

**1 NOVEMBER 2001**



**Health Services**

**AEROMEDICAL EVACUATION EQUIPMENT  
STANDARDS**

**COMPLIANCE WITH THIS PUBLICATION IS MANDATORY**

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Supersedes AFI 41-309, 15 October 2001.

Pages: 222  
Distribution: F

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This instruction provides a listing of approved Air Force Research Laboratory and US Army Aeromedical Research Laboratory (USAARL) medical equipment which can be used on fixed and rotary wing aircraft. It further provides a guide on how to use the equipment identified in Table of Allowances (TA) 887, *Aeromedical Evacuation (AE) In-Flight Kits* in support of aeromedical evacuation missions. This publication is to be used in conjunction with Air Force Instruction (AFI) 41-301, *Worldwide Aeromedical Evacuation System*, AFI 41-302, *Aeromedical Evacuation Operations and Management*, AFI 11-2AE Vol 1, *Aeromedical Evacuation Crewmember Training*, AFI 41-316, *Aeromedical Evacuation In-flight Kit--Packaging Guide*, and Air Force Research Laboratory publication AL/CF-TR-1995-0171, *Status Report On Medical Materiel Items Tested and Evaluated For Use In The USAF Aeromedical Evacuation System*. Send comments and suggested improvements on AF Form 847, **Recommendation for Change of Publication**, through channels, to HQ AMC/SGX, 203 West Losey Street, Room 1180, Scott AFB IL 62225-5219.

**SUMMARY OF REVISIONS**

This revision adds paragraphs and corrects figures from interim change 2000-1. Paragraphs 13.3.7.8 through 13.3.7.13 were not incorporated from the Interim Change. Pictures of the Century car seat were mistakenly added into interim change 2000-1, under paragraph 7.8, Leather Restraint Set. Interim Change IC 2001-1, added three new equipment items: the Propaq Encore 206EL, MiniOX 3000 Oxygen Monitor and Century Car Seat. The Century Car Seat paragraphs and figures were misnumbered and Interim Change 2001-2 was released to correct this administrative oversight. After release it was discovered that the Century Car Seat figure numbers were still incorrect in paragraph 7.9. of the AFI and the Interim Change 2001-2. This has been corrected. Follow preflight guidance before use in-flight. A "|" indicates revised material since the last edition. The entire text of the Interim Changes is located in the last attachments of this AFI.

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## Chapter 1

### GENERAL INFORMATION

**1.1. Purpose.** Provides a standardized listing of available medical equipment to use on both fixed and rotary wing aircraft.

**1.2. Responsibilities.** It is the responsibility of aeromedical evacuation (AE) Commander to ensure each aeromedical evacuation crew member (AECM) assigned to their unit receives training on the applicable equipment contained within this publication. Furthermore, the Commander will ensure a copy of this publication will be available on each AE mission. The Commander will determine further distribution.

**1.3. Safety.** Gloves will be worn when working with electrical connections. Gloves will not be worn when working with oxygen equipment.

#### **1.3.1. WARNINGS, CAUTIONS, and NOTES.**

**1.3.1.1. WARNINGS** are operating procedures, techniques, etc., which could result in personal injury or loss of life if not carefully followed.

**1.3.1.2. CAUTIONS** are operating procedures, techniques, etc., which could result in damage to equipment if not carefully followed.

**1.3.1.3. NOTES** are operating procedures, techniques, etc., which are considered essential to emphasize.

**1.4. Waivers.** Refer to AFI 11-2AE Vol 3.

**1.5. Equipment Accountability.** All assigned medical equipment will be kept in a mission ready status and will be maintained on the host base Medical Logistics System (MEDLOG) IAW AFMAN 23-110, Vol. 5, Chap 18 to ensure proper asset accountability, Quality Assurance and maintenance histories. All supplies and equipment assigned to a War Reserve Material (WRM) project are owned by the Medical Dental Division (MDD) until deployed, and will be maintained on MEDLOG records IAW AFMAN 23-110, Vol. 5, Chap 15. When material is used or loaned for training, follow procedures in AFMAN 23-110, Vol. 5, Chap 15. While this equipment can be used for training, it will not be marked "For Training Use Only" or other similar wording. If an item is not repairable, it will be turned in for salvage to the host equipment account.

#### **1.6. Equipment Responsibility.**

1.6.1. It is the responsibility of the unit medical equipment section at home station to insure that all mission assigned equipment is:

1.6.1.1. Within calibration requirement dates and that this date will not be exceeded during the planned mission scenario.

1.6.1.2. In a complete mission ready status to include calibration, cleanliness, operation, and required accessories.

1.6.1.3. Unusual or repeated equipment failure must be brought to the attention of the MAJCOM/SG and HQ AMC/SGXR by telephone followed up by a message or letter. Documentation will

include Medical Equipment Repair Center (MERC) reports and any Standard Form (SF) 380, **Reporting and Processing Medical Material Complaint/Quality Improvement Report**, as well as any trends noted in your squadron. Prior to salvaging or disposing of any equipment item, HQ AMC/SGXR must be notified to ensure it is not needed for further evaluation.

1.6.2. It is the responsibility of the mission assigned medical crew to ensure that all equipment for their mission is:

1.6.2.1. Preflight all equipment after showtime and prior to mission launch.

1.6.2.2. Within calibration requirement due dates.

1.6.2.3. Clean and mission ready (all component parts available).

1.6.2.4. Assure Air Force Technical Order (AFTO) Form 350, **Repairable Item Processing Tag**, is available should any equipment malfunction during any part of the mission.

1.6.2.5. Cleaned at termination if used en route - prior to storage or return to unit.

1.6.2.6. Plugged in for recharging if battery operated.

1.6.2.7. An incident report is initiated for all patients or crew related safety occurrences.

**NOTE:** Accessory items (unless contaminated) should be left in-place

**1.7. Equipment Loading.** The following equipment may be rolled up and down the aircraft ramp when loaded or unloaded:

1.7.1. Adult ventilators.

1.7.2. Unoccupied transport incubators, securely attached to a wheeled frame or containing integral wheels.

1.7.3. Unoccupied ambulance-type stretchers.

1.7.4. Air Compressors.

1.7.5. Oxygen/compressed air cylinders.

1.7.6. When heavy/bulky equipment is rolled up/down the ramp, ensure an adequate number of personnel are available to reduce the possibility of injury.

**WARNING:** Regulators must be removed and cylinders capped prior to loading/unloading. Only cylinders with caps will be accepted.

## Chapter 2

### APPROVED MEDICAL EQUIPMENT

#### *Section 2A—Air Force Research Laboratory.*

**2.1. General.** The following is a list of medical equipment, approved by Air Force Research Laboratory, for use on fixed wing aircraft in support of AE *In-Flight Kits*. The equipment authorized for use in TA 887 and their national stock numbers (NSN) for commonly used equipment can be found in AFI 41-316, *Aeromedical Evacuation Inflight Kit--Packaging Guide*. For a complete and comprehensive listing of approved medical equipment, refer to Air Force Research Laboratory Publication AL/CF-TR-1995-0171 or the Air Force Research Laboratory's web site at <http://afmedl1.brooks.af.mil/aeromed/statusguide/>.

**2.2. Equipment Classification.** Air Force Research Laboratory classifies its equipment into the following three (3) categories:

**2.2.1. Acceptable.** This equipment is approved for use on large-bodied United States Air Force (USAF) AE aircraft.

**NOTE:** All pieces of equipment within this publication are considered acceptable unless otherwise identified.

**2.2.2. Conditional.** This equipment is approved for use on large-bodied USAF AE aircraft only when specific operational restrictions are met.

**NOTE:** Conditional pieces of equipment are identified within this publication by the following notice:

**WARNING:** Refer to Air Force Research Laboratory Publication AL/CF-TR-1995-0171 or the Air Force Research Laboratory's web site at <http://afmedl1.brooks.af.mil/aeromed/statusguide> for conditional operational restrictions.

**2.2.3. Unacceptable.** This equipment is not approved for use on any USAF AE aircraft.

**NOTE:** No unacceptable equipment appears in this publication.

#### **2.3. Air and Oxygen.**

2.3.1. 10-Liter Patient Therapeutic Liquid Oxygen Converter (PTLOX), Model Cru-87/U (**Conditional**)

2.3.2. Bard-Parker Nebulizer Heater Jacket (**Acceptable**)

2.3.3. Biomarine High Humidity Adapter (**Acceptable**)

2.3.4. Biomarine Oxygen Analyzer, Model Oa202r (**Acceptable**)

2.3.5. Biomarine Oxygen Monitor/Controller, Model 400 (**Acceptable**)

2.3.6. Bird Air-Oxygen Microblender, Model 3800a (**Acceptable**)

2.3.7. Bird Free Flow Humidification Kit (**Acceptable**)

2.3.8. C-141 Therapeutic Oxygen Manifold Distribution System (Toms) (**Acceptable**)

- 2.3.9. Disposable Oxygen Masks Tomac Bagless, Adult Size, Seflo Universal Tomac with Rebreather Bag, Adult Size (**Acceptable**)
- 2.3.10. Kamen-Wilkinson Foam Cuff and Endotracheal Tube (**Acceptable**)
- 2.3.11. Lanz Endotracheal Tube With Mcginnis Cuff (**Acceptable**)
- 2.3.12. Miniox III Oxygen Monitor (**Conditional**)
- 2.3.13. Mistogen Electronic Nebulizer, Model En 153a (**Acceptable**)
- 2.3.14. Mistogen Electronic Nebulizer, Model Xen 153 (**Acceptable**)
- 2.3.15. Portable Therapeutic Lox System 5l (**Acceptable**)
- 2.3.16. Pressed Steel Tank Gas Oxygen Cylinder, Model 3ht1850 (**Conditional**)
- 2.3.17. Timeter Airdyne Medical Air Compressor, Model 3500 (**Conditional**)
- 2.3.18. Veriflo Oxygen Jacket Regulator, Model 747, P/N 1900231 (**Acceptable**)

