trend Data collected 20 minutes ago is in the left column on the graph.

A second depression of the TREND key displays the calculated SaO₂ values from the previous 60 minutes of recorded data. On the 60 minute Trend Graph each column represents the minimum of each 36 seconds of data.



60 MINUTE TREND GRAPH

Each depression of the TREND key causes the Trend Graph to alternate between displaying 20 minutes of Trend Data and 60 minutes of Trend Data. The Trend Graph remains on the display until the WAVEFORM control is depressed, and the plethysmographic waveform is initialized.

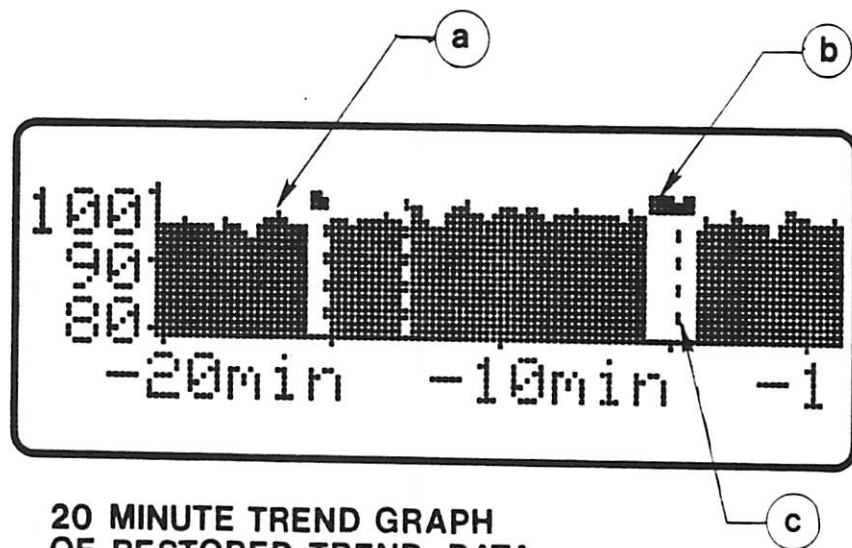
During a "PROBE OFF" or "NO PROBE" Alarm Condition, an Alarm Message replaces the Trend Graph on the Graphic Display. Depress the TREND key to re-enter the Trend Graph Display.

Trend Data is not erased when the oximeter is turned off, provided the battery is not disconnected or a "RECHARGE BATTERY" Alarm Condition occurs automatically shutting the unit off. The previous 20 or 60 minute Trend Data can be viewed when the oximeter is turned on again. The oximeter is capable of storing up to eight hours of Trend Data, which can be accessed through analog or digital output. The 8 hours of Trend Data is continually updated as new information is collected. It is saved in memory and can be restored.

RESTORING PREVIOUS TREND DATA

1. Holding the TREND key while turning the oximeter on restores the previous 8 hours of Trend Data. The previous 8 hours of Trend Data can be accessed through Analog or Digital output. The most recent 20 or 60 minutes of Trend Data can be viewed on the 20 or 60 Minute Trend Graphs.
2. The Status Message, "PREVIOUS TREND DATA AVAILABLE" is momentarily displayed on the Graphic Display.
3. The Status Message, "OHMEDA-BIOX 3700, REVISION: X, SYSTEM CHECK IN PROCESS" momentarily appears on the Graphic Display while the oximeter performs its diagnostic self-test.

4. The Status Message, "SYSTEM OPERATIONAL" appears on the Graphic Display indicating the oximeter is operating correctly. Dashes appear on the Digital Display until the readings have stabilized.
5. When the probe is on a patient, the plethysmographic waveform appears on the Graphic Display and SaO₂ and Pulse Rate readings appear on the Digital Display. The system is fully operational.
6. Depress the TREND key, and the previous Trend Data is displayed along with the present Trend Data.

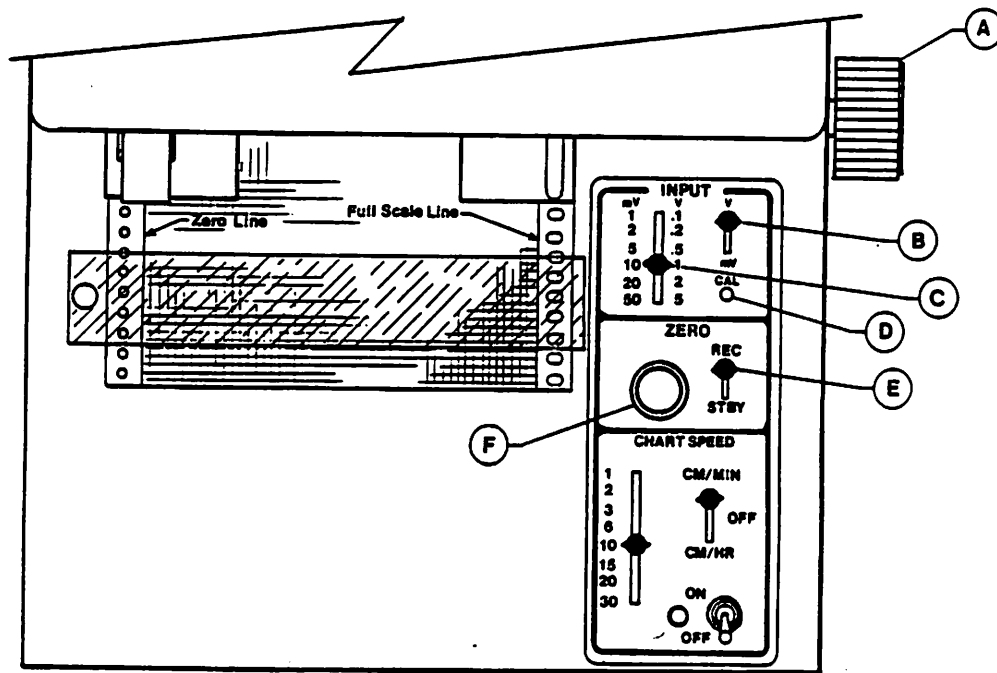


- a. Previous Trend Data
- b. A three pixel (dot) column in the 98% - 100% SaO₂ range indicates condition where SaO₂ data can not be collected, (such as a "NO PROBE", "PROBE OFF", "LO QUALITY SGNL", OR "INTERFERENCE DETECTED" condition).
- c. A column with five sets of 2 pixel (dot) indicates when the oximeter was turned off.

OHMEDA SINGLE OR DUAL CHART RECORDER CONNECTION

CAUTION Connect only a high impedance device (1K Ohm or higher) to the analog output jack. Improper loading will upset the correspondence between the measured voltage and the intended output voltage.

The Ohmeda Biox Model 0001 Single Channel or the Model 0003 Dual Channel Strip Chart Recorder connect directly to either of the Analog Output jacks. To connect the Ohmeda Biox Recorders with the Ohmeda Biox 3700 Oximeter, use the following procedure:



OHMEDA CHART RECORDER CONTROL PANEL

OHMEDA SINGLE OR DUAL CHART RECORDER CONNECTION

1. Using the knob **A** on the side of the recorder, advance the chart paper until the numbers are visible.
2. Locate the positive (+) and negative (-) input signal connections on the rear of the chart recorder. Using a small flat blade screwdriver (supplied with the Ohmeda Chart Recorder):
 - * Connect the clear wire tab to the positive (+) input signal connection.
 - * Connect the black wire tab to the negative (-) input signal connection.
3. Connect the plug end of the shielded chart recorder cable into the rear panel of the oximeter at the SaO₂ jack or Pulse Rate jack (depending on which data is to be output). Ensure that the plug is firmly connected to the oximeter.
4. Locate the input voltage selection switches on the chart recorder control panel.
 - * Push the mV/V Switch **B** to the V (Volt) setting
 - * Set the Numerical Slide Switch **C** to the 1 V (One Volt) setting
 - * Set the REC/STBY Switch **E** to REC (Record)
5. Turn on the Chart Recorder.
6. Hold down the Low SaO₂ ▼ arrow key on the oximeter front panel and turn the oximeter on. The following Status Message momentarily appears on the Graphic Display:

"OHMEDA-BIOX 3700
REVISION: X
SYSTEM CHECK
IN PROCESS"

NOTE: "X" represents an alphanumeric value of the software revision level.

OHMEDA SINGLE OR DUAL CHART RECORDER CONNECTION

Next, the following Status Message appears on the Graphic Display:

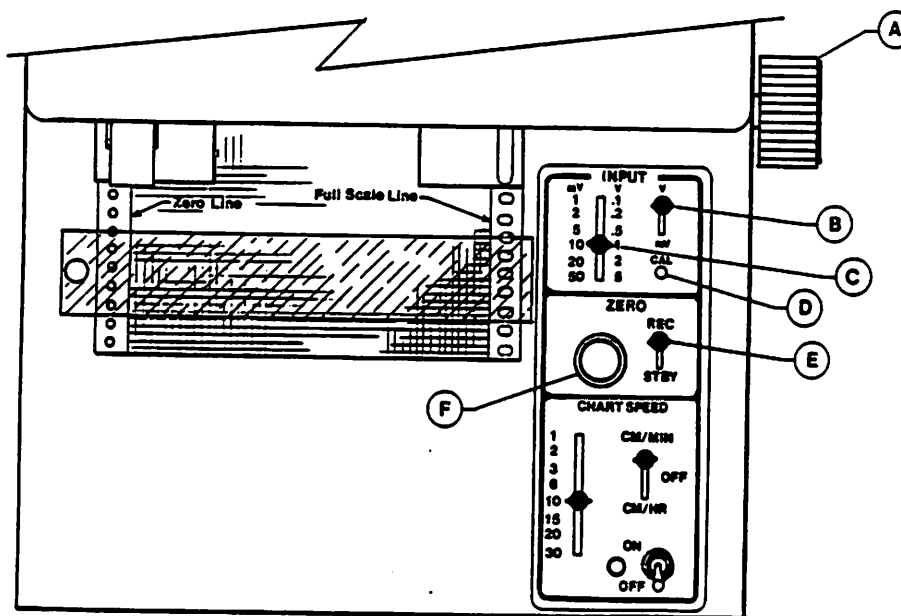
"SAO2 & PULSE ANALOG
OUTPUTS = 0 VOLTS
WAVEFORM:NEXT TEST
TREND : QUIT"

IMPORTANT: If this Status Message does not appear, turn the oximeter off, and repeat step #6.

- Adjust the Zero Control Knob **F** on the control panel of the chart recorder to set the pen to zero line on the recorder paper. The chart recorder pen should move across the recorder paper towards the zero line.
- Depress the WAVEFORM key on the oximeter. The Status Message which appears on the Graphic Display is:

"SAO2 & PULSE ANALOG
OUTPUTS = 1 VOLT
WAVEFORM:NEXT TEST
TREND: QUIT"

The chart recorder pen should move across the recorder paper from the zero line to approximately the full scale line.



OHMEDA CHART RECORDER CONTROL PANEL

9. Adjust the calibration (CAL) potentiometer **D** on the chart recorder control panel with a small flat blade screwdriver (supplied with the Ohmeda Chart Recorder) to set the pen to full scale on the recorder paper (100% SaO₂ or 250 BPM).

NOTE: The screwdriver supplied with the Ohmeda Chart Recorder has various size blades stored in the handle. Pull the screwdriver handle off to locate the blades. The largest blade should be used to calibrate the recorder.

10. Depress the WAVEFORM key on the oximeter. The following Status Message appears on the Graphic Display:

```
*** CALIBRATE UNIT **  
ADJUST POT AT BOTTOM  
HOLE TO VALUE = 0 ± .1  
HIT WAVEFORM TO END"
```

The chart recorder pen should move across the recorder paper from the full scale line to the zero line. Wait a few seconds for the reading on the oximeter Digital Display to stabilize.

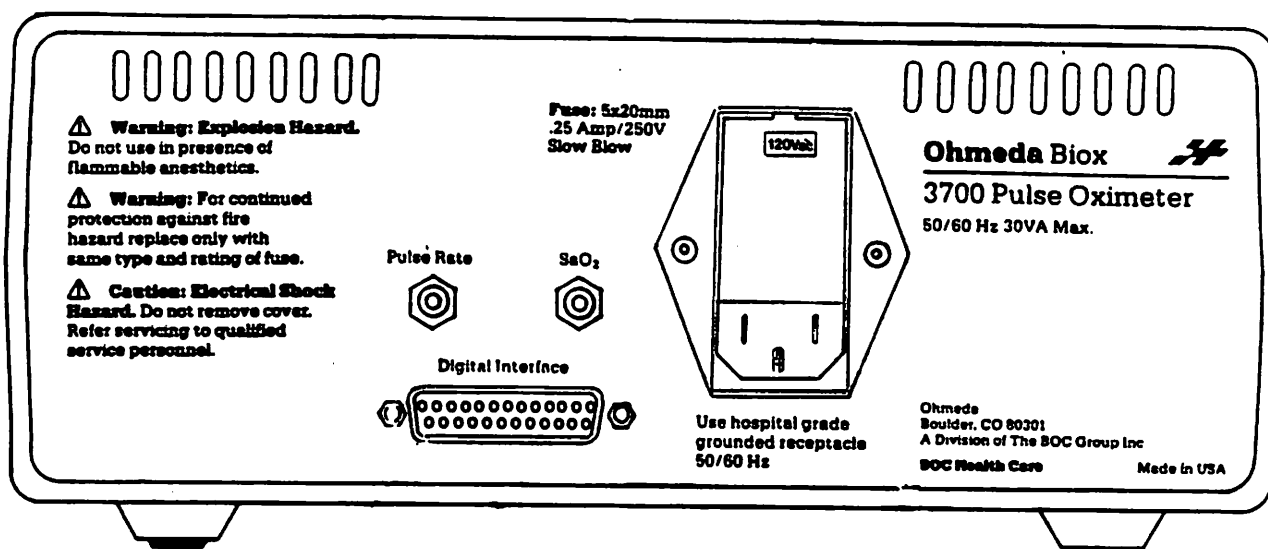
* Verify that the oximeter Digital Display reads zero (0.0 ± .1). If the Digital Display does not read zero (0.0 ± .1), refer to the Calibration Procedure in this manual (see page 86).

11. Depress the WAVEFORM key to return to the Status Message "OHMEDA-BIOX 3700 REVISION: X SYSTEM CHECK IN PROCESS". The chart recorder should be calibrated to the oximeter and ready for use.

CONNECTION WITH CHART RECORDERS, POLYGRAPHS AND OTHER RECORDING EQUIPMENT

The 3700 interfaces with any analog recording device capable of accepting the 0 to 1 Volt signal outputs representing oxygen saturation and pulse rate. The 3700 is interfaced through the mono mini-phone output jacks on the rear panel of the 3700. The jacks are wired as follows:

jack tip (input connector tip) = signal
jack base (input connector base) = signal ground



REAR PANEL

If using a recorder other than Ohmeda's, please contact the recorder's manufacturer for input connections and calibration instructions.

NOTE: Ensure that there is a tight connection between the output jack and the oximeter connector.

ANALOG OUTPUT OF TREND DATA

The Graphic Display allows viewing of 20 or 60 minutes of Trend Data. To view the Trend Data buffer of SaO₂ and Pulse Rate since the last time the oximeter was turned on, **first calibrate the chart recorder with the oximeter** as described in the Chart Recorder Connection Section of this manual. To view the full eight hours of trend data, restore the previous trend data by depressing the TREND 20/60 key while turning the oximeter on.

CAUTION Connect only a high impedance device (1K Ohm or higher) to the analog output jack. Improper loading will upset the correspondence between the measured voltage and the intended output voltage.

Next, follow the steps listed below.

1. Depress the TREND 20/60 key for three seconds. The following Status Message appears on the Graphic Display:

"ANALOG TREND OUTPUT
START CHART RECORDER
HIT TREND
TO START OUTPUT"

2. Depress the TREND key to start outputting the full eight hours of the Trend Data buffer continuously. One hour of Trend Data is output approximately every minute. During this time the Graphic Display should read:

"OUTPUTTING TREND
TIME REMAINING: X:XX
HIT TREND KEY
TO END OUTPUT"

This Status Message is updated approximately every second to inform the operator of the hours and minutes of Trend Data remaining. This feature allows the user to select a particular section of Trend Data to be output.

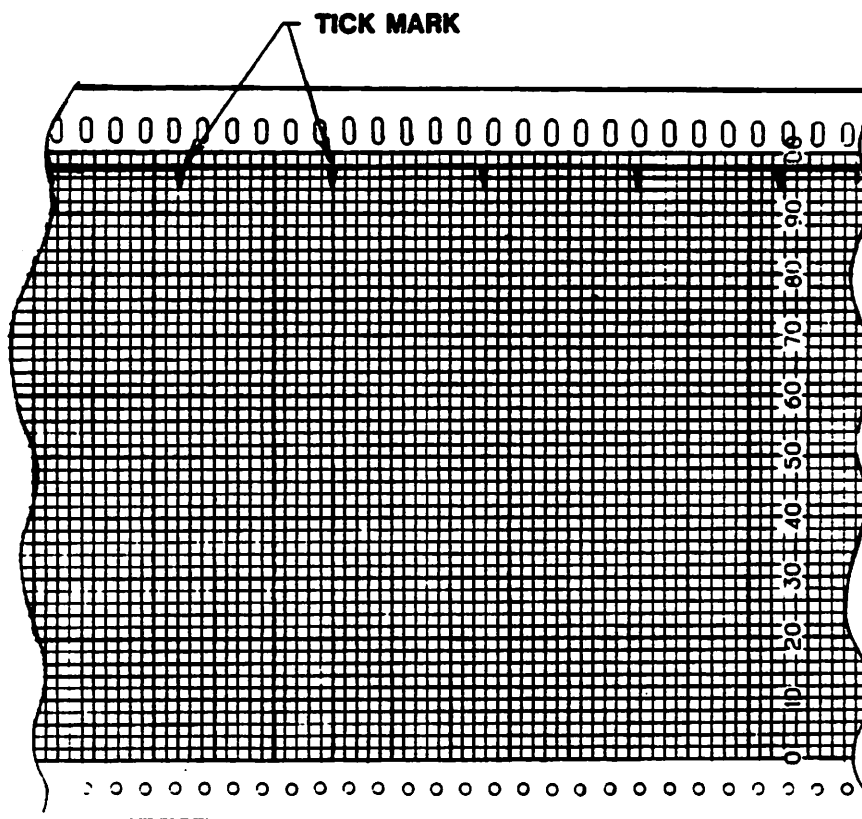
After the data is output, the oximeter returns to the previous display. The Trend Data is still in memory and can be output again.

NOTE: Eight hours of trend data is output in approximately eight minutes.

ANALOG OUTPUT OF TREND DATA

During the real time analog output of data, the LO QUALITY SGNL condition is represented by a tick mark. This happens for both the SaO₂ and the Pulse Rate output. Instead of going to zero when LO QUALITY SGNL occurs, a three percent spike (tick mark) drop below the current reading lasts for 1/3 second for SaO₂, and an eight BPM spike (tick mark) drop below the current reading lasts for 1/3 second for Pulse Rate.

The tick mark appears at the beginning of every LO QUALITY SGNL occurrence. If the LO QUALITY SGNL is continuous, the tick mark occurs every 15 seconds thereafter.



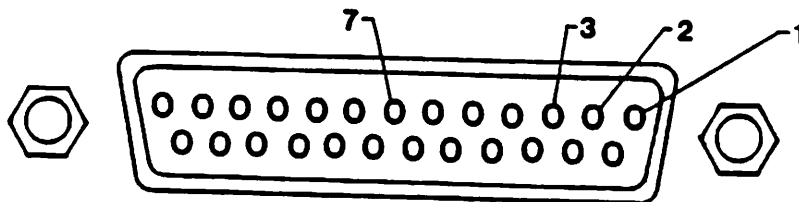
Most printers, display terminals, and computers with an RS-232C interface and the capability to accept ASCII formatted data at a 1200 BPS (Bits Per Second) baud rate may be interfaced to the Ohmeda Biox 3700 Pulse Oximeter.