#### **2.4. Cardiac.**

- 2.4.1. Cas Medical Systems Neonatal Blood Pressure Monitor Model 901 (**Acceptable**)
- 2.4.2. Corometrics Neonatal Cardiac Monitor, Model 506 (**Conditional**)
- 2.4.3. Datascope Dual Trace Physiologic Monitor, Model 850m (**Acceptable**)
- 2.4.4. Datascope M/D3 Monitor, Defibrillator/Synchronizer, Recorder and Support Module Ii (**Conditional**)
- 2.4.5. Datascope Physiological Monitor, Model 850 (**Acceptable**)
- 2.4.6. Life Pak 4 ECG Monitor, Tapewriter and Defibrillator (**Acceptable**)
- 2.4.7. Life Pak 5 Cardioscope and Battery Pak Charger (**Acceptable**)
- 2.4.8. Lifepak 10 (-43, -47, -59) Cardiac Monitor/Defibrillator (**Conditional**)
- 2.4.9. Lifepak Battery Support System (BSS) (**Conditional**)
- 2.4.10. Medasonics Ultrasound Stethoscope (**Conditional**)
- 2.4.11. Medtek Bpi 420 Blood Pressure/Pulse Monitor (**Acceptable**)
- 2.4.12. Monopulse 807b Defibrillator with Electrocardioscope, Pacemaker, And Synchronizer (**Acceptable**)
- 2.4.13. MRL 360slx Monitor/Defibrillator/Pacer (**Conditional**)
- 2.4.14. MRL 450 SI-Af Monitor, Defibrillator/Synchronizer, Recorder (**Acceptable**)
- 2.4.15. Propaq Vital Signs Monitor Model 106 (**Acceptable**)
- 2.4.16. Ultrasonic Monitor, Hemosonde Model 2300 (**Acceptable**)
- 2.4.17. Zoll Pd 2000 Monitor/Defibrillator/Pacer (**Conditional**)

#### **2.5. Incubators.**

- 2.5.1. Airborne Life Support Systems (ALSS) Infant Transport Incubator, Model ALSS 185 (**Conditional**)
- 2.5.2. Airborne Life Support System (ALSS) Transport Incubator, Model 20h Neonatal Transport System (NTS) (**Conditional**)
- 2.5.3. International Biomedical Corp Neonatal Transport System (NTS) (ALSS Model 20h) (**Conditional**)
- 2.5.4. Ohio Air-Vac Transport Incubator with Battery Pack (**Acceptable**)

## **2.6. Infusion.**

- 2.6.1. Arm-A-Flow IV Flow Regulator 3m IV Flow Regulator (**Acceptable**)
- 2.6.2. Baxter As82f Auto syringe (**Acceptable**)
- 2.6.3. Baxter As20gh-2 Auto Syringe (**Conditional**)
- 2.6.4. Biomed Spring-Actuated Infusion Pressor, Cat 51787 (**Acceptable**)
- 2.6.5. Bipress Auto Infusion System (**Conditional**)
- 2.6.6. Emergency and Military Infusion System (EMIS) (**Acceptable**)
- 2.6.7. Extracorporeal Infusion Pump, Models 1203,1211 (**Conditional**)
- 2.6.8. Harvard Apparatus Model 2720 Syringe Infusion Pump (**Acceptable**)

**NOTE:** Power Requirements 115 Volts Alternating Current (Vac) 60hz

- 2.6.9. IMED 928 Volumetric Pump (**Conditional**)

**NOTE:** Power Requirements-Battery Power Only

- 2.6.10. IMED 960 Volumetric Infusion Pump (**Conditional**)
- 2.6.11. IVAC Medsystem III Multi-Channel Infusion Pump (**Acceptable**)
- 2.6.12. MTP Model 1001af Infusion Pump (**Conditional**)
- 2.6.13. Sam Infusion Pump Bubble Detector with Holter Infusion Pump (**Acceptable**)
- 2.6.14. Travenol Flo-Gard 6000 Volumetric Infusion Pump (**Acceptable**)
- 2.6.15. Travenol Infusion Pump, Model As20s (Pump Also Identified as Baxter Auto Syringe As20s) (**Acceptable**)

## **2.7. Miscellaneous.**

- 2.7.1. Compur M 1000 Mini-Photometer (**Acceptable**)
- 2.7.2. Compur M 1100 Mini-Centrifuge (**Acceptable**)
- 2.7.3. Curity Monoflo Drainage Bag, Curity Urine Meter With Aspirating Port (**Acceptable**)
- 2.7.4. Dextrometer Reflectance Colorimeter (**Acceptable**)
- 2.7.5. Digital Thermometer, Model 268 (**Acceptable**)

- 2.7.6. Dover Urinary Drainage Bag With Flo- Check Valve, Dover Urinary Drainage Bag With Urine Meter (**Acceptable**)
- 2.7.7. Dynacor Closed Urinary Drainage System (**Acceptable**)
- 2.7.8. Extracorporeal Membrane Oxygenation System (Ecmo) (**Conditional**)
- 2.7.9. Nato Litter Back Rests (**Acceptable**)
- 2.7.10. Nelkin/Piper Digital Thermometer, Model 270 (**Acceptable**)
- 2.7.11. Physio-Control Military Auxiliary Power Supply (**Conditional**)
- 2.7.12. Remic Headset Communication System, Model 7800h (**Conditional**)
- 2.7.13. Spectrum 500 LP(Military Version 2500us) Air Ambulance Life Support System (**Conditional**)
- 2.7.14. Tempa-Dot Single Use Oral Thermometer (**Acceptable**)
- 2.7.15. Thermoregulator, Model Rk 250 (**Conditional**)
- 2.7.16. Uni-Temp Single Use Thermometer (**Acceptable**)
- 2.7.17. Vickers Aircraft Transit Isolator (**Conditional**)
- 2.7.18. Steridyne Model Mt-500-If Digital Thermometer (**Acceptable**)
- 2.7.19. Takeda Medical Digital Thermometer Model Uf-10 (**Acceptable**)

## **2.8. Power.**

- 2.8.1. Electrical Cord Assembly Set (ECAS) (**Acceptable**)
- 2.8.2. Avionic Instrumentation Inc Portable Power System (Frequency Converter/400 - 60) Model 4b3500-1a-Mv-735 (**Acceptable**)
- 2.8.3. Unitron Frequency Converter/400 - 60 Hz, Model Ps- 75-426-1 (Big Bertha) (**Acceptable**)
- 2.8.4. Unitron Frequency Converter/400 - 60 Hz, Model Ps-62-66d (Baby Bertha) (**Acceptable**)
- 2.8.5. Ohmeda Low Maintenance Battery Pack, Stock #217-3813-910 (**Acceptable**)
- 2.8.6. Vanner Electrical Inverter, Model Sp 00112 (**Acceptable**)

## **2.9. Pulse Oximeters.**

- 2.9.1. Biochem Microspan 1040a Pulse Oximeter (**Conditional**)
- 2.9.2. BCI Pulse Oximeter, 3303 (**Conditional**)
- 2.9.3. Nellcor N-200 Pulse Oximeter (**Conditional**)
- 2.9.4. Nonin 8500 Hand Held Pulse Oximeter (**Acceptable**)
- 2.9.5. Nonin 8600 Pulse Oximeter (**Acceptable**)
- 2.9.6. Nonin 8604d-L Pulse Oximeter (**Acceptable**)

## **2.10. Respiratory**

- 2.10.1. Heimlich Valve (**Acceptable**)
- 2.10.2. Laerdal Adult Resuscitator, Catalog #870001 (**Acceptable**)
- 2.10.3. Laerdal Child Resuscitator, Catalog #860001 (**Acceptable**)
- 2.10.4. Laerdal Infant Resuscitator, Catalog #850001 (**Acceptable**)
- 2.10.5. Ohio Model 885 Conversion, Anesthesia Machine (**Acceptable**)
- 2.10.6. Pleur-Evac Adult- Pediatric, Non-Metered, Model A-4000 and Pleur-Evac Adult-Pediatric, Metered,  
Model A- 4010, Argyle Sentinel Seal Dual Chest Drainage Unit, Migada Underwater Chest Drainage Unit,  
Pleura Gard Chest Drainage System, Thora Drain 111 Underwater Chest Drainage System, And Thora-Klex  
Chest Drainage Unit Are All Approved For Flight. (**Conditional**)
- 2.10.7. Pleura Gard Chest Drainage System (**Conditional**)
- 2.10.8. Thora Drain III Underwater Chest Drainage System (**Conditional**)
- 2.10.9. Thora-Klex Chest Drainage Unit 7750 And 7700 (**Conditional**)
- 2.10.10. Travenol Heart-Lung Resuscitator, Model Hlr 50-90 (**Conditional**)

## **2.11. Securing.**

- 2.11.1. Aeromedical Pole (**Acceptable**)
- 2.11.2. Clinical Records Rack (**Acceptable**)
- 2.11.3. Horton Bracket (**Acceptable**)
- 2.11.4. Litter Equipment Support Device (**Acceptable**)
- 2.11.5. Litter/Stryker Frame Respirator Mount(**Acceptable**)
- 2.11.6. Multipurpose Aeromedical Tray Holder (**Acceptable**)
- 2.11.7. Neonatal Transport System (NTS) (**Acceptable**)
- 2.11.8. C-21 Securing Plate Neonatal Transport System (NTS) Wooden Support Block (**Acceptable**)
- 2.11.9. Pediatric Safety Net (**Acceptable**)
- 2.11.10. Waters Bracket (**Acceptable**)

## **2.12. Suction.**

- 2.12.1. Impact Model 305gr Portable Aspirator (**Conditional**)
- 2.12.2. Impact Model 308m Portable Aspirator (**Acceptable**)
- 2.12.3. Impact Model 326m Continuous/Intermittent Portable Aspirator (**Acceptable**)
- 2.12.4. Laerdal Mil-Vac Portable Aspirator (**Conditional**)