Prior to connecting the Ohmeda Biox 3700 Oximeter with RS-232C devices, make sure the settings on the terminal or equipment are:

1200 Baud
7 Bit Data
Odd Parity
1 Stop Bit

Connector wiring:

Pin 1	Chassis Ground
Pin 2	Receive Data By the Oximeter
Pin 3	Transmit Data From the Oximeter
Pin 7	Signal Ground



DIGITAL INTERFACE CONNECTOR

(located on the Oximeter rear panel)

When the Oximeter is connected with RS-232C devices, SaO₂ and pulse rate readings and alarm conditions are transmitted and updated every two seconds.

EXAMPLE

In this example, we will connect the Ohmeda Biox 3700 Oximeter to an IBM® PC.

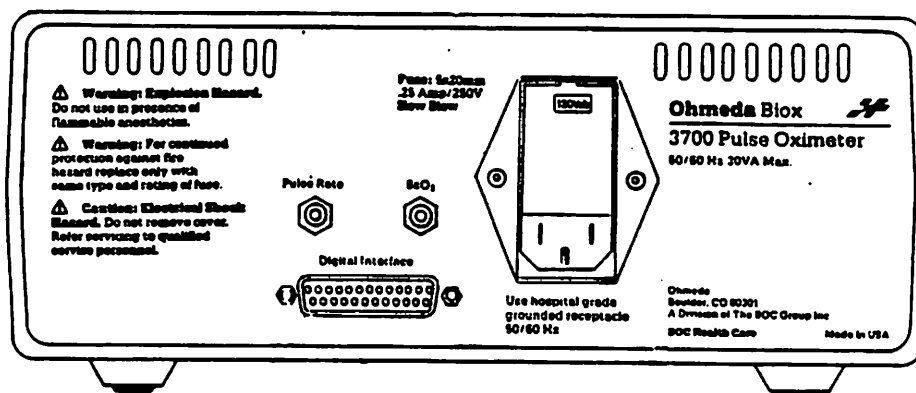
(IBM and IBM PC are registered tradenames of International Business Machines Corporation)

EXAMPLE**EQUIPMENT NEEDED**

- * Requires a board for the IBM that supports Serial Communication with the same serial port connections as the Ohmeda Biox 3700 Oximeter
- * Connectors Male (DB-25P) to Female (DB-25P) Interface Cable with pins 1, 2, 3, & 7 connected on both ends of the cable.

PROCEDURE

1. On the Ohmeda Biox 3700 Oximeter rear panel, locate the Digital Interface Connector.



2. Connect the Male(DB-25P) end of the RS-232C Interface Cable to the Oximeter Digital Interface Connector.
3. On the rear panel of the IBM PC, locate the RS-232C Interface Connector.
4. Connect the Female (DB-25P) end of the RS-232C Interface Cable to the IBM PC RS-232C Interface Connector.
5. Ensure that the RS-232C Interface Cable is securely connected on both ends.
6. Proceed to Manual Section: Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter.

DIGITAL INTERFACE

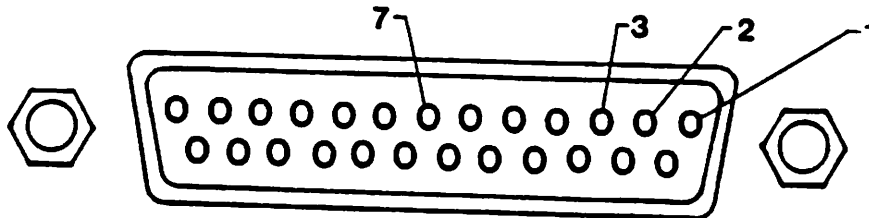
Most printers, display terminals, and computers with an RS-232C interface and the capability to accept ASCII formatted data at a 1200 BPS (Bits Per Second) baud rate may be interfaced to the Ohmeda Biox 3700 Pulse Oximeter.

Prior to connecting the Ohmeda Biox 3700 with RS-232C devices, make sure the settings on the terminal or equipment are:

1200 Baud
7 Bit Data
Odd Parity
1 Stop Bit

Connector wiring:

Pin 1	Chassis Ground
Pin 2	Receive Data By the Oximeter
Pin 3	Transmit Data From the Oximeter
Pin 7	Signal Ground



DIGITAL INTERFACE CONNECTOR

(located on the rear panel)

When the oximeter is connected with RS-232C devices, SaO₂ and pulse rate readings and alarm conditions are transmitted and updated every two seconds.

COMPUTER INTERFACE

CONNECTION OF THE OHMEDA BIOX 3700 WITH AN IBM® PERSONAL COMPUTER.

Ohmeda provides this section as a sample for general information only. Ohmeda is not responsible for any changes IBM makes in their product.

The minimum requirements are:

- * 256K RAM
- * Asynchronous Communications Adapter (Serial Port)
- * DOS (Disk Operating System) 2.1 or higher program which should contain two disks:
 1. DOS
 2. DOS Supplemental Program
- * Upper case is required to communicate with the oximeter

The 3700 Oximeter should be on and operational.

SET-UP

1.
 - * Put the DOS disk into the disk drive and close the drive door.
 - * Turn on the computer.
2. The prompt on the computer screen should display:

```
A>
```

Type BASICA after the prompt. The computer screen should look like the following:

```
A>BASICA
```

3. Depress the return key.
4. The Basic Language Sign-On message should appear on the computer screen.

IMPORTANT: Read this guideline and the sections of the manual which are referenced before attempting computer interface with the Ohmeda Biox 3700 Oximeter.

REQUIREMENTS	Determine if the computer or terminal can connect with the Ohmeda Biox 3700 Oximeter.	See Manual Section: Digital Interface
SET-UP	Connect the Ohmeda Biox 3700 Oximeter to a computer or terminal.	See Manual Section: Digital Interface
PROGRAMMING	Program the computer or terminal to communicate with the Ohmeda Biox 3700 Oximeter.	See Manual Section: Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter
IMPLEMENTING	If the program has been saved, type RUN"3700COM.BAS" (Make sure you are in the correct directory.)	See Manual Section: Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter
APPLICATIONS	For further information on: Auto-Dump Mode Trend-Dump Mode Waveform Mode Slave Mode Control Mode	See Manual Section: Computer Interface Communication

Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter

Ohmeda provides this section as a sample for general information only. Ohmeda is not responsible for any changes IBM makes to their product.

This section describes how to program an IBM PC to communicate with an Ohmeda Biox 3700 Oximeter. Before proceeding with this section, ensure that the Ohmeda Biox 3700 Oximeter is connected to the IBM PC as described in the Digital Interface Section of this manual.

Before programming the IBM PC to communicate with the Ohmeda Biox 3700 Oximeter, an understanding of some key aspects about how the IBM PC works is suggested. The time spent becoming familiar with the IBM PC will more than repay itself later on.

In order to program the IBM PC, an understanding of these concepts and commands are suggested. Refer to documentation supplied with the IBM PC for this information.

* Use of the keyboard especially:



CAPS LOCK



BACKSPACE



SHIFT



ESCAPE



ENTER



CTRL BREAK

* The BASIC Program Editor
* SAVE
* RUN
* LIST

Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter

The following program enables the IBM PC and the Ohmeda Biox 3700 Oximeter to communicate with one another. **It is important to use capital letters as they are shown in this procedure.**

1. Press POWER/STANDBY to turn the Oximeter on.
2. Turn the IBM PC on.
3. A prompt should appear on the computer screen within a minute. The prompt may vary due to which default drive is being used. The prompt may look like:


A>



Press the CAPS LOCK key

NOTE: The CAPS LOCK key toggles between uppercase (capital letters) and lowercase.

When you are in uppercase:

SYMBOLS * you still need to press the SHIFT key  to type the symbols in the upper position of the number keys.

Lowercase: If you want to type lowercase letters while in uppercase:

- * press the CAPS LOCK key again and start typing
 - * or press the SHIFT key to type a single lower case letter
-

Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter

3. Type BASICA after the prompt. The computer screen should look like the following:

A>BASICA

If the computer screen does not display capital letters, then press the CAPS LOCK key.

4. Press ENTER



5. The BASIC Language Sign-On Message should appear on the computer screen. For example, the message may look like the following:

```
IBM Personal Computer Basic
Version D3.10 Copyright IBM Corp 1981, 1985
61310 bytes free
```

6. On the next page is an example program which may be run on the IBM PC to communicate with the Ohmeda Biox 3700 Oximeter. Before typing the program, here are some Helpful Hints to review.

Editing Hints

To Correct a MINOR typing mistake:



* Use the BACKSPACE Key to back up to the mistake



* Type the correct character

* Press the ENTER key after the correction has been made

To Correct a MAJOR typing mistake:



* Press the ESCAPE key

* A Backslash appears and the cursor should move down one line on the computer screen

* The line with the mistake has been cancelled

* Retype the line

* Press the ENTER key after the line has been entered



COMPUTER INTERFACE

5. Remove the DOS disk.
6. Insert the DOS Supplemental Program disk into the disk drive.
7. Type: LOAD"COMM". The computer screen should look like the following:

```
LOAD"COMM"
```

8. Depress the return key.
9. Type: 215 COMFIL\$=COMFIL\$+",CS,DS,CD". The computer screen should look like the following:

```
215 COMFIL$=COMFIL$+",CS,DS,CD"
```

10. Depress the return key.
11. Type: 330
DELETE 360-430
410 PRINT A\$;

Depress the return key after each line entered. The computer screen should look like the following:

```
215 COMFIL$=COMFIL$+",CS,DS,CD"  
330  
DELETE 360-430  
410 PRINT A$;
```

12. Type: RUN. The computer screen should look like the following:

```
215 COMFIL$=COMFIL$+",CS,DS,CD"  
330  
DELETE 360-430  
410 PRINT A$;  
RUN
```

13. Depress the return key.

14. The following menu should appear on the computer screen:

```
COMMUNICATIONS MENU  
  
CHOOSE ONE OF THE FOLLOWING:  
  
1. Description of program  
2. Dow Jones/News Retrieval  
3. IBM Personal Computer  
4. Series/1  
5. THE SOURCE  
6. Other service  
7. End program
```

15. Depress the number 6 (six). The computer screen should clear the Communications Menu and display:

```
BAUD RATE
```

 Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter


6. Type the following program (line 10 through line 100). Remember to enter the line number and press ENTER after each line entered. There is a Troubleshooting Table on the next page to help you.

IMPORTANT

The symbol "O" denotes the capital letter O.
 The symbol "Ø" denotes the number zero.

```

10 KEY OFF: SCREEN Ø,Ø: WIDTH 8Ø: COLOR 7,Ø: CLS:LOCATE ,,Ø
20 ON ERROR GOTO 1ØØ
30 OPEN "COM1:12ØØ,Ø,7,1,CS,DS,CD" AS #1
40 BØ=INKEYØ:IF BØ<>" " THEN PRINT #1,BØ;
50 IF EOF(1) THEN 4Ø
60 AØ=INPUTØ(LOC(1),#1)
70 L=Ø:L=INSTR(L+1,AØ,CHRØ(1Ø)):IF L>Ø THEN MIDØ(AØ,L,1)=" "
80 PRINT AØ;
90 GOTO 4Ø
1ØØ RESUME
  
```

7. Carefully check to see that the program on the computer screen has been entered correctly. Examine the program line by line. If all the information has been entered correctly, go to Step 8 to save the program.

 Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter

7. Continued...

 PROGRAM TROUBLESHOOTING

SYMPTOM

ACTION

Computer screen blank
after typing RUN.

- . Ensure that the RS-232C Interface Cable is securely connected.



- . or Press CONTROL - BREAK simultaneously



- . type LIST and press ENTER

- . examine program line by line

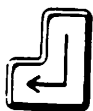
Syntax Error



- . Type LIST and press ENTER

- . Examine the program line referenced

After making any corrections, remember:



- * press ENTER after each line corrected
- * save the program again before running it

8. Save the program in a file named 3700COM by typing
SAVE"3700COM.BAS" and Press ENTER.



9. Type RUN. Press ENTER.



COMPUTER INTERFACE

16. Type 1200 after Baud Rate. Depress the return key. The computer screen should look like the following:

```
BAUD RATE 1200
```

17. Next PARITY should appear on the computer screen. Type the letter O for ODD PARITY and then depress the return key. The computer screen should look like the following:

```
BAUD RATE 1200  
PARITY O
```

18. NUMBER OF BITS PER CHARACTER appears next on the computer screen. Type the number 7 (seven). Depress the return key. The computer screen should look like the following:

```
BAUD RATE 1200  
PARITY O  
NUMBER OF BITS PER CHARACTER 7
```

19. NUMBER OF STOP BITS should appear next on the computer screen. Type the number 1 (one). Depress the return key. The computer screen should look like the following:

```
BAUD RATE 1200  
PARITY O  
NUMBER OF BITS PER CHARACTER 7  
NUMBER OF STOP BITS 1
```

COMPUTER INTERFACE

20. CHARACTERS ECHOED TO SCREEN (Y/N) should appear next on the computer screen. Depress N (for No), and depress the return key.

```
BAUD RATE 1200
PARITY 0
NUMBER OF BITS PER CHARACTER 7
NUMBER OF STOP BITS 1
CHARACTERS ECHOED TO SCREEN (Y/N) N
```

21. Data Entered Correctly (Y/N): If the data is entered correctly depress Y (for Yes), and depress the return key. If the data is NOT entered correctly, depress N (for No) and re-enter the data.

```
BAUD RATE 1200
PARITY 0
NUMBER OF BITS PER CHARACTER 7
NUMBER OF STOP BITS 1
CHARACTERS ECHOED TO SCREEN (Y/N) N
```

```
Data entered correctly (Y/N) Y
```

22. Depress the return key again. The computer should be communicating with the Ohmeda Biox 3700 Oximeter in the Auto-Dump Mode.
23. Remove the DOS Supplemental Program disk.

Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter

10. If the previous steps have been performed correctly, the Ohmeda Biox 3700 Oximeter should be communicating with the IBM PC in the Auto-Output Mode.

One line of data is output to the computer screen every two seconds. The message should look like the following:

```
:SAO2=XXX PR=XXX
```

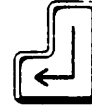
11. Proceed to manual section: Computer Interface "Communication", which discusses how to use the different modes.

NOTE: Once the program has been saved, it does not need to be retyped every time the Computer Interface is used. The program just needs to be run. To do this from the DOS Prompt:

- * type BASICA and press ENTER after the prompt



- * type RUN"3700COM.BAS" and press ENTER.



Communication

The Ohmeda Biox 3700 Oximeter has the capability of two way communication with terminals. Most controls can be operated remotely by using an RS-232C input device.

This section discusses:

- * how the Ohmeda Biox 3700 Oximeter communicates with computers
- * how the computers communicate with the Ohmeda Biox 3700 Oximeter

It also describes the five modes of operation:

- * Auto-Output Mode
- * Trend-Output Mode
- * Waveform Mode
- * Slave Mode
- * Control Mode

In order to use these modes:

- * the Ohmeda Biox 3700 Oximeter must be connected to the computer or terminal (as described in the "Digital Interface" Section of this manual)
- * the computer or terminal must be programmed (as described in the "Programming the IBM PC to Communicate with the Ohmeda Biox 3700 Oximeter" Section of this manual)

It is **IMPORTANT** to remember:

- * the commands typed into the computer are NOT seen on the computer screen
- * use capital letters as they are shown in the manual
- * refer to the Troublshooting Table at the end of this section if necessary

Ohmeda Biox 3700 Oximeter Communication with Computers

- * Auto-Output Mode
- * Trend-Output Mode
- * Waveform Mode

AUTO-OUTPUT MODE

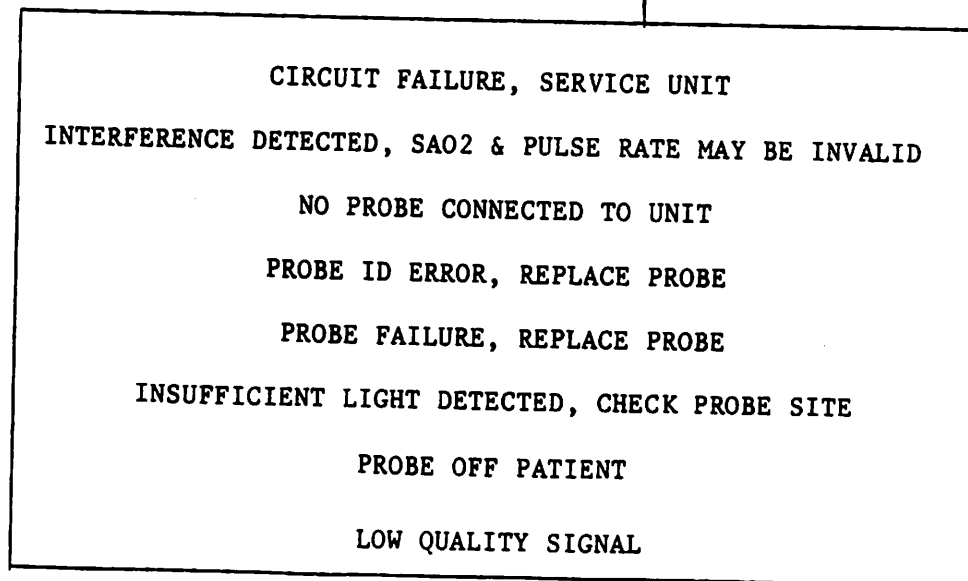
Entering This is the default mode. If you have completed programming the IBM PC as described in the previous section, you have already seen the Auto-Output Mode. It is present when the oximeter begins communication with a computer, and is the mode the oximeter returns to when exiting from other modes.

Enabling One line of data is output to terminal every two seconds. The message looks like the following:

:SAO2=XXX PR=XXX

If the following messages appear on the Graphic Display, they also appear on the terminal:

:SAO2=XXX PR=XXX **



Ohmeda Biox 3700 Oximeter Communication with Computers

AUTO-OUTPUT MODE

Exiting

You really do not exit from the Auto-Output Mode, you just enter another mode.

COMPUTER INTERFACE

The Ohmeda Biox 3700 Oximeter has the capability of two-way communication with terminals. Most controls can be operated remotely by using an RS-232C input device.

There are four modes of operation: Auto-Dump Mode, Trend-Dump Mode, Slave Mode and Control Mode.

AUTO-DUMP MODE

This is the default mode, present when the oximeter is turned on. The data is output to either a printer or terminal every two seconds. The message looks like the following:

"SAO2=XXX PR=XXX"

If the following messages appear on the Graphic Display, they also appear on the printer or the terminal:

"SAO2=XXX PR=XXX ** "

CIRCUIT FAILURE, SERVICE UNIT

INTERFERENCE DETECTED, SAO2 & PULSE RATE MAY BE INVALID

NO PROBE CONNECTED TO UNIT

PROBE ID ERROR, REPLACE PROBE

PROBE FAILURE, REPLACE PROBE

INSUFFICIENT LIGHT DETECTED, CHECK PROBE SITE

PROBE OFF PATIENT

LOW QUALITY SIGNAL

TREND-DUMP MODE

This allows for eight hours of Trend Data to be output onto a printer or a terminal. To restore and view the full eight hours of Trend data, depress the TREND key while turning the oximeter on. Hold the oximeter TREND key down for three seconds, and the following appears on the CRT:

```
..OHMEDA BIOX 3700 PULSE OXIMETER
TREND DATA OUTPUT
12 SECONDS PER DATA POINT..
```

When the TREND key is depressed a second time, the data is output in the following format:

```
..** POWER ON **..
```

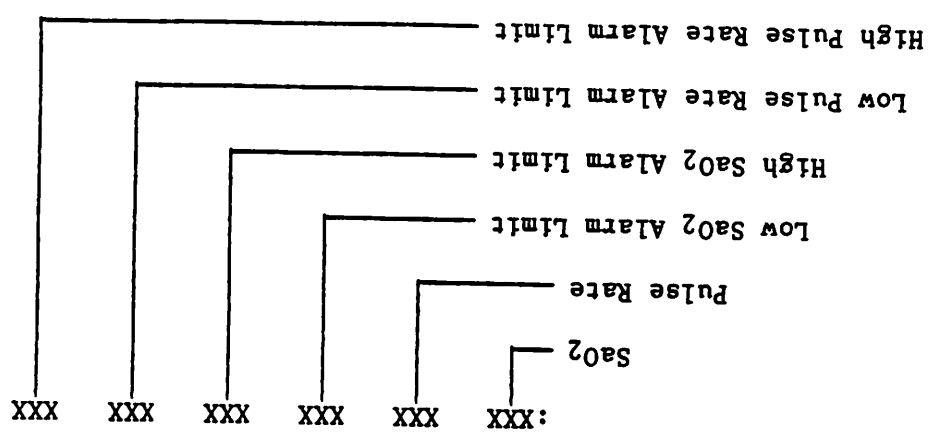
```
..:SAO2=XXX PR=XXX..
```

The oximeter outputs approximately one hour of Trend Data each minute.