2.12.5. Laerdal Suction Unit, Model LSU (**Conditional**)

2.12.6. Ohio Intermittent Suction Unit, Catalog #6704-1251-901 (**Acceptable**)

### **2.13. Ventilators.**

2.13.1. Baby Bird Infant Ventilator, Model 5900 (**Acceptable**)

2.13.2. Bear 33 Volume Ventilator (**Conditional**)

2.13.3. Bio-Med Infant Ventilator, Model Mvp-10 (**Conditional**)

2.13.4. Bird Mark 7a (**Acceptable**)

2.13.5. Bird Mark 10 Ventilator (**Acceptable**)

2.13.6. Bird Mark 14 Ventilator (**Acceptable**)

2.13.7. Flynn Series III Ventilator with Oxygen Powered Aspirator (**Acceptable**)

2.13.8. Impact Uni-Vent 750 Ventilator (**Conditional**)

2.13.9. Life Care Plv 102 Ventilator (**Conditional**)

2.13.10. Military Transport Respirator, Model Txp (**Conditional**)

2.13.11. Omni-Vent Series D.Mri Ventilator (**Conditional**)

2.13.12. Robert Shaw Dual Cylinder Portable Resuscitator (**Conditional**)

2.13.13. Samson Neonatal Resuscitator (**Acceptable**)

2.13.14. Urgency Bird Reduced For Neonates (**Acceptable**)

### **Section 2B—US Army Aeromedical Research Laboratory (USAARL).**

**2.14. General.** The following is a list of medical equipment, approved by USAARL, for use on rotary wing aircraft.

**2.15. Equipment Classification.** USAARL only classifies its equipment as acceptable.

### **2.16. Air and Oxygen.**

2.16.1. Catalyst Research Miniox3, Oxygen Monitor.

### **2.17. Cardiac.**

2.17.1. IVAC 4000, Vital Signs Monitor.

**WARNING:** Unit does not work well in high noise environment.

2.17.2. Physio Control Lifepak 5, Defib/Monitor, No Pacer.

2.17.3. Physio Control Lifepak 6s, Defib/Monitor, No Pacer.

2.17.4. Physio Control Lifepak 8, Defib/Monitor, No Pacer.

2.17.5. Physio Control Lifepak 10, Defib/Monitor, No Pacer.

2.17.6. Physio Control Vsm-2, Vital Signs Monitor.

2.17.7. Physio Control Lifestat 100, Blood Pressure Monitor.

2.17.8. Physio Control Lifestat 200, Blood Pressure Monitor.

## **2.18. Incubators.**

2.18.1. Airborne Life Support System 20-H, Incubator, Infant Transport.

2.18.2. Ohio Air-Vac, Incubator, Infant Transport.

## **2.19. Infusion.**

2.19.1. IMED 927, Infusion Pump.

2.19.2. IMED 960a, Infusion Pump.

2.19.3. Medical Tech Prod, 1001, Infusion Pump.

2.19.4. Baxter As20s, Infusion Pump.

## **2.20. Miscellaneous.**

2.20.1. Human Technologies Cor-124, Core Temp Recorder.

**2.21. Power.** There is no acceptable equipment in this category at this time.

**2.22. Pulse Oximeters.** There is no acceptable equipment in this category at this time.

**2.23. Respiratory.** There is no acceptable equipment in this category at this time.

**2.24. Securing.** There is no acceptable equipment in this category at this time.

## **2.25. Suction.**

2.25.1. Impact Medical Corporation 325m, Suction Pump.

2.25.2. Laerdal, Suction Pump.

## **2.26. Ventilators.**

2.26.1. Biomed Devices Mvp-10, Pediatric Respirator.

**WARNING:** Altitude testing not performed.

## Chapter 3

### AIR AND OXYGEN USER'S GUIDE

#### 3.1. Airdyne 3500 Air Compressor

**3.1.1. Purpose:** The Airdyne Air Compressor provides a source of dry compressed air at 50 pounds per square inch (PSI) +/- 5 PSI.

**3.1.2. Description:** The Airdyne Air Compressor has two air outlets, one air inlet, an information/control panel, and four casters.

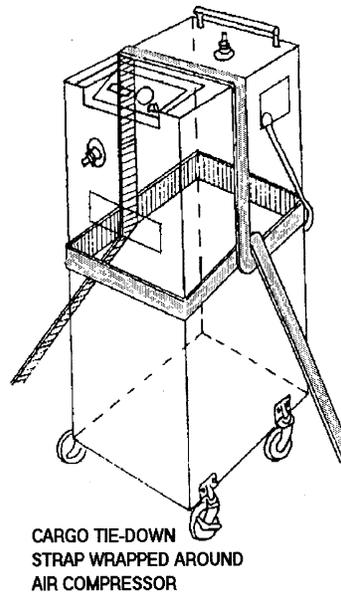
**3.1.3. Power Source:** The Airdyne Air Compressor uses 115 volts alternating current (VAC)/50-60 Hertz (Hz).

**3.1.4. Pre-Flight:** Insure inspection is current, the power cable and plug are undamaged, the inlet filter is clean, and outlets are free of debris. Plug in the compressor and switch on. The pressure gauge should operate in the GREEN ARC (50 PSI +/- 5 PSI). Switch off.

**WARNING:** Maximum flowrate from this compressor is 45 liters per minute at sea level and 41 liters per minute at 8,000 feet. If using this compressor to power a ventilator, ensure the airflow is adequate for the ventilator. The air compressor has an altitude restriction of 8,000 feet. Use of the compressor above this cabin altitude will cause inconsistent pressures. Only one ventilator may be operated with the air compressor at a time.

**3.1.5. Securing:** Position the air compressor close to the item requiring compressed air, with the pressure gauge visible and the power switch accessible. Place one D-Ring on each side of the compressor. Attach one end of a cargo tie-down strap to one of the D-Rings. Route the strap halfway up the side of the compressor and hold it at this point. Route the strap horizontally at this level, wrapping it around the compressor. Run the strap under the vertical section and bring it up over the top of the compressor then down the other side, and under the horizontal portion of the strap. Secure the remaining end of the strap to the second D-Ring, tighten the strap snugly. Set the brakes on the compressor wheels. **Figure 3.1.**

**Caution:** DO NOT over tighten the tie-down strap. Over-tightening will damage the wheels on the compressor.

**Figure 3.1. Cargo Tie-Down Strap Wrapped Around Air Compressor.**

**3.1.6. Operation:** Plug the power cable into a 115 VAC/50-60 Hz power source. Connect a low-pressure air hose to an outlet, and switch on to blow out any dust or debris in hose. Switch off and connect the hose to the equipment. Switch on, the pressure gauge should read 50 PSI +/- 5 PSI. Periodically verify operation and pressure output.

**3.1.7. Disassembly:** Switch off, disconnect the low-pressure air hose from the compressor outlet. Unplug the power cable, release the tie-down strap, and unlock the wheel brakes.

### **3.2. Converter Portable Therapeutic Liquid Oxygen System (PTLOX).**

**3.2.1. Purpose.** The PTLOX is designed to provide controlled flow of humidified oxygen to as many as three (3) oxygen outlets when an aircraft oxygen source is unavailable.

**3.2.2. Description.** The PTLOX is comprised of the container assembly and accessory kit assembly. The container assembly consists of three (3) gaseous oxygen outlets, a liquid oxygen filler port, and a liquid oxygen quantity gauge (used for filling and monitoring quantities of liquid oxygen stored in the unit). An accessory kit assembly that attaches to the liquid oxygen, oxygen unit contains the following: oxygen hoses, flow control valves, and humidification units for distributing oxygen from the converter. Oxygen is delivered to the converter outlets at a pre-set pressure of 50 +/- 5 pounds per square inch (psi), and a maximum flowrate of 15 liters per minute (LPM) per outlet. A pressure gauge continuously registers oxygen delivery pressure. PTLOX maximum oxygen (O<sub>2</sub>) flow is 60 LPM when using a Minilator.

**WARNING:** Keep the PTLOX System away from fires. Place a minimum of 50 feet from all sparking or flammable devices. Per Air Force Instruction (AFI) 21-101, *Maintenance Management of Aircraft*, maintenance and filling of LOX systems will be done only by qualified LOX personnel. Per AFM 161-30, Volume 1, *Solid Rocket/Propellants*, and AFM 161-30, Volume 2, *Liquid Propellants*, handling and storage of this unit will be the responsibility of qualified LOX personnel. Never allow

the converter to be placed where the vent may be obstructed. The vent line and fitting must remain open at all times.

**NOTE:** The PTLOX System vents oxygen when the system is not being used, and a low hissing sound may be heard. The maximum venting rate is 1 liter of liquid oxygen per 24 hours.

**3.2.3. Components.** The PTLOX unit accessory case contains:

- 3.2.3.1. Three (3) twenty foot low-pressure oxygen hoses.
- 3.2.3.2. Three (3) flow control valves with securing clips and hook/pile straps.
- 3.2.3.3. Three (3) humidifier units.

**3.2.4. Pre-flight.** Ensure the monthly inspection/annual calibration and testing has been accomplished IAW T.O. 15X-2-8-1 and documented. Current dates will be annotated on the AFTO form 244 and attached to the PTLOX. Inspect the system for any signs of damage. Ensure the carrying handles and securing straps are in place and are securely attached to the unit. Open the accessory case, inventory the components and inspect them for serviceability. Ensure the sterile water has not expired. Check the structural soundness and function of the accessory case securing latches.

3.2.4.1. Remove the accessory case from the liquid oxygen unit. Determine the liquid oxygen quantity by depressing the quantity switch and observing the digital display for the liters of liquid oxygen present. The quantity will be between 0.00 liters and 10.00 liters. Ensure the quantity is sufficient for the mission. Check the pressure gauge for proper operating pressure (50 +/- 5 psi).

3.2.4.2. Check the battery condition by depressing the battery test switch. The digital display should show between 10.00 and 19.99. If not, replace the batteries with 9-volt batteries. Open the outlet cover panel by sliding it back, and check the outlets for any indication of damage, then close the outlet cover panel.

**3.2.5. Assembly and Operation. WARNING:** DO NOT wear gloves when connecting oxygen lines.

**WARNING:** Never place the system where it will come in contact with petroleum products as fire or explosion may result

**CAUTION: DO NOT** connect Schrader adapter to outlets if PTLOX is empty or prepared with nitrogen. This will bleed off pressure and/or introduce contaminants into the system and potentially ruin unit.

**CAUTION:** The PTLOX System is to be positioned facing upward and never on its side.

**WARNING:** If any odors other than the hose smell are detected, have other personnel recheck it for odors. Contact the aircraft environmental systems personnel as soon as possible and report this incident. Do not use this unit! Replace it.

3.2.5.1. Secure the PTLOX System at the desired location with the tie down straps on the sides. Remove the accessory case, and open it. Remove a flow control valve, for each patient requiring oxygen, and secure the valve to the litter support strap near the heads of the patients. Attach the clip assembly to a litter support strap or seat strap (**Figure 3.2.**).. Remove the dust caps from the inlet and outlet of the flow control valve and secure in the accessory case. Remove an oxygen hose storage reel from the accessory case and remove the hose from the reel. Connect the threaded end of the hose to the inlet on the side of the flow control valve, and ensure the valve is set to 0 LPM. Slide the oxygen outlet cover back until it is secure. Remove the outlet cap by twisting the

knurled knob at the outlet in a clockwise direction. Insert the Schrader end (tapered) of the oxygen hose into the oxygen outlet and press firmly till it attaches securely. Turn flow control valve to highest setting and allow oxygen to flow for 20 seconds to purge the system. Smell the emitted oxygen for any odors. Return setting to 0 LPM. Remove a humidification bottle from the accessory case, and fill bottle with sterile water, as required. Attach humidification bottle to the bottom outlet of the flow control valve. Secure the bottle to the litter support strap by wrapping the hook and pile strap on the flow control valve around the bottle and litter support strap. Set the flow control valve to the prescribed flowrate, and ensure there is flow from the humidifier. Place the delivery device on the patient

**WARNING:** A flow control valve, with index set at zero (0) must be attached to the supply hose outlet fitting prior to inserting the supply hose disconnect into the container assembly supply receptacle. This procedure is imperative to prevent 50-psi oxygen from escaping out an open hose.

**WARNING:** Always connect the flow control valve fitting marked "OUTLET" to the humidifier. Reverse connection or use of a GAS source other than  $50 \pm 5$ -psi oxygen may result in inaccurate flow rates.