SLAVE-MODE

Use this mode with either computer or terminal connection. Specific data is output as it is requested. By using a computer or a terminal depress the **ESCAPE** key and **S** in succession to get to the Slave Mode.

This gets you out of the Auto-Dump Mode. High and low readings/limits can be requested by depressing **ESCAPE** and **?** in succession.



Ohmeda Biox 3700 Oximeter Communication with Computers

TREND-OUTPUT MODE

This mode allows for up to eight hours of Trend Data to be output to a printer or a terminal. To output the full eight hours of Trend Data, restore the previous Trend Data. Otherwise you will only output the Trend Data from the current power on.

NOTE: To restore the previous Trend Data for the full eight hours of output, turn the Oximeter off and depress the SaO2 TREND 20/60 key while turning the Oximeter on. The following Status message should appear on the Oximeter Graphic Display:

PREVIOUS TREND
DATA AVAILABLE

Entering Hold the oximeter SaO2 TREND 20/60 key for approximately three seconds or until this Status Message appears on the Oximeter Graphic Display:

ANALOG TREND OUTPUT
START CHART RECORDER
HIT TREND
TO START OUTPUT

The following message should appear on the computer screen at the same time:

OHMEDA BIOX 3700 PULSE OXIMETER
TREND DATA OUTPUT
12 SECONDS PER DATA POINT

Ohmeda Biox 3700 Oximeter Communication with Computers

TREND-OUTPUT MODE

Enabling Depress the oximeter SaO2 TREND 20/60 key a second time to start the Trend-Output. The data is output to the computer screen in the following format:

```
**POWER ON**  
:SAO2=XXX PR=XXX  
:SAO2=XXX PR=XXX
```

This Status Message Appears on the Oximeter Graphic Display:

```
OUTPUTTING TREND  
TIME REMAINING: X:XX  
HIT TREND KEY  
TO END OUTPUT
```

The Oximeter Status message is updated approximately every second to inform the operator of the hours and minutes of Trend Data remaining. If the previous Trend Data is being output, messages which appear on the Oximeter Graphic Display do NOT appear on the computer terminal. Instead, the SaO2 and Pulse Rate equal zero when this situation occurs.

NOTE: Eight hours of Trend Data is output in approximately eight minutes.

Exiting To exit the Trend Output Mode while data is being output, press the Oximeter SaO2 TREND 20/60 key.

After the Trend Data is output the oximeter returns to the previous display and the Auto-Output Mode automatically resumes. The Trend Data is still in memory and can be output again without turning the oximeter on and off again.

Ohmeda Biox 3700 Oximeter Communication with Computers

WAVEFORM MODE

The Waveform Mode is available on Revision K and above Ohmeda Biox 3700 Oximeters.

This mode is useful for devices or programs designed for graphically displaying the information. When in the Waveform Mode is enabled:

- * the RS-232C Trend Output can NOT be enabled
- * the oximeter only acknowledges the command to exit the Waveform Mode

Entering and Enabling

Using a computer or terminal, press ESCAPE CL ENTER



Waveform:

Waveform information is representative of the photoplethysmographic signal. It corresponds directly with the Oximeter Graphic Display. It is sent as two ASCII numeric bytes followed by a carriage return. Waveform data is sent on 1/30 second intervals in 60 Hz Mode.

- XX . where XX is from 00 to 31 inclusive
- . XX is 00 when an error condition exists

Signal Strength Indicator (SSI):

SSI information is representative of the overall signal quality and is sent as an 'S' and two ASCII numeric bytes followed by a carriage return. SSI data is sent every second.

- SXX . where XX is from 00 to 31 inclusive
- . XX is 00 when an error condition exists

Ohmeda Biox 3700 Oximeter Communication with Computers

WAVEFORM MODE

Entering and Enabling

Saturation and Pulse Rate:

Saturation and Pulse Rate information is representative of the displayed saturation and pulse rate as determined by the Oximeter. The formats are shown below. SaO2 and Pulse Rate data is sent every two seconds.

:SAO2=XXX PR=XXX where XXX in the Saturation field is from 0 to 100, and XXX in the Pulse Rate field is from 0 to 255. This format is used when the readings are considered valid.

:SAO2=---- PR=---- dashes are used when the calculated Saturation and Pulse Rate are considered invalid.

:SAO2=XXX PR=XXX YY XXX may be numbers or dashes as described in the above examples. YY is representative of a two digit error code as defined below.

ERROR CODES

02 CIRCUIT FAILURE, SERVICE UNIT
04 PROBE FAILURE, REPLACE PROBE
06 NO PROBE CONNECTED TO UNIT
08 INTERFERENCE DETECTED, SAO2 AND PULSE RATE MAY BE INVALID
10 PROBE OFF PATIENT
12 INSUFFICIENT LIGHT DETECTED, CHECK PROBE SITE
13 PROBE ID ERROR, REPLACE PROBE
14 LOW QUALITY SIGNAL

Exiting

Press ESCAPE CM ENTER



Computer Communication with Ohmeda Biox 3700 Oximeter

- * Slave Mode
- * Control Mode

SLAVE MODE

Use this mode with either computer or terminal connection. The SaO₂ and Pulse Rate limits and readings are output for viewing as requested. The Slave Mode disables all mode functions with the exception of the Trend-Output Mode which can be enabled using the Ohmeda Biox 3700 Oximeter.

Entering

Using a computer or terminal, press ESCAPE S in succession to enter the Slave Mode and stops data from being output to the computer screen.



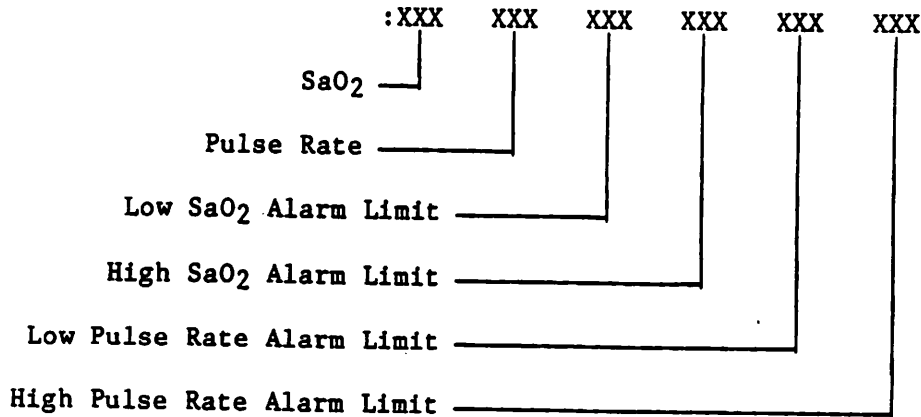
Enabling

High and low SaO₂ and Pulse Rate limits are displayed by pressing ESCAPE ? in succession. The data is output once on the computer screen in the following format:



:XXX XXX XXX XXX XXX XXX

What does this data mean? The following example illustrates what each piece of data represents:



Computer Communication with Ohmeda Biox 3700 Oximeter

SLAVE MODE

Enabling

While in the Slave Mode, the Oximeter does not acknowledge any commands that it does not recognize. When incorrect commands are sent to the Oximeter, the Oximeter does nothing until it receives a familiar command.

Exiting



The Oximeter automatically returns to the Auto-Dump Mode after you exit the Slave Mode. Press ESCAPE X in succession. Remember that the computer does not display any commands entered by you on the screen, but this command exits you from the Slave Mode and returns you to the Auto-Output Mode.

Computer Communication with Ohmeda Biox 3700 Oximeter**CONTROL MODE**

This mode allows the user to send the Oximeter commands.

Entering and Enabling

Entering and enabling this mode are done simultaneously. The Control Mode can only be used in the Auto-Output Mode and return to the Auto-Output Mode after the command is completed. Enabling the Control Mode changes the Oximeter parameters without touching the front panel. In the Control Mode changes appear on the Oximeter. All options available in this mode are preceded by an ESCAPE C.

EXAMPLE

Suppose you want to change the oximeter Pulse Volume setting to one. You need to:

- * Use the box below, to determine which capital letter corresponds with the Pulse Volume. The letter H corresponds with the Pulse Volume.
- * Use the box below, to determine if the Pulse Volume can be set to one. The parameter for the Pulse Volume is zero to ten. Therefore, the Pulse Volume can be set to one.

A = Alarm Silence	(no parameter)
B = SaO ₂ Low Alarm Limit	(50%-100%)
C = SaO ₂ High Alarm Limit	(70%-100%)
D = Pulse Rate Low Alarm Limit	(40-200 BPM)
E = Pulse Rate High Alarm Limit	(70-250 BPM)
F = Fast Response Mode	(no parameter)
G = Slow Response Mode	(no parameter)
H = Pulse Volume	(zero-10)
I = Alarm Volume	(1-10)
J = Start Trend Output	(no parameter)
K = Stop Trend Output	(no parameter)
L = Start Waveform Mode	(no parameter)
M = Stop Waveform Mode	(no parameter)

NOTE: L and M only work with Revision K and above Ohmeda Biox 3700 Oximeter.

 Computer Communication with Ohmeda Biox 3700 Oximeter

CONTROL MODE

EXAMPLE

In order to change the Pulse Volume, press in succession ESCAPE CH1 ENTER



The H is the capital letter which represents the Pulse Volume and the 1 (one) is the parameter to which you want to set the Pulse Volume.

If the information has been entered correctly, the Pulse Volume should change. If the information has been entered incorrectly, a WHAT? appears on the computer screen and a beep is heard.

If the Pulse Volume has not gone to one:



- * press the CAPS LOCK key
- * press ESCAPE CH1 ENTER

Entering and Enabling

The following information is important to know when using the Control Mode:

Parameters To set an alarm limit or pulse volume to off, input Ø (zero) as the parameter.

If no parameter needs to be input, press ENTER after the capital letter entered.

The % and BPM do NOT need to be entered with the parameter for SaO₂ and Pulse Rate limits.

The SaO₂ alarm limits change in steps of one. The Pulse Rate alarm limits change in steps of five.

WHAT? The message WHAT? appears on the computer screen along with an audible beep if:

- * the Oximeter does not recognize a letter or parameter field
- * or a parameter has been omitted.

Computer Communication with Ohmeda Biox 3700 Oximeter

CONTROL MODE

Entering and Enabling




If you have entered data incorrectly, press the ENTER key a few times to clear the buffer.

Trend Output When J (start Trend output) is selected, the Trend Data is output in the same format as the Trend-Output Mode.

To restore the previous Trend Data for the full eight hours of output, turn the Oximeter off and depress the SaO₂ TREND 20/60 key while turning the Oximeter on.

Starting Trend Output with the Control Mode can only be done while in the Auto-Output Mode. Trend Output can be started from the Oximeter Front Panel at any time.




If you want to change any of the items in the box below, you need to press:

  CAPITAL LETTER PARAMETER 

A = Alarm Silence	(no parameter)
B = SaO ₂ Low Alarm Limit	(50%-100%)
C = SaO ₂ High Alarm Limit	(70%-100%)
D = Pulse Rate Low Alarm Limit	(40-200 BPM)
E = Pulse Rate High Alarm Limit	(70-250 BPM)
F = Fast Response Mode	(no parameter)
G = Slow Response Mode	(no parameter)
H = Pulse Volume	(zero-10)
I = Alarm Volume	(1-10)
J = Start Trend Output	(no parameter)
K = Stop Trend Output	(no parameter)
L = Start Waveform Mode	(no parameter)
M = Stop Waveform Mode	(no parameter)

Exiting

The Control Mode automatically returns to the Auto-Output Mode after the information has been entered into the computer. If you want to change another item in the box above, press:

  CAPITAL LETTER PARAMETER 

COMMUNICATION TROUBLESHOOTING

SYMPTOM

ACTION

Unable to enter
a mode



- Ensure that CAPS LOCK is in upper case

Auto-Output Mode
does not return
after a Trend Output

- You might be in the Slave Mode.
- Press ESCAPE X



COMMUNICATION QUICK REFERENCE TABLE

<u>MODE</u>	<u>ENTER</u>	<u>ENABLE</u>	<u>EXIT</u>
Auto-Output			
	Default Mode	-----	-----
Trend-Output			
	. Hold down Oximeter SaO2 TREND 20/60 key	-----	Press SaO2 TREND 20/60 key
	. ESCAPE CJ ENTER (Control Mode)	-----	ESCAPE CK ENTER (Control Mode)
Waveform			
NOTE:	ESCAPE CL ENTER	-----	ESCAPE CR ENTER
Available on revision K and above Ohmeda Biox 3700 Oximeters			
Slave			
	ESCAPE S	ESCAPE ?	ESCAPE X
Control			
	ESCAPE C letter parameter ENTER	-----	-----

----- means the action automatically happens

A = Alarm Silence	(no parameter)
B = SaO ₂ Low Alarm Limit	(50%-100%)
C = SaO ₂ High Alarm Limit	(70%-100%)
D = Pulse Rate Low Alarm Limit	(40-200 BPM)
E = Pulse Rate High Alarm Limit	(70-250 BPM)
F = Fast Response Mode	(no parameter)
G = Slow Response Mode	(no parameter)
H = Pulse Volume	(zero-10)
I = Alarm Volume	(1-10)
J = Start Trend Output	(no parameter)
K = Stop Trend Output	(no parameter)
L = Start Waveform Mode	(no parameter)
M = Stop Waveform Mode	(no parameter)

COMPUTER INTERFACE

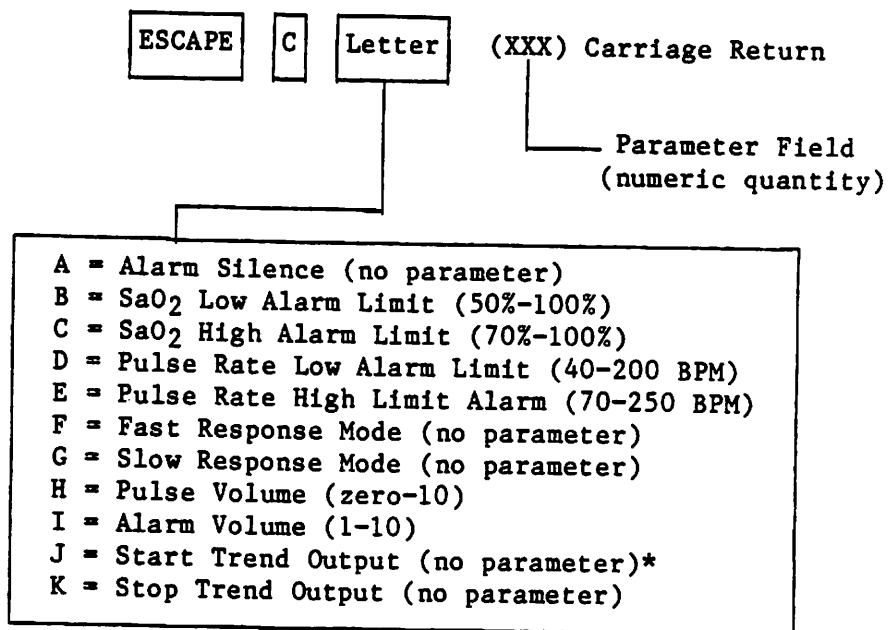
While in the Slave Mode, the oximeter does NOT acknowledge any commands that it does not recognize. When incorrect commands are sent to the oximeter, the oximeter does nothing until it receives a familiar command.

The oximeter does not automatically go back to the Auto-Dump Mode. To exit from the Slave Mode depress in succession. This brings you back to the Auto-Dump Mode.

CONTROL-MODE

This mode allows the user to send the oximeter commands anytime in any mode. It allows the user to control the parameters of the oximeter without touching its front panel.

Using a terminal or a computer, depress:



To set an alarm limit or volume to OFF, input 000 (zeros) as the parameter. If the oximeter does not recognize a letter or parameter field, or if a parameter field has been omitted, the message "WHAT?" along with a bell tone (ASCII 07) appears on the computer.

* When the "J" is selected, the Trend Data is output in the same format as the Trend-Dump Mode.

OXIMETER

WARNING ELECTRICAL SHOCK HAZARD: Always turn the power OFF before cleaning the oximeter.

Do NOT autoclave or pressure sterilize this monitor. Do NOT soak or immerse this monitor in any liquid. Do NOT Gas Sterilize this monitor. The outer surface of the oximeter can be cleaned with a soft cloth dampened in a mild soap and water solution or isopropyl alcohol (70%). Ensure that the oximeter is unplugged prior to cleaning and the unit is completely dry before use.

Do not touch, press or rub the display panel with abrasive cleaning compounds, instruments, brushes, rough surface materials or make any contact with anything that can scratch the panel. Do not use organic solvents to clean the display panel. Use a cotton swab saturated with 70% isopropyl alcohol and gently wipe the panel.

CAUTION Never immerse this monitor in liquid.

CAUTION Do NOT autoclave this monitor.

CAUTION Do NOT gas sterilize this monitor.

CLEANING AND STERILIZATION

PROBES

The ear probe, finger probe, and flex probe are the only surfaces of this monitor that come in contact with the patient. To clean probes after each patient use:

Disconnect the probe from the patient.

Disconnect the probe from the oximeter.

Clean with a soft cloth using mild soap and water solution, or an isopropyl alcohol (70%) swab.

Allow the probe to dry completely before returning it to operation.

CAUTION Do NOT soak or immerse probe in any liquid solution.

CAUTION Do NOT autoclave probes.

The probes may be Gas Sterilized using an Ethylene Oxide mixture at 120 - 130 degrees F. In all cases, follow the sterilizer manufacturer's recommendations for specific aeration periods required.

CAUTION Following sterilization with Ethylene Oxide, probes should be quarantined in a well ventilated area to allow dissipation of residual Ethylene Oxide gas absorbed by the probe. Follow sterilizer manufacturer's recommendations for specific aeration periods required.

NOTE: Materials the probes are composed of are available upon request. Please contact the Ohmeda Boulder Quality Assurance Department.

RECHARGING THE BATTERY

The internal battery of the Ohmeda Biox 3700 oximeter provides approximately 1.5 hours of continuous operation when charged to full capacity. When the Alarm Message "RECHARGE BATTERY" appears on the Graphic Display, the audible alarm sounds and the oximeter automatically shuts off in approximately 10 seconds. Plug the oximeter into AC mains power (USA 120 VAC).

CAUTION Do NOT turn the oximeter on after the "RECHARGE BATTERY" Alarm condition is displayed without plugging it into AC mains power (USA 120 VAC). Operating the oximeter on battery power during a "RECHARGE BATTERY" Alarm condition may permanently damage the lead-acid battery.

The recharging times and capacity proportions are:

- * 80% capacity = recharge approximately 4 hours
- * 100% capacity = recharge approximately 16 hours

NOTE: DURING THE RECHARGING PROCESS THE OXIMETER MAY BE OPERATED WHEN IT IS PLUGGED INTO AC MAINS POWER (USA 120 VAC).

Under normal conditions, the battery lasts for several hundred "charge - discharge" cycles. To obtain maximum battery life, recharge the oximeter whenever it is not in use. The battery will not overcharge.

MAINTENANCE

CALIBRATION PROCEDURE

Whenever the Device Failure Alarm Message "CALIBRATE UNIT" appears on the Graphic Display, the operator of the oximeter should perform the following:

1. Locate the Calibration Access Plug underneath the oximeter chassis.
2. Remove the Calibration Access Plug. The calibration pot is situated directly inside of the oximeter. Lift the oximeter and locate the calibration potentiometer.
3. Using a small, flat blade, plastic or nonconductive screwdriver, slowly adjust the potentiometer. Watch the calibration reading on the Digital Display, and wait for it to stabilize.
4. Continue adjusting the potentiometer until the calibration reading is zero (± 0.1).
5. Replace the Calibration Access Plug in the bottom of the oximeter chassis.
6. Depress the WAVEFORM key. The Status Message "SYSTEM OPERATIONAL" should appear on the Graphic Display. The oximeter is ready for use.