3.2.5.2. Operating time may be calculated in two ways:

3.2.5.2.1. If 15 LPM is being used, **Table 3.1.** will provide the duration of time the system will operate for 1, 2, or 3 patients, with various quantities of oxygen in the system.

**NOTE:** The PTLOX System will provide a MAXIMUM flow rate of 15 LPM per outlet.

3.2.5.2.2. Multiply the total LPM by 60 by each hour of scheduled mission time to ascertain the total liters of gaseous oxygen required. Divide this total by 804 (i.e.  $25 \text{ LPM} \times 60 \times 4 \text{ hours} / 804 = 7.5 \text{ liquid}$ ).

**NOTES:**

The PTLOX System will vent when not in use. **Table 3.2.** shows liquid oxygen remaining after each 24-hour period after being filled to 10 liters.

Authorized to operate a maximum of twenty-five (25) PTLOX Converters on all military aircraft except C-21 without overboard venting. On C-21, authorized to operate a maximum of ten (10) PTLOX Converters.

3.2.5.2.3. When transporting PTLOX Converters as cargo, follow guidance as outlined in AFJMAN 24-204.

Figure 3.2. Hookup of Control Valve/Clip Assembly Humidification Kit and Oxygen Hoses.

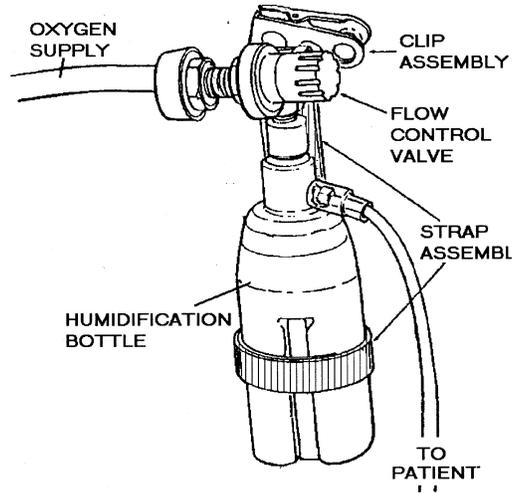


Table 3.1. Duration of Remaining Oxygen Supply in Minutes

Liters of Lox	Equivalent Liters of Gaseous Oxygen	with 1 Patient	with 2 Patients	with 3 Patients
10.0	8040	536	268	178
9.5	7638	509	254	169
9.0	7236	482	241	160
8.5	6834	455	227	151
8.0	6432	428	214	142
7.5	6030	402	201	134
7.0	5628	375	187	125
6.5	5226	348	174	116
6.0	4824	321	160	107
5.5	4422	294	147	98
5.0	4020	268	134	89
4.5	3618	241	120	80
4.0	3216	214	107	71
3.5	2814	187	93	62
3.0	2412	160	80	53
2.5	2010	134	67	44
2.0	1608	107	53	35
1.5	1206	80	40	26
1.0	804	53	26	17
0.5	402	26	13	8

**Table 3.2. Converter Loss During Standby.**

<b>Time After Filling (In Hours)</b>	<b>Liquid Oxygen Remaining (In Liters)</b>
24	9.1
48	7.9
72	6.6
96	5.3

**3.2.6. Disassembly and Storage.**

3.2.6.1. Turn the flow control valve off. Remove the oxygen hose from the outlet by turning the knurled knob at the outlet in a clockwise direction and pulling up on the end of the hose. Replace the outlet cap by pushing it firmly into the outlet, and then close the oxygen outlet cover. Remove and dispose of the humidifier bottle (if disposable). Remove the flow control valve from the oxygen hose, replace the dust caps, and secure the valve in the accessory case. Rewind the oxygen hose on its storage reel and stow the reel in the accessory case.

**NOTE:** The oxygen hose must be wound tightly, otherwise it will not fit back into the accessory case.

3.2.6.2. Close and secure the accessory case lid, and attach the case to the top of the PTLOX System unit. Release the tie down straps and secure them to the rings on the sides of the unit.

**NOTE:** If the PTLOX System is not scheduled for use for a period of 30 days or more, qualified liquid oxygen personnel will prepare the unit for storage as outlined in Technical Order (T.O.) 15X-2-8-1, Liquid Oxygen Converter Type CRU-87/U.

**3.3. Minilator.**

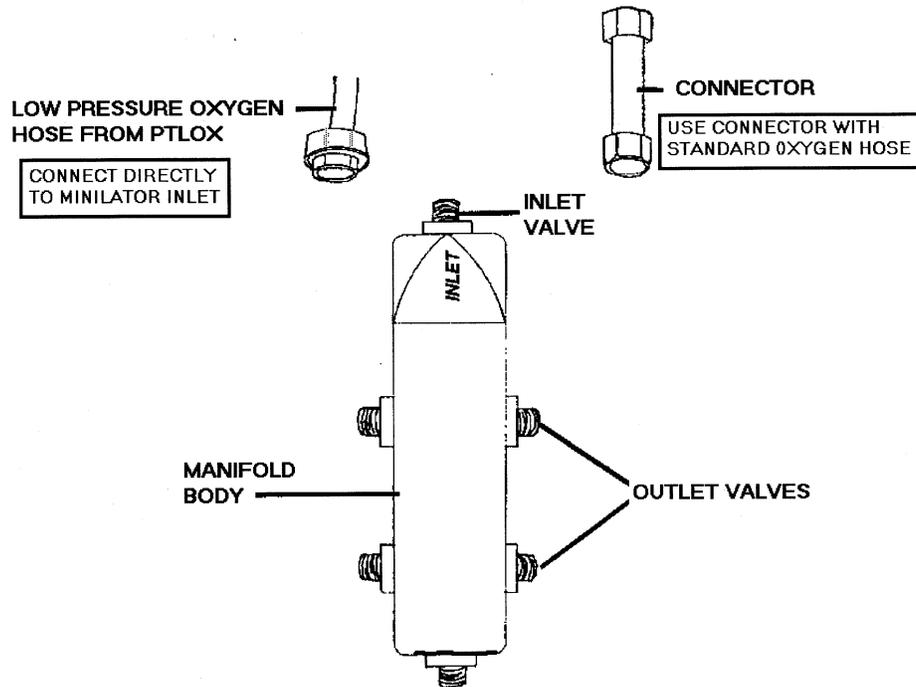
**3.3.1. Purpose.** The Minilator is a manifold system designed to provide therapeutic oxygen for up to five (5) patients from a single oxygen source.

**WARNING:** The Minilator was not designed for and should not be used to support ventilatory devices. Connect a separate oxygen hose from an approved oxygen source to operate ventilators.

**NOTE:** The oxygen flow control valve from the PTLOX system accessory kit will not be used with the Minilator when connected to the Minilator OUTLET valves.

**3.3.2. Description.** The Minilator is an oxygen distribution system with one (1) inlet, which is connected to the oxygen source, and a manifold with five (5) outlets for distributing oxygen (**Figure 3.2.**). Check valves are installed in the outlets to prevent oxygen flow from any unused outlets. Dust covers are installed to prevent debris from entering the Minilator. A connector is used to connect the oxygen delivery hose to the Minilator inlet.

Figure 3.3. Minilator and Connector.



**3.3.3. Pre-flight.** Inspect the manifold and connector for damage or obvious contamination.

**3.3.4. Assembly and Operation.**

3.3.4.1. Connect standard low-pressure oxygen hose from a pressure reduction regulator to the connector, and the connector to the Minilator inlet valve. If using the C-17 therapeutic oxygen system, connect the standard low-pressure oxygen hose from C-17 therapeutic outlet to the connector and the connector to the Minilator inlet. Remove the necessary dust caps from the outlet valves, and connect standard low-pressure oxygen hoses to the outlets. Use oxygen flow to clear the lines of any contaminants. Connect the low-pressure hoses to flowmeter/humidifier assemblies and purge the system with low flow oxygen, then set the flow rates to the prescribed values.

3.3.4.2. When using the PTLOX as an oxygen source, connect the PTLOX low-pressure hose to the Minilator inlet valve. Remove the necessary dust caps from the outlet valves. Connect a veriflow regulator to the end of a standard low-pressure oxygen hose before connecting the hose to the Minilator outlet valve. Ensure veriflow regulator setting is at zero (0). Then connect the PTLOX low-pressure hose with schrader end into the PTLOX system. Purge system to clear the lines of any contaminants and return setting to zero (0). Attach humidifier assemblies as required and set the flow rates to the prescribed values.

**WARNING:** A Veriflow flow meter, with index set at zero (0) must be attached to the Minilator outlet valve prior to connecting to the PTLOX.

**CAUTION:** Use an oxygen hose with the Minilator before connecting to the Therapeutic Oxygen Manifold System (TOMS). The Minilator is NOT to be directly connected to the TOMS.

**NOTE:** When using a Minilator with the PTLOX, the maximum oxygen flow is 60 LPM.

**NOTE:** When using a Minilator with the TOMS, the maximum oxygen flow is 45 LPM.

**3.3.5. Disassembly and Storage.** Discontinue the oxygen source to the Minilator. Remove the hoses from the Minilator outlets and replace the dust caps. Disconnect the hose from the Minilator inlet or connector and remove the connector (if used) from the inlet. Replace the dust cap. Store the Minilator and connector, if applicable.

### **3.4. Oxygen Analyzer - MiniOX III Oxygen Monitor.**

**3.4.1. Purpose.** The MiniOX III Oxygen Monitor is designed to monitor oxygen concentrations delivered to patients supported by ventilators, or in an incubator.

**NOTE:** A review of Altitude Physiology is recommended prior to the use of this monitor.

#### **3.4.2. Description.**

3.4.2.1. The MiniOX III consists of:

- 3.4.2.1.1. The oxygen monitor.
- 3.4.2.1.2. MSA Medical Oxygen sensor.
- 3.4.2.1.3. Sensor cable.
- 3.4.2.1.4. T-Adapter.
- 3.4.2.1.5. Sensor retaining strap.
- 3.4.2.1.6. Securing bracket.
- 3.4.2.1.7. 9-volt battery.
- 3.4.2.1.8. Carrying case.

3.4.2.2. All controls and displays are located on the face of the monitor unit, and a connection jack for the sensor cable is located on the lower right side of the unit.

3.4.2.3. There are three displays located at the top, bottom right, and bottom left, on the face of the instrument, respectively:

- 3.4.2.3.1. The Digital display shows the percentage of oxygen in the air around the sensor and shows status of the system.
- 3.4.2.3.2. The High Alarm shows the maximum percentage of oxygen that is to be delivered to a patient.
- 3.4.2.3.3. The Low Alarm shows the minimum percentage of oxygen that should be delivered to a patient.

3.4.2.4. There are two (2) alarm light emitting diodes (LED) indicators, one for the high setting, and one for the low setting located over the High and Low Alarm displays.

3.4.2.5. There are three (3) alarm switches located at the base of the switch panel. They are, from left to right, the Low Alarm Set switch, the Alarm Silence switch, and the High Alarm Set switch.

3.4.2.6. Above the Low Alarm Set switch, and from bottom to top are the Calibrate, Off, and Read O<sub>2</sub> switches. Above the High Alarm Set switch, and from bottom to top are the Decrease, the Increase, and the Unlock switches.

**NOTE:** An audible alarm accompanies any alarm condition.

**NOTE:** The audible alarm is deactivated for 30 seconds by pressing the Alarm Silence switch. If the condition is not corrected in this time, the alarm will reactivate. With the Alarm Silence switch depressed, the corresponding alarm LED will flash. The audible alarm can be heard in parts of the C-9A, but not in any part of the C-130 or C-141.

3.4.2.7. A low battery alarm operates in two stages:

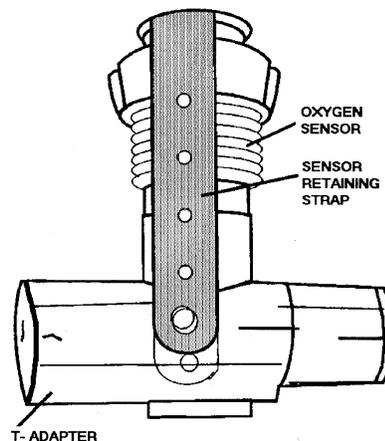
3.4.2.7.1. "LOW BATTERY" will appear on the display when approximately 6 hours of battery life remain. This is accompanied by a beep every 30 seconds.

3.4.2.7.2. "OFF LOW BATTERY" will appear on the display when the battery power decreases below a working level. The instrument will automatically shut off and generate a three tone sound every second.

3.4.2.8. The oxygen monitor is connected to the sensor by a 10 foot long, coiled sensor cable. This cable has identical plugs with locking collars at each end, for connection to jacks on the sensor and oxygen analyzer.

3.4.2.9. The sensor is basically cylindrical with one end containing the cable connector jack. The other end, the deflector, is designed to protect the sensor probe, and to attach the sensor into the T-Adapter when it is used with ventilator circuits. A sensor retaining strap is used to secure the sensor to the T-Adapter ([Figure 3.3](#)).

**Figure 3.4. Sensor Secured To T-Adapter.**



**3.4.3. Power Source.** A 9-volt alkaline battery that is housed in a compartment in the back of the monitor.

#### **3.4.4. Pre-flight.**

**NOTE:** This will be done prior to takeoff and can be done in the Medical Equipment Section.

3.4.4.1. Check the calibration and inspection sticker for currency. Inspect the MiniOX III and its components for any signs of damage. Ensure the MiniOX III Oxygen Monitor, Oxygen Sensor - one in use and one spare, 10 foot long Sensor Cable, T-Adapter, Sensor retaining strap, mounting

bracket, 9 volt alkaline battery- one in use and one spare, oxygen connecting tubing with nipple fitting, and carrying case are present:

3.4.4.2. Attach the coiled sensor cable to the sensor and tighten the twist collar. Attach the cable to the oxygen monitor in the same way. Connect the oxygen tubing with the nipple fitting to an oxygen source, connect the nipple fitting to the T-Adapter and turn the oxygen on at four (4) LPM. Insert the sensor into the T-Adapter. Allow oxygen to flow over the sensor for three (3) to five (5) minutes.

**NOTE:** DO NOT hold the sensor when doing calibrations. Hold the sensor cable. The sensor is heat sensitive and may give erroneous readings if held.

3.4.4.3. Press the READ O<sub>2</sub> switch to turn the monitor on. "CAL" will flash on the display. Press the "CALIBRATE" key, and "CAL" will again flash on the display. Press the "UNLOCK" key, and use the arrow keys to scroll up or down to 100.0%. The MiniOX III will lock-in the calibration valve, "WAIT" will flash on the screen, two beeps will sound, and "READ" then the "O<sub>2</sub>%" will be displayed. Turn the oxygen off.

**NOTE:** If "UNLOCK" is not pressed within 30 seconds of "CALIBRATE" being pressed, the monitor will exit the calibrate mode. Press "CALIBRATE" to re-enter the calibrate mode. If "CAL" should ever flash on the display the instrument needs to be re calibrated. Check for improper calibration gas or improper calibration value setting and re calibrate the instrument. If this fails, the sensor may need to be replaced.

3.4.4.4. Remove the sensor from the T-Adapter and expose it to room air. Within five (5) minutes, a reading of  $20.8 \pm 2\%$  should be displayed. If the variation is greater than 2%, repeat the calibration. If the variation remains greater than 2% the sensor must be replaced. Press the "OFF" button to switch the monitor off. The MiniOX III has a built-in memory that will store its last settings unless the battery is removed. Press "READ O<sub>2</sub>" to turn the monitor on and to recover the last settings.

3.4.4.5. If the MiniOX III has been previously calibrated on 100% oxygen, check the calibration and inspection decal for currency, inventory and inspect the MiniOX III and components, connect the sensor to the sensor cable and the cable to the monitor and expose the sensor to room air. Within five (5) minutes, the display should show  $20.8\% \pm 2\%$ . If not, re calibrate the monitor.

3.4.4.6. Switch the MiniOX III oxygen monitor off, and store it and all components in the carrying case until it is needed.

### **3.4.5. Operation.**

**NOTE:** Prior to use, the monitor MUST be calibrated with 100% oxygen at ground level at the patient pick-up point. Normally the MiniOX III is extremely accurate and reliable, and further calibration will not be required during flight. If in-flight calibration becomes necessary follow the instructions in "Inflight Calibration."

3.4.5.1. Connect the sensor to the monitor with the sensor cable. Press "READ O<sub>2</sub>" to switch the monitor on, then set the Low and High Alarm.

3.4.5.2. To set the Low and High Alarm:

3.4.5.2.1. Press LO - or HI - set, and observe "AL" on the display.

3.4.5.2.2. Use the increase or decrease arrow buttons to set the alarm to the desired value. The Low Alarm is usually set 5 percentage points below the patient's ordered value.

3.4.5.3. After the Low - or High - Alarm is set, the MiniOX III monitor will lock-in the alarm value, beep once, display "READ" and the oxygen percentage. Place the sensor near the patient's airway.

**NOTE:** The High Alarm cannot be set lower than the Low Alarm setting, or vice versa. The High Alarm function may be disabled by entering the HI Set Mode and increasing the alarm set point until "--" is displayed. If the sensor becomes disconnected or ceases to function, "OFF SENSOR" will show on the display. Reconnect or replace the sensor. If the sensor is replaced, re calibrate the MiniOX III monitor. The display is accurate to within + 1%, therefore AECMs SHOULD NOT devote excessive time in attempting to modulate oxygen flow to achieve the nearest one-tenth of 1%. The range of accuracy is both therapeutically acceptable and operationally feasible.

#### 3.4.5.4. Sensor Replacement:

3.4.5.4.1. When the MiniOX III is unable to be calibrated, or gives erratic readings, the sensor must be replaced. To replace the sensor:

3.4.5.4.1.1. Press "OFF" on the keypad to turn the unit off.

3.4.5.4.1.2. Remove the sensor from the coiled cable.

3.4.5.4.1.3. Attach a new sensor to the coiled cable and tighten the twist collar.

3.4.5.4.1.4. Recalibrate the unit.

#### 3.4.5.5. If the sensor is to be used in-line in ventilator tubing:

3.4.5.5.1. Insert the sensor into the T-Adapter with the deflector pointing downward.

3.4.5.5.2. Attach one end of the retaining strap over a post on the T-Adapter.

3.4.5.5.3. Loop the strap over the sensor, placing the strap center hole over the sensor cable jack, and attach the remaining strap end to the other post on the T-Adapter.

3.4.5.5.4. Attach the sensor to the monitor with the sensor cable and ensure the twist collars are tight.

3.4.5.5.5. Place the T-Adapter in-line with the ventilator tubing, and connect to the inlet port of the humidifier.

3.4.5.5.6. The sensor **MUST** be pointing down or sideways when used in-line with ventilator tubing to decrease the possibility of moisture building up on the sensor.

**NOTE:** Moisture on the sensor will cause inaccurate readings and shorten the life span of the sensor. If possible, mount the sensor **UPSTREAM** of the humidifier. The MiniOX III actually measures the partial pressure of oxygen, not the percentage. The partial pressure is converted to a percentage and displayed on the screen.

3.4.5.6. Due to the decrease in partial pressure of oxygen as the aircraft cabin altitude increases during ascent, oxygenation of the patient will decrease. A decrease in oxygen percentage on the MiniOX III display will also occur. Increase the flow of oxygen to compensate until the desired percentage is reflected on the MiniOX III display. During descent the partial pressure of oxygen will increase, and the flow of oxygen must be reduced to maintain the desired oxygen percentage.

**NOTE:** Due to the decreased partial pressure at higher altitudes, and limitations of the oxygen system, higher concentrations of oxygen will be impossible to achieve, and this will be reflected on the MiniOX III display. Set the oxygen flow to the maximum rate.

**3.4.6. In-flight Calibration.** Normally the MiniOX III monitor is calibrated before flight, and will not require calibration in-flight. However, the MiniOX III monitor must be re calibrated if:

3.4.6.1. "CAL" appears on the display.

3.4.6.2. The instrument is dropped and erratic or unexpected readings are obtained.

3.4.6.3. The sensor must be changed.

3.4.6.4. The battery must be changed.

3.4.6.5. The MiniOX III gives continuous erratic readings.

3.4.6.6. Calibrate the MiniOX III in the same way as described in preflight. After in-flight calibration, the MiniOX III will display the correct percentage of oxygen, but because of the lower partial pressure of oxygen used, the patient will not receive adequate oxygenation. To compensate for calibrating at the lower partial pressure, use the Altitude Post Calibration Conversion Chart (table 3.3) to obtain the MiniOX III reading that corresponds to the ordered percentage of oxygen. This ensures that the patient receives the same partial pressure of oxygen as before.

Table 3.3. MiniOX III ALTITUDE POST-CALIBRATION CONVERSION CHART.