If the the oximeter fails to respond as described, DO NOT USE IT. Contact an Authorized Ohmeda Service Representative for assistance. (See rear cover of this manual.)

PARTS LIST

The following parts may be ordered through Ohmeda. (Outside the USA, use the BX number.)

8 FT/2.44 m Extension Cable for the 3700 (BX#7000-079)	380-1500-001
Headband (BX#7900-045)	380-1500-002
Ear Probe Stabilizer (Package of 10) (BX#8102-007)	380-1500-003
Disposable Adhesive Wrap (BX#7900-068)	380-1500-004
3M Coban Self-Adherent Wrap (BX#7320-005)	380-1500-005
3700 Operating/Maintenance Manual (BX#1118-300)	380-0900-001
3700 Service Manual (BX#1118-302)	380-0900-002
Traceability Registration Card (Warranty Card) (BX#1000-246)	380-0900-005
Finger Probe (8 FT/2.44 m) (BX#8122-001)	380-1000-019
Finger Probe (12FT/3.66 m) (BX#8122-005)	380-1000-023
Flex Probe (8 FT/2.44 m) (BX#8122-002)	380-1000-020
Flex Probe (12 FT/3.66 m) (BX#8121-004)	380-1000-022
Ear Probe (8 FT/2.44 m) (BX#8121-003)	380-1000-021

NOTE: Model Number 8122 probes are compatible with Revision H and above 3700 Oximeters. Model Number 8121 probes are compatible with all revisions of 3700 Oximeters.

REPAIR POLICY AND PROCEDURE

Do NOT use malfunctioning equipment. Make all necessary repairs, or have the equipment serviced by Ohmeda Service Personnel. After repair, test the equipment to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

To ensure full reliability, have all repairs and service done by an Authorized Ohmeda Service representative. If this cannot be done, replacement and maintenance of those parts listed in the manual may be undertaken by a competent, trained individual having experience in the repair of devices of this nature.

CAUTION No repair should be undertaken or attempted by unqualified personnel.
--

Replace damaged parts with components manufactured or sold by Ohmeda. Then test the unit to ascertain that it complies with the manufacturer's published specifications.

Contact the nearest Ohmeda Regional Service Center (outside the USA, the nearest Ohmeda office or representative) for Service Assistance. In all cases, other than where Ohmeda's warranty is applicable, repairs will be made at Ohmeda's current list price for the replacement part(s) plus a reasonable labor charge.

If equipment is sent to Ohmeda, package it securely in the original shipping container if possible and ship it prepaid. Enclose:

- * A letter with the equipment describing in detail any difficulties experienced
- * Warranty information - copy of invoice or other applicable documentation must be included
- * Ship to and bill to information
- * Purchase order number
- * And the repairs felt necessary
- * Person (name and telephone number) to contact for functional questions

APPENDIX OF MESSAGES

..INTERFERENCE
DETECTED
SAO2 & PULSE RATE
MAY NOT BE VALID..

..LO
BT..

..LO QUALITY SGNL..

..MICROPROCESSOR
ERROR
SERVICE UNIT..

..MICROPROCESSOR
INTERRUPT ERROR
SERVICE UNIT..

..NO PROBE
CONNECTED TO UNIT..

..OHMEDA-BIOX 3700
REVISION:X
SYSTEM CHECK
IN PROCESS..

..OUTPUTTING TREND
TIME REMAINING X:XX
HIT TREND KEY
TO END OUTPUT..

..PLEASE PLUG UNIT
INTO WALL OUTLET
TO DETERMINE
LINE FREQUENCY..

..PLUG UNIT INTO
WALL OUTLET
TO
RECHARGE BATTERY..

..A/D CONVERTER
FAILURE
SERVICE UNIT..

..ALARM VOLUME
HOLD KEY TO SET,
VOLUME IS #..

..ANALOG
SYNCHRONIZATION
ERROR
SERVICE UNIT..

..ANALOG TREND OUTPUT,
START CHART RECORDER
HIT TREND
TO START OUTPUT..

..BATTERY IN USE..

..BT..

..CALIBRATE UNIT
ADJUST POT AT BOTTOM
HOLE TO VALUE = 0 ± .1
HIT WAVEFORM TO END..

..CIRCUIT FAILURE
SERVICE UNIT..

..F..

..FAST RESPONSE
SELECTED..

..INSUFFICIENT LIGHT
DETECTED
CHECK PROBE SITE..

..SYSTEM ERROR X
PLEASE NOTE
ERROR CODE AND
SERVICE UNIT..

..STACK ERROR
PLEASE NOTE
CONDITIONS AND
SERVICE UNIT..

..SLOW RESPONSE
SELECTED..

..SAO2 & PULSE ANALOG
OUTPUTS = # VOLTS
WAVEFORM: NEXT TEST
TREND: QUIT..

..S..

..ROM TEST ERROR
LOW BYTE
SERVICE UNIT..

..ROM TEST ERROR
HIGH & LOW BYTES
SERVICE UNIT..

..ROM TEST ERROR
HIGH BYTE
SERVICE UNIT..

..RAM TEST ERROR
TREND CHECKSUM
SERVICE UNIT..

..RAM DATA INVALID
RE-INITIALIZING..

..RAM TEST ERROR
LOW BYTE
SERVICE UNIT..

..RAM TEST ERROR
HIGH & LOW BYTES
SERVICE UNIT..

..RAM TEST ERROR
HIGH BYTE
SERVICE UNIT..

..RAM CHECK
ERROR
SERVICE UNIT..

..PULSE WAVEFORM
SELECTED..

..PULSE VOLUME
HOLD KEY TO SET,
VOLUME LEVEL IS #..

..PROBE OFF
PATIENT..

..PROBE FAILURE
REPLACE PROBE..

..PROBE ID ERROR
REPLACE PROBE

..PREVIOUS TREND
DATA AVAILABLE..

..POWER SUPPLY
FAILURE
SERVICE UNIT..

..VOLTAGE REFERENCE
FAILURE
SERVICE UNIT..

..TREND MODE
SELECTED..

..THANK YOU
UNIT MAY NOW RUN
ON BATTERY..

..SYSTEM
OPERATIONAL..

APPENDIX OF MESSAGES

TABLE OF KEYS

<u>KEY</u>	<u>ACTION</u>
POWER/STANDBY	Turns the oximeter on and off.
WAVEFORM	Displays the plethysmographic waveform.
	<u>If you are in:</u> <u>Action:</u>
WAVEFORM (hold 3 sec)	Fast Response Puts the oximeter in Slow Response
	Slow Response Puts the oximeter in Fast Response
TREND 20/60	<u>If you are in:</u> <u>Action:</u>
	Waveform Displays 20 Min Trend Graph
	20 Min Trend Graph Displays 60 Min Trend Graph
	60 Min Trend Graph Displays 20 Min Trend Graph
TREND 20/60 + POWER/STANDBY Depress and hold while depressing	While the oximeter is off: restores the previous Trend Data and turns the oximeter on.
TREND 20/60 (hold 3 sec)	Starts the Trend Data output.
PULSE VOLUME	Adjusts the volume setting for the pulse tone.
ALARM VOLUME	Adjusts the volume setting for the audible alarms.

TABLE OF KEYS

<u>KEY</u>	<u>ACTION</u>
ALARM SILENCE	Temporarily silences all audible alarms for 30 seconds.
LOW SaO ₂	Raises or lowers the low SaO ₂ alarm limit.
LOW SaO ₂ + POWER/STANDBY (down arrow) while depressing	Turns the oximeter on and brings it into the User Calibration Mode.
HIGH SaO ₂	Raises or lowers the high SaO ₂ alarm limit.
LOW PULSE	Raises or lowers the low pulse rate alarm limit.
HIGH PULSE	Raises or lowers the high pulse rate alarm limit.

INDEX

A

Accuracy, 18, 31
Adult, 41-44
Alarms, 14-15, 23-24, 29, 54, 59, 92-93
 messages, 7, 15, 20, 59-61
 silencing of, 24, 59, 82, 93
 volume, 13, 23, 56, 82, 89, 92

"A/D CONVERTER
FAILURE
SERVICE UNIT", 11, 60, 89

"ALARM VOLUME
HOLD KEY TO SET
VOLUME LEVEL IS #", 23, 56, 89

"ANALOG
SYNCHRONIZATION
ERROR
SERVICE UNIT", 60, 89

"ANALOG TREND OUTPUT
START CHART RECORDER
HIT TREND KEY
TO START OUTPUT", 56, 72, 89

Auto-Dump Mode, 79-82

B

Battery, 5, 17-18, 21, 23, 25, 30, 56-57, 59, 61, 65, 85, 89, 91
 charge time, 85
 recharge procedure, 85

"BATTERY IN USE", 18, 56, 89

"BT", 21, 50, 56-57, 89

C

"CALIBRATE UNIT
ADJUST POT AT BOTTOM
HOLE TO VALUE = $0 \pm .1$
HIT WAVEFORM TO END", 60, 70, 86, 89

Carboxyhemoglobin, 31

Caution, 4-6, 15, 17-18, 22, 25, 36, 38, 40, 44, 46, 49, 51, 53, 67, 72, 83-85, 88

Chart Recorder, 56, 67-72
 connection, 67-70, 72

"CIRCUIT FAILURE
SERVICE UNIT", 60, 80, 89

Cleaning & Sterilization, 14, 83-84
 oximeter, 83
 probes, 84

Computer Interface, 75-79, 80-82

Control Mode, 82

D

Dashes, 18, 22, 24, 59, 66

Data, 3, 7, 12, 19, 22-23, 29, 31-35, 38, 40, 44, 47, 49-51, 53-54, 56-59, 61, 63-66, 68, 72-74, 79-82, 90, 92
 collection, 64-65