**MINIOX III  
ALTITUDE POST-CALIBRATION CONVERSION CHART**

<b>CABIN ALTITUDE (X 1000 FT)</b>	10.0	30	36	44	51	58	65	73	80	87	94	*	*	*	*	*	*	
	9.0	29	35	42	49	56	63	70	77	84	91	98	100	100	100	100	100	100
	8.0	28	34	40	46	54	61	67	74	81	87	93	100	100	100	100	100	100
	7.0	27	32	39	45	52	58	65	71	78	84	91	97	100	100	100	100	100
	6.0	26	31	37	44	50	56	62	69	75	81	87	94	100	100	100	100	100
	5.0	25	30	36	42	48	54	60	66	72	78	84	90	96	100	100	100	100
	4.0	24	29	35	41	46	52	57	64	70	75	81	87	93	97	100	100	100
	3.0	23	28	33	39	45	50	56	61	67	73	78	84	89	95	100	100	100
	2.0	23	27	32	38	43	48	54	59	64	70	75	81	86	91	97	100	100
	1.0	22	26	31	36	41	47	52	57	62	67	73	78	83	88	93	98	100
		21	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

**DESIRED OXYGEN PERCENTAGE (%)**

**CAUTION: DO NOT USE THIS CHART ROUTINELY, USE ONLY WHEN RECALIBRATION AT ALTITUDE IS WARRANTED**

\* INDICATES THAT WHILE THE MINIOX III MAY READ 100% THE DESIRED PARTIAL PRESSURE CANNOT BE ACHIEVED AT THAT ALTITUDE

**3.4.7. MiniOX III Altitude Post Calibration Conversion Chart. CAUTION:** DO NOT use this chart routinely. Use it only when re calibration at altitude is warranted.

3.4.7.1. Locate the actual cabin altitude on the vertical axis (left), and the desired oxygen percentage (ordered) on the horizontal axis (bottom). The number where the row from the cabin altitude and the column from the desired oxygen percentage intersect is the percentage oxygen that the MiniOX III must read for the oxygen to be at the desired partial pressure (ordered percentage).

3.4.7.2. Chart on the patient’s record; The oxygen concentration ordered and administered and the oxygen concentration (%) reading on the MiniOX III.

3.4.7.3. Calibrate the MiniOX III at the next en route stop. Once the calibration at ground level is done, the conversion chart will not be needed.

**CAUTION:** The conversion chart is used ONLY following calibration at altitude and ONLY until recalibration at ground level.

**3.4.8. Securing.**

3.4.8.1. Place the MiniOX III into its securing bracket, and attach the bracket so the MiniOX III is in an upright position. The bracket may be attached to the patient’s litter, the incubator handle

or (intravenous) IV pole if the patient is in an incubator, or the C-9A stanchion pole or console. The bracket will not secure to a C-130 or C-141 stanchion pole. Secure the MiniOX III in a location where an AECM may easily view the monitor display.

**NOTE:** DO NOT secure the MiniOX III to the Stryker "A" frame. The chrome finish is too smooth to properly secure the monitor.

### **3.4.9. Disassembly and Storage.**

3.4.9.1. Press "OFF" to switch the MiniOX III monitor off, then disconnect the sensor cable from the monitor and sensor. Store the sensor and cable in the carrying case. Remove the securing bracket and detach the monitor from it. Store both the bracket and monitor in the case.

**NOTE:** Properly dispose of the sensor if any infectious sputum, blood, or body fluids come in contact with the interior sensor diaphragm.

**NOTE:** The MSA medical oxygen sensor has a one year warranty from the date of manufacture and a minimum six month shelf life when stored in its sealed package.

3.4.9.2. Performing calibration is the only way to determine sensor is operating correctly. If monitor will not calibrate when accomplishing calibration procedure, dispose of sensor and reaccomplish calibration with new sensor.

3.4.9.3. Expose a sensor to ambient air for one (1) hour after removal from its package before performing calibration.

**WARNING:** The sensor contains caustic material (potassium hydroxide). If the sensor develops a leak, dispose of it immediately! It must be disposed according to applicable federal, state, and local regulations. Should contact with skin or clothing occur, rinse area with large quantities of water. In case of eye contact, flush with water for a minimum of 15 minutes. Consult a physician.

### **3.4.10. Battery Replacement.**

3.4.10.1. Turn the MiniOX III monitor OFF. Open the battery bay by lifting the metal support stand and press down on the ridges of the triangle on the battery door while sliding the door toward the bottom of the case. Remove the battery from the case and carefully disconnect it from the contacts. WAIT AT LEAST 45 SECONDS then connect the fresh battery to the contacts. Place the battery into the case so the terminal end slides into the right side of the case, then lay the battery flat in the case. Slide the battery door back onto the case and slide it up until it snaps shut.

## **3.5. Politzer Bag.**

**3.5.1. Purpose.** The Politzer Bag is used to relieve altitude related ear blocks after more gentle methods have failed.

**3.5.2. Description.** The Politzer Bag consists of three (3) components: a rubber bulb, a tube, and a nasal tip.

**3.5.3. Pre-flight.** Ensure all three (3) components are present, and that there is no damage to any of the parts.

**3.5.4. Operation.** Attempt to have the patient clear the block by using maneuvers such as yawning, swallowing, chewing gum, Toynbee Maneuver (swallowing with the nostrils closed), Valsalva

Maneuver, etc. If all these maneuvers fail and pain persists due to ear blockage, attempt to clear the blockage with the Politzer Bag:

3.5.4.1. Place the tip of the Politzer Bag in one nostril (preferably the larger nostril in the case of a deviated septum).

**NOTE:** If the patient's nasal opening is too small for the Politzer Bag tip, remove the tip and insert the tube into the nasal opening. DO NOT insert the tube farther than 3/4 inch. If the rubber tubing is also too large, remove the tubing from the bulb, and use the bulb tip in the nostril. DO NOT insert the tip of the bulb farther than 1/2 to 3/4 inch into the patient's nostril.

3.5.4.2. Seal the nose by gently squeezing it. Have the patient say "RRRRRR" on your command. Squeeze the bulb firmly, while the patient begins to swallow. The sudden increased pressure in the Naso-Pharyngeal Cavity should open the Eustachian Tubes, allowing the pressure in the Middle Ear to equilibrate with the ambient pressure. Repeat as necessary.

3.5.4.3. If the Politzer Bag fails to clear the blockage, and pain persists, ask the aircraft commander to return to a higher altitude if possible until the symptoms disappear, and then descend gradually. Instill Afrin Nasal Spray (If not contra indicated) into the patient's nostrils and have them repeat the maneuvers tried earlier, after a few minutes. Have the patient evaluated by a Flight Surgeon as soon as possible if pain persists, or if the ear block is not relieved. Have all ear block patients evaluated for Otitis Media at their remain over night (RON) stop or at their destination medical treatment facility.

### 3.6. Therapeutic Oxygen Manifold System (TOMS).

**3.6.1. Purpose:** The TOMS is a unique piece of equipment, designed specifically for use on the C-141. System provides an adequate, safe and controlled method for supplying oxygen to litter patients.

**3.6.2. Description:** The TOMS consists of a three-outlet manifold with an adjustable regulator. It attaches to an aircraft oxygen recharger outlet of the troop oxygen system by way of a braided wire high-pressure hose assembly. The high-pressure hose has a fitting which allows for recharging of walk-around bottles during the operation of the system. The manifold enables the administration of measured quantities of oxygen, with proper individual patient control and humidification to as many as three patients simultaneously. TOMS has a maximum O<sub>2</sub> flow of 45 LPM.

3.6.2.1. During operation of the TOMS, the high pressure oxygen from the aircraft system is reduced to the optimum working pressure of 50 pounds per square inch (psi), gauge by a hand operated regulator attached to the manifold.

**WARNING:** Because of possible line pressure fluctuations or flow restrictions, the TOMS WILL NOT be used to provide oxygen to ventilators.

#### 3.6.3. Components:

3.6.3.1. TOMS components consist of the following:

3.6.3.1.1. Three-outlet manifold with regulator and pressure gauge.

3.6.3.1.2. A wire braided high-pressure oxygen hose with tee (recharger) assembly.

3.6.3.1.3. Three low-pressure oxygen hoses.

3.6.3.1.4. Three oxygen flowmeters.

3.6.3.1.5. Three humidifier bottle fastener assemblies.

3.6.3.1.6. One carrying case.

**3.6.4. Pre-Flight:** Check for completeness and serviceability of all component parts. Check the expiration date of the sterile water bottles.

**3.6.5. Operation:** Attach oxygen manifold/regulator/pressure assembly to center litter stanchion pole by inserting ball-lock quick release pins through manifold into Evans seat back attachment points

**NOTE:** In cases where the two quick-release pins cannot be properly engaged in the stanchion pole, engage the upper pin only and use hook and pile fasteners to secure the manifold in place.

3.6.5.1. Rotate pressure control knob fully counter-clockwise.

3.6.5.2. Attach the wire braided high-pressure oxygen hose to the oxygen manifold by coupling the Schrader connectors.

3.6.5.3. Run guide wire braided oxygen hose up the stanchion pole, across to the bulkhead to connect with the recharger hose by coupling the Schrader connections.

3.6.5.4. Activate the aircraft therapeutic oxygen system at the oxygen panel, if it is not already on.

3.6.5.5. The pressure gauge on the manifold assembly should read 50 PSI. If the gauge does not read 50 PSI, pressure can be increased/decreased by:

3.6.5.5.1. Releasing the lock ring at the adjustment knob (pull to unlock).

3.6.5.5.2. Turning adjustment knob until 50 PSI is read on the gauge.

3.6.5.5.3. Re-engage locking ring (push to lock).

**NOTE:** The TOMS should be placed forward on the stanchion pole so AECMs can check the gauge easily.

**WARNING:** Pressure to the flowmeter should never exceed 55 psi.

**CAUTION:** The gauge should be checked periodically to ensure that 50 PSI is being maintained. If gauge should read other than 50 PSI, re-adjust as outlined above.

3.6.5.6. Assemble the flowmeters/clamp assemblies to the humidifier/nebulizer bottles and secure in patient area.

3.6.5.7. Connect green hoses to the oxygen outlets on the manifold assembly and purge hoses prior to connecting to flowmeters.

**WARNING:** Aircraft oxygen supply is approximately 300 psi. Hold the high-pressure hose "T" assembly when connecting/disconnecting the high pressure hose to prevent whiplash injury.

3.6.5.8. Adjust the oxygen flow at the humidifier flowmeter to the desired flow rate.

3.6.5.9. Monitor pressure gauge to ensure 50 PSI is maintained.

**NOTE:** The capability to recharge the portable walkaround is provided at the wire braided oxygen hose.

### **3.6.6. Disassembly and Storage:**

3.6.6.1. Disconnect the high-pressure hose from aircraft recharger outlet.

- 3.6.6.2. Disconnect high pressure hose from regulator and replace dust caps.
- 3.6.6.3. Disconnect low-pressure hose from manifold and screw ends together to prevent dust from entering hoses.
- 3.6.6.4. Remove manifold/regulator assembly and replace dust covers.
- 3.6.6.5. Remove flowmeter/clamp assemblies.
- 3.6.6.6. Place all components in carrying case noting any missing pieces or broken equipment.