Default Parameter, 13, 18
 alarms, 13, 23
 pulse rate, 13, 24
 SaO₂, 13, 24

Detector, 3, 7, 9-11, 15, 19, 33-34, 37, 39, 41-42, 47-49, 51, 60, 62

Diagnostic Self-Test, 14, 18, 58, 60, 65

Dicrotic Notch, 32

Digital Interface, 25, 74

Displays, 7, 9, 14-15, 18, 20, 22, 23-24, 57, 64
 digital, 14, 18-19, 22, 24, 59, 66, 70, 86
 graphic, 14-15, 18-21, 34, 55, 59, 65-66, 68-70, 72, 80, 85-86

Dyes, 31

E

Ear Probe, 28, 35, 37-39, 50-52, 54, 60
 cleaning, 84
 connection to oximeter, 36
 attaching to patient, 37-38
 preoperative check, 15-16

F

"FAST RESPONSE
 SELECTED", 21, 56-57, 89

Finger Probe, 28, 35, 39-40
 artificial fingernails, 39
 cleaning, 84
 connection to oximeter, 36
 attaching to patient, 39-40
 preoperative check, 15-16

Flex Probe, 28, 35, 41-49
 cleaning, 84
 connection to oximeter, 36
 attaching to patient, 41-49
 preoperative check, 15-16

Front Panel, 20-24, 68, 82

G

General Operation Guidelines, 17-19

Graph, 7, 9, 14-15, 18-21, 23-24, 32-34, 54-59, 61, 64-66, 68-72, 80, 85-86, 92

H

Handle, 26-27
 positions of use, 26

I

Indicator, 20-21, 23, 30, 32, 34

Inspection, 14

"INSUFFICIENT LIGHT
 DETECTED

CHECK PROBE SITE", 60, 80, 89

"INTERFERENCE DETECTED
 SAO2 & PULSE RATE

MAY NOT BE VALID", 56, 64, 66, 80

K

Key, 12, 21, 23-24, 56-59, 64-66, 68-70, 72, 75-79, 81, 86, 89, 90, 92-93

L

"LO BT", 57, 65

"LO QUALITY SGNL", 21, 34, 61, 64, 66, 73, 89

M

Maintenance, 83-88
 calibration, 60, 70, 86
 cleaning, 3, 83-84
 inspection, 14
 recharging battery, 85

Messages, 7, 20, 55-61, 80, 89-91
 alarm, 7, 20, 59-61
 status, 7, 20, 55-58

"MICROPROCESSOR ERROR", 61, 89

"MICROPROCESSOR INTERRUPT ERROR", 61, 89

Modes, 12, 19, 21, 23, 34, 54, 56-58, 79, 82, 91, 93

Motion Artifact, 21, 33, 54

N

Neonatal, 35, 47-49

INDEX

Noise, 11, 32-33

..NO PROBE CONNECTED TO UNIT", 15, 24, 58-59, 61, 65, 66, 80, 89

0

OHMEDA-BIOX 3700 REVISION: X SYSTEM CHECK IN PROCESS", 14, 18, 57, 65, 68, 70, 89

Output, 25, 29, 56-58, 65, 67-69, 71-73, 80-82

..OUTPUTTING TREND TIME REMAINING X:XX HIT TREND KEY TO END OUTPUT", 57, 72, 89

Oximeter, 3-10, 12-19, 21-23, 25-26, 28-34, 36, 50, 54-61, 63-72, 74-75, 79-86, 92-93

alarms, 7, 20, 59-61

cleaning and sterilization, 83

description, 7

displays, 14-15, 18-21, 22, 24, 34, 55, 59, 65-66, 68-70, 72, 80, 85-86

environmental tolerances, 30

maintenance, 83-86

specifications, 28-31

P

Panel, 4, 6, 9, 20, 24-25, 29, 68-71, 74, 82-83

front, 9, 20, 24-25, 68, 82

rear, 4, 6, 20, 25, 29, 68, 71, 74

Parts List, 87

..PLEASE PLUG UNIT INTO WALL OUTLET" TO DETERMINE LINE FREQUENCY", 57, 89

Plethysmographic Waveform, 7, 18, 20-21, 23, 32-33, 54, 56-58, 65-66, 92

R

..PULSE WAVEFORM SELECTED", 58, 90

..PULSE VOLUME HOLD KEY TO SET, VOLUME LEVEL IS #", 23, 58, 90

..PULSE RATE, 7, 9, 13-14, 18-19, 22, 25, 29, 31, 33, 56-57, 59, 61, 66, 68, 71-74, 80-82, 89, 93

high, 13, 22, 31, 81, 93

low, 13, 22, 31, 81, 93

PATIENT", 15, 24, 45, 58-59, 62, 65-66, 80, 90

..PROBE OFF

..PROBE FAILURE REPLACE PROBE", 62, 80, 90

..PROBE ID ERROR REPLACE PROBE", 61, 80, 90

..PREVIOUS TREND DATA AVAILABLE", 58, 65-66, 90, 92

SERVICE UNIT", 59, 61, 90

..POWER SUPPLY FAILURE" preoperative check, 15-16

attaching to patient, 37-49

cleaning & sterilization, 84

Probes, 4-5, 7, 15-17, 22, 28, 35, 36-52, 54, 60, 82, 84

RECHARGE BATTERY", 61, 89

..PLUG UNIT INTO WALL OUTLET TO RECHARGE BATTERY", 61, 89

..PLUG UNIT INTO WALL OUTLET TO RECHARGE BATTERY", 61, 89

Pigmentation, 31, 34, 60

Pixel, 64, 66

photo-plethysmographic Waveform, 21, 32

..RAM CHECK ERROR", 62, 90

INDEX

- "RAM TEST ERROR", 62, 90
 High Byte, 62, 90
 High & Low Byte, 62, 90
 Low Byte, 62, 90
 Trend Checksum, 63, 90
- "RAM DATA INVALID
RE-INITIALIZING", 63, 90
- Recharge battery, 5, 61, 85
- Repair, 5-6, 14, 88
- "ROM TEST ERROR", 63, 90
 High Byte, 63, 90
 High & Low Byte, 63, 90
 Low Byte, 63, 90
- RS-232C, 25, 29, 74, 80
- S**
- SaO₂, 7-9, 12-14, 18-19, 21-25, 29,
31, 34, 54, 56-57, 59, 61, 64, 66,
68-69, 70, 72-74, 80-82, 89, 90, 93
 high, 13, 22, 24, 31, 81, 93
 low, 13-14, 22, 24, 31, 68, 81, 93
- "SAO₂ & PULSE ANALOG
OUTPUTS = # VOLTS
WAVEFORM:NEXT TEST
TREND: QUIT", 69, 90
- Service Unit, 59-63, 80, 89-91
- Signal And Data Validity, 32-34
- Signal Strength Indicator, 21, 34
- Silence, Alarm, 24, 59, 82, 93
- "SLOW RESPONSE
SELECTED", 19, 21, 23, 54, 56-58,
82, 90, 92
- Specifications, 28-31
- "STACK ERROR
PLEASE NOTE
CONDITIONS AND
SERVICE UNIT", 63, 90
- "SYSTEM ERROR - #
PLEASE NOTE
ERROR CODE AND
SERVICE UNIT", 63, 90
- "SYSTEM
OPERATIONAL", 14, 18, 21, 66, 86, 91
- T**
- "THANK YOU
UNIT MAY NOW RUN
ON BATTERY", 57, 91
- Thumbwheel, 14, 18, 24
- Trend Data, 7, 23, 56-59, 63-66,
72-73, 81-82, 92
 previous, 23, 58, 65-66, 72, 92
- Trend Graph, 23, 58, 64-65, 92
 20 minutes, 23, 64
 60 minutes, 23, 58, 64-65
 8 hours, 65
 restoring data, 23, 65-66
- Trend Memory, 65
- "TREND MODE
SELECTED", 58, 91
- U**
- User Responsibility, 6
- V**
- "VOLTAGE REFERENCE FAILURE", 63, 91
- Volume, 13, 21, 23, 29, 56, 58, 82,
89-90, 92
 alarm, 13, 23, 56, 82, 89, 92
 pulse, 13, 23, 58, 82, 90, 92

W

Warning, 3, 14, 17-19, 35, 47-48, 51, 83

Waveform, 7, 18, 20-21, 23, 32-34, 54, 56-58, 60-61, 65-66, 69-70, 86, 89-90, 92

photo-plethysmographic, 21, 32
plethysmographic, 7, 18, 20-21, 23, 32-33, 54, 56-58, 65-66, 92

WAVEFORMS
WAVEFORMS
WAVEFORMS
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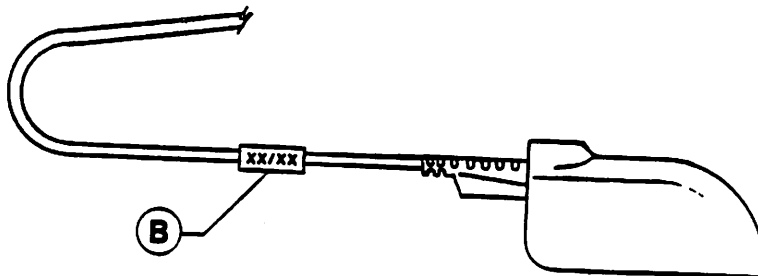
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WARRANTY

This product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the first Buyer thereof, other than for resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to the Buyer's order, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and to conform to the description of the Product contained in this operating manual and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of 14 months for the Finger Probe and the Ear Probe and ninety (90) days with respect to the Flex Probe. The Date Code Tag (B) located on the cable near the probe identifies the month and year that the warranty period begins. The period extends for 14 months from this date for Ear and Finger Probes; 3 months for Flex Probes.



Removal of this tag voids the warranty. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda, or altered by anyone other than Ohmeda, or if the Product and/or probe have been subject to misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option, a Product, which is telephonically reported to the Ohmeda Regional Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the warranty, to Ohmeda Boulder during normal business hours, transporting charges prepaid and which, upon Ohmeda's examination, is not found to conform with the above warranties. OHMEDA SHALL NOT BE OTHERWISE LIABLE FOR ANY DAMAGES INCLUDING BUT NOT LIMITED TO INCIDENTAL DAMAGES, CONSEQUENTIAL DAMAGES OR SPECIAL DAMAGES.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. OHMEDA MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR PARTS THEREOF.