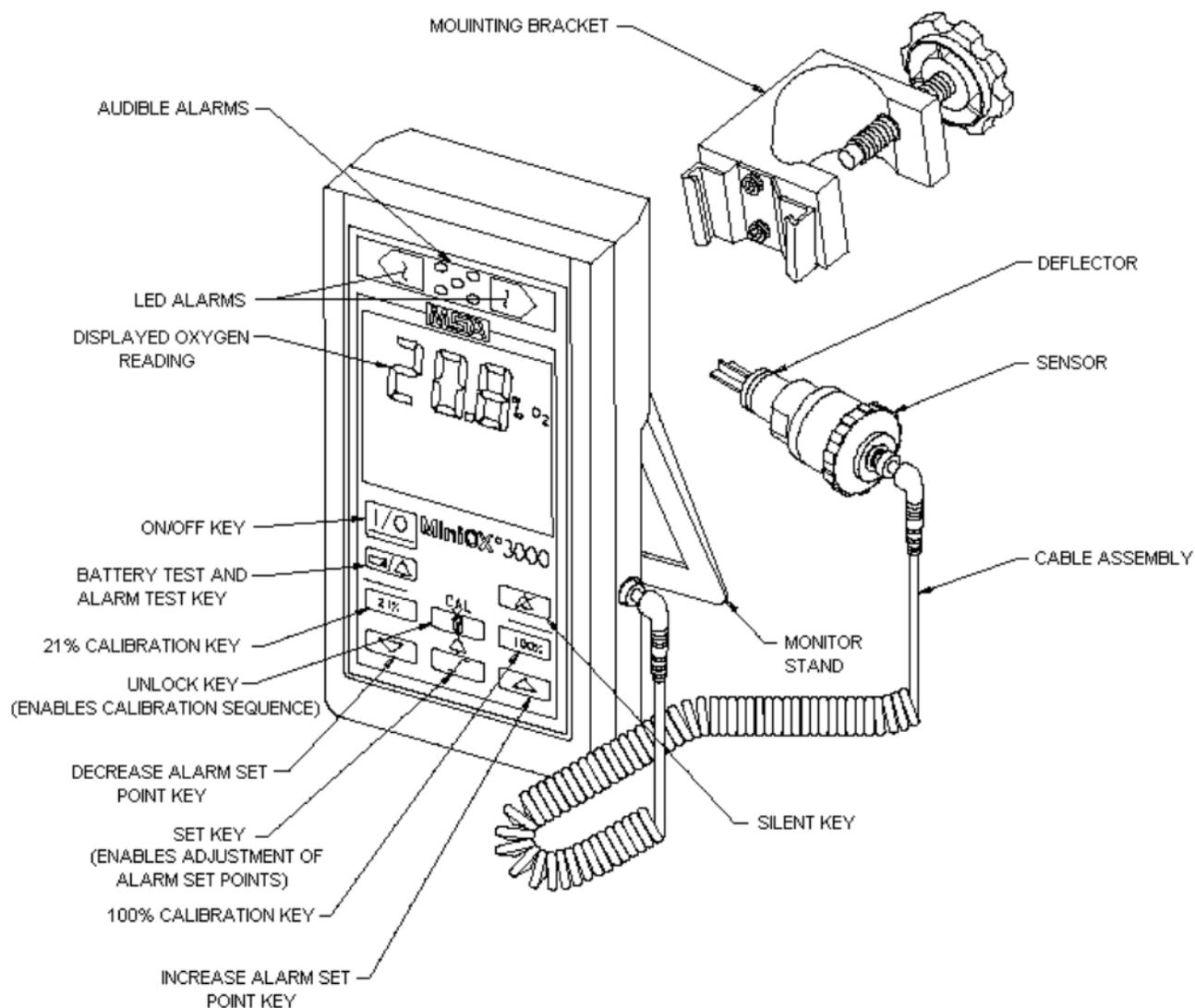
### **3.7. Oxygen Analyzer -MiniOX 3000 Oxygen Monitor.**

3.7.1. Purpose. The MiniOX 3000 Oxygen Monitor provides continuous, direct monitoring of oxygen mixtures in a variety of applications, including: Respiratory therapy (e.g., respirators, ventilators, pediatric incubators), anesthesiology, and oxygen therapy (oxygen tents).

#### **3.7.2. Description.**

3.7.2.1. Battery-operated and microprocessor-controlled, the MiniOX 3000 Oxygen Monitor measures oxygen concentrations in the 0% to 100% range. The monitor's performance features ensure reliable and accurate oxygen measurement. These features include: calibration, high and low oxygen concentration alarms, low and depleted battery alarms, oxygen sensor indicator, automatic error detection, battery test, oxygen alarm test.

Figure 3.5. MiniOX 3000 and Accessories – Front View



3.7.2.2. The MiniOX 3000 consists of:

- 3.7.2.2.1. MiniOX 3000 monitor.
- 3.7.2.2.2. Oxygen Sensor and deflector.
- 3.7.2.2.3. 10-foot coiled cable.
- 3.7.2.2.4. Tee adapter.
- 3.7.2.2.5. Sensor retaining strap.
- 3.7.2.2.6. 9-volt alkaline battery.
- 3.7.2.2.7. Carrying case.
- 3.7.2.2.8. MiniOX 3000 Operation Manual.

3.7.2.3. The calibration function allows calibration of the device against room air (Defined as oxygen concentration of 20.8%) or 100% O<sub>2</sub>.

3.7.2.4. Audible and visual alarms alert the operator when monitor calibration is required. High and low oxygen concentration alarms may be set in the ranges of: 15% to 100% (high alarm) and 16% to 99% (low alarm) or the default high/low settings may be used (50% and 18%, respectively.)

3.7.2.5. The MiniOX 3000 Oxygen Monitor has audible and visual alarms that activate when oxygen concentrations exceed preset low or high alarm settings. Default settings are 18% and 50% respectively; however, the operator may select alarm levels between 15% and 100%.

3.7.2.5.1. When the MiniOX 3000 unit detects an oxygen concentration that exceeds the preset alarm limit: the red LED for that alarm flashes, an audible alarm activates, and the measured concentration appears in the display.

3.7.2.5.2. The operator can silence the audible alarm for three 30-second intervals for a total of 90 seconds; however, the visual alarm continues to flash. At the end of the silence period, the audible alarm reactivates if the alarm condition is not corrected.

**NOTE:** An audible and visual alarm accompanies any alarm condition.

**NOTE:** The audible alarm may not be heard in high noise environments. Visually monitor unit during flight.

3.7.2.6. The MiniOx 3000 features a two-stage alarm that warns of depleted and expired battery voltage.

3.7.2.6.1. The first alarm alerts the operator that the monitor has approximately six hours of operating time remaining; a warning message appears in the display, with an audible alarm that sounds at 30-second intervals.

3.7.2.6.2. If the operator does not replace the battery after this alarm, a second low battery alarm activates when the battery is no longer able to support monitoring. The monitor displays a warning message and activates an audible and visual alarm.

3.7.2.7. Audible and visual alarms activate when oxygen concentrations: fall below the preset (or default) low alarm setting or rise above the preset (or default) high alarm setting.

3.7.2.8. The MiniOX 3000 Oxygen Monitor: detects low and depleted battery conditions, activates audible and visual alarms for sensor disconnection or malfunction, and various internal operating errors.

3.7.2.9. The MiniOX 3000 Oxygen Monitor conducts self-checks: at power up (battery installation), at turn-on, and during operation.

3.7.2.10. The monitor has two operator-initiated test functions: the Alarm Test verifies the operation of the high and low oxygen level alarms, the Battery Test assesses the relative remaining battery life.

3.7.2.11. The MiniOX 3000 Oxygen Monitor consists of two components: the instrument and the oxygen sensor.

3.7.2.11.1. The front of the hand-held instrument features: a touch-sensitive keypad, a liquid crystal display (LCD) that shows: monitor status, continuous oxygen concentration, preset alarm levels, two red light emitting diodes (LEDs) that serve as visual alarms.

3.7.2.11.2. The back of the instrument case features: a bail bar to allow the instrument to “stand” on a horizontal surface during monitoring operations and a plastic wedge that slides into an optional bracket for mounting the instrument on a horizontal or vertical pole.

3.7.2.12. Connected to the instrument by a coiled cable, the galvanic oxygen sensor consists of a deflector assembly and a plastic housing containing two electrodes. A coiled cable connects the sensor to the instrument. Plugs at each end of the cable snap into jacks (one located in the sensor housing and one located in the instrument) and are held securely in place by twist collars.

**3.7.3. Power Source.** One standard 9-volt alkaline battery is housed in the back of the monitor.

#### **3.7.4. Pre-flight.**

**NOTE:** This will be done prior to scheduled takeoff and can be done in the Medical Equipment Section.

3.7.4.1. Check the calibration and inspection sticker for currency. Inspect the unit and its components for any signs of damage. Ensure all components are present (refer to [3.7.2.](#)).

3.7.4.2. Attach the sensor to the coiled cable. Firmly press the connector until it snaps into place; tighten the twist collar. Insert the opposite end of the coiled cable into the jack on the side panel of the instrument; tighten the twist collar. Insert the gasket into the open end of the deflector, ensuring that the gasket is properly seated within the deflector. Gently screw the deflector onto the sensor.

**NOTE:** DO NOT handle the sensor while performing calibrations. Body heat can cause the sensor’s thermistor to change disproportionately to the change in gas sample temperature at the sensing electrode. This may produce some error until thermal equilibrium is restored.

3.7.4.3. The MiniOX 3000, Monitor must be calibrated:

3.7.4.3.1. Daily, while in operation.

3.7.4.3.2. Each time the monitor is turned ON.

3.7.4.3.3. Following sensor disconnection/ reconnection.

3.7.4.3.4. When environmental conditions (temperature, pressure and humidity) change.

3.7.4.3.5. Before using the monitor at the final cruising cabin altitude.

3.7.4.4. To Calibrate in Room Air: Press I/O to turn ON the instrument. “CAL” flashes in the display. Press 21%. The following appears on the display: “CAL”, “LOCKED”, and “21% Cal.”. Press UNLOCK key. The following will be displayed: “CAL”, “21% CAL”, and a 10-segment bar graph that “counts down” two seconds per bar for 20 seconds.

3.7.4.4.1. After 20 seconds, the calibration process is complete. The device: displays 20.8% +/- 2% O<sub>2</sub> (18.8% to 22.8%), proceeds to the monitoring mode, and displays the current oxygen concentration as %O<sub>2</sub>.

3.7.4.5. To Calibrate at 100 O<sub>2</sub>%:

3.7.4.5.1. Calibrate in room air (See [3.7.4.4.](#) Calibrate in Room Air). Expose the sensor to 100% oxygen, via T-adaptor with O<sub>2</sub> at 4Lpm, and allow the readings to stabilize prior to initiating the calibration. “CAL” flashes in the display. Press 100%. The following appears on the display: “CAL”, “LOCKED” and “100% Cal.”. Press UNLOCK. The following appears on

the display: “CAL”, “100% Cal”, and a 10-segment bar graph that “counts down” two seconds per bar for 20 seconds.

3.7.4.5.2. After 20 seconds, the calibration process is complete; the device displays: 100% +0/-2%(98% to 100%) proceeds to the monitoring mode and displays the current oxygen concentration as %O<sub>2</sub>.

**NOTE:** When calibrating the monitor at altitude the cabin pressure must remain at a constant level for at least 2-3 minutes before calibration can be accomplished. If cabin altitude changes the MiniOx 3000 must be recalibrated at that pressure.

**NOTE:** The MiniOX 3000 Oxygen Monitor has a five-second “time out” following keypad functions. If you do not press UNLOCK within five seconds, the instrument returns to the flashing “CAL” mode.

**NOTE:** During calibration if “CAL ERR” flashes in the display, visual, audible alarms activate and then “CAL” flashes, turn OFF the instrument and repeat calibration procedure. When recalibrating, be sure to select the calibration value and use the corresponding calibration gas. If “CAL ERR” reoccurs, it may be necessary to replace the sensor.

**NOTE:** During operation if “CAL” appears on the display, you must recalibrate the monitor. If “CAL” displays following proper recalibration, it may be necessary to replace the sensor.

### 3.7.5. Operation.

#### 3.7.5.1. Installing the sensor in a breathing circuit.

3.7.5.1.1. Needed components: MiniOX 3000, attached sensor (with deflector), Tee adapter, and retaining strap.

3.7.5.1.2. Install the tee adapter into the breathing circuit upstream from the humidifier. Make sure that the side port of the tee adapter is facing upward. Remove the coiled cable from the sensor. Firmly insert the sensor (with deflector) into the tee adaptor with the deflector pointing downward to prevent moisture from condensing onto the sensor membrane.

**NOTE:** Ensure that the sensor is placed upstream of the humidifier and the sensor is mounted pointing down to prevent moisture from draining onto the sensor membrane. If moisture is allowed onto the membrane it will result in a lower oxygen concentration reading and an increased response time.

**WARNING:** To ensure accurate operation, a tight fit must exist between the sensor and “T” adapter. The sensor must be mounted with the deflector pointing downward, upstream from a humidified source.

#### 3.7.5.2. Setting the Alarms.

3.7.5.2.1. To set the Low Alarm: Press SET once. The following appears on the display: “AL” and up/down arrows. Using the arrow keys, scroll up or down to the desired Low Alarm set point (15% to 99%). The MiniOX 3000 Oxygen Monitor “locks” this value. After five seconds the monitor: beeps once, automatically proceeds to the Monitoring Mode.

**NOTE:** The Low Alarm CANNOT be disabled or set: below 15%, above 99%, or higher than or equal to the High Alarm setting.

3.7.5.2.2. To set the High Alarm: press SET twice. The following appears on the display: “AL” and up/down arrows. Using the arrows keys, scroll up or down to the desired High Alarm set point (16% to 100%). The MiniOX 3000 Oxygen Monitor “locks” this value. After

five seconds, the monitor: beeps once and automatically proceeds to Monitoring Mode (Press SET once after selecting set point to manually proceed to Monitoring Mode).

**NOTE:** The High Alarm value: CANNOT be set equal to, or less than, the Low Alarm value; CAN be disabled by increasing the alarm set point beyond 100% until “—“ display.

### 3.7.6. In-Flight Calibration.

3.7.6.1. The MiniOX 3000 must be recalibrated prior to use at cruising altitude if the monitor has been used on the ground or if the unit is initially being used in flight. To calibrate the unit in-flight used the standard procedures of calibrations to 21% and 100% ( see 3.7.4.4.- 3.7.4.5.).

**NOTE:** The sensor responds to partial pressure (not percentage) of oxygen. Changes in barometric pressure change the reading, even if the percent of oxygen in the sample remains constant. Therefore, to eliminate error due to pressure changes, the instrument must be calibrated at the pressure in which it is used.

**NOTE:** Accuracy of the unit during ascent and descent are potentially inaccurate. It will take several minutes at a stable cabin pressure to ensure accurate readings and calibration.

**WARNING:** DO NOT USE THE MiniOX III ALTITUDE POST-CALIBRATION CONVERSION CHART in AFI 41-309, Table 3.3. for this piece of equipment.

### 3.7.7. Disassembly and Storage.

#### 3.7.7.1. Sensor Replacement.

3.7.7.1.1. Replace the sensor when room air reading is greater than 20.8% +/- 2% (18.8% to 22.8%) in Two-Point Linearity Check (See Manual), the MiniOX 3000 Oxygen Monitor will not calibrate, or “Sensor” and “OFF” display and audible and visual alarms persist when sensor and cable connections are correct and cable is viable.

3.7.7.1.2. To replace sensor: Verify that the monitor is turned OFF. The display should be blank. Disconnect the expired sensor from the coiled cable. Attach a new sensor to the coiled cable and firmly press the connector until the sensor snaps into place. Tighten the twist collar. Recalibrate the monitor.

**WARNING:** The sensor is a sealed unit containing potassium hydroxide. If the unit should develop a leak, discard it immediately. The sensor contains a caustic material and must be disposed of in accordance with Federal, State and Local regulations. Should contact occur with skin or clothing, rinse area immediately with large quantities of water. In case of eye contact, immediately flush eyes with water for at least 15 minutes, holding eyes open. Contact a physician. Can be fatal if swallowed.

**NOTE:** The sensors are warranted by the manufacture for useful life of 12 months. The sensor life may be useful up to 18-24 months. This time starts at manufacturing. The manufacturing date appears on the side shaft of the sensor as a two-digit identifier. The first digit represents a month (A=JAN, B=FEB, C=MAR, D=APR, E=MAY, F=JUN, G=JUL, H=AUG, I=SEP, J=OCT, K=NOV, L=DEC). The second digit the year of manufacture ( 0=2000; 1=2001, 2=2002, 3=2003).

**NOTE:** When the MiniOX 3000 is unable to be calibrated, or gives erratic readings, the sensor must be replaced.

3.7.7.1.3. Storage of the unit: Disconnect the sensor and coiled cord, turn unit off. Replace parts to their respective spaces in the padded foam case.

3.7.7.1.4. Cleaning: The MiniOX 3000 monitor and sensor may be cleaned by wiping it with a mild detergent, ethanol, or *Cidex*. DO NOT STERILIZE.

**CAUTION:** Never autoclave, immerse, or expose the MiniOX 3000 Oxygen Monitor (including sensor) to high temperatures (>70C). Never expose the device to pressure, irradiation, vacuum, steam, or chemicals (other than alcohol or mild cleaning agents).

### **3.7.8. Battery Replacement.**

3.7.8.1. Verify that the monitor is turned OFF. The display should be blank. Pull out the support stand from the back of the case. Unscrew the two screws on the battery cover in back of the instrument and remove cover. Remove the battery from the case and unsnap the battery from the battery holder.

**NOTE:** To ensure proper start-up, wait at least 45 seconds before connecting the fresh battery to the battery connector. Snap the terminal of the new 9-volt battery into the battery holder. Install the battery cover and screw into place. Make sure that the battery cover is properly seated and flat on the back of the MiniOX 3000 Oxygen Monitor case. Recalibrate the monitor. Reset the low and high alarms, if desired.

**NOTE:** To maximize battery life, press I/O to turn OFF the MiniOX 3000 unit when not monitoring. In order to retain alarm settings, do not remove battery.

## Chapter 4

### CARDIAC USER'S GUIDE

#### 4.1. Cardio Sonic Acoustic Amplifier.

**4.1.1. Purpose.** The Cardio Sonic Acoustic Amplifier provides a means of auscultating blood pressures, breath sounds, and heartbeat activity through clothing, and in high noise environments.

**4.1.2. Description.** The Cardio Sonic Acoustic Amplifier consists of a transducer connected to binaural tubes by a flexible transmission tube. The transducer has a diaphragm that is encircled by a sound shield, and a guard which snaps-on to the sound shield to protect the diaphragm. The binaural tubes are adjustable by rotating them in the transmission tube, and have ear seals at their ends.

**4.1.3. Pre-flight.** Inspect the acoustic amplifier for any damage or missing parts, ensuring that the diaphragm is not cracked or punctured, and that the instrument is clean.

#### 4.1.4. Operation.

4.1.4.1. Snap the transducer guard off the sound shield and slide it away from the transducer, along the transmission tube. Angulate the binaural tubes approximately 15 degrees forward (toward the bridge of the nose) by rotating each tube where it enters the transmission tube. Place the ear seals at the opening of the ear canals and ensure a tight seat between the seals and the canals. The Cardio Sonic Acoustic Amplifier requires an airtight seal at the ears to function properly.

4.1.4.2. Place the transducer diaphragm gently against the patient using light contact pressure. Increase pressure as necessary until the sounds are heard. For most conditions, proper pressure is attained when the sound shield contacts the skin or clothing. If the transducer is forced too firmly against the patient, the audible signal may be reduced.

**NOTE:** Regular practice with the acoustic amplifier is required to attain and maintain proficiency with it.

4.1.4.3. When taking blood pressure DO NOT place the transducer under the blood pressure cuff. Place the transducer below the cuff, where contact pressure can be controlled. Replace the transducer guard onto the sound shield when use of the acoustic amplifier is completed.

4.1.4.4. If the transducer diaphragm becomes dented it may be repaired: Unscrew the sound shield from the transducer, remove the diaphragm and reform it to its original shape. Replace the diaphragm and screw the sound shield back onto the transducer, keeping the diaphragm centered. Test proper tightening of the diaphragm by pressing laterally on the diaphragm. There should not be any movement of the diaphragm.

#### 4.2. Defibrillator, Cardioscope Lifepak 10 Monitor/Defibrillator & Battery Support System.

**4.2.1. Purpose.** The LIFEPAK monitor/defibrillator provides capability for monitoring, recording and defibrillation inflight for patients with compromised cardiac status. The Lifepak 10 monitor/defibrillator and battery support system must be carried on all patient missions.

**4.2.2. Description.** The LIFEPAK 10 monitor/defibrillator is a rugged, compact, portable instrument which offers electrocardiogram (ECG) monitoring and direct current (DC) defibrillation. The monitor may capture ECG signals through a shielded three-lead cable, the defibrillator paddles, or the

FAST-PATCH electrodes, and the ECG wave forms are displayed on a cathode ray tube at the front left of the instrument, or a thermal strip chart recorder. Push buttons on the main control panel at the front left of the instrument control the operation of the monitor, cathode ray tube, and recorder. The defibrillator controls are located on the paddles located at the front right of the instrument. If the instrument is charged, but the energy is not discharged through the paddles within 60 seconds, the energy will be automatically discharged internally. The LIFEPAK 10 monitor/defibrillator may be stored and carried in a soft case that has zippered pouches for storing supplies and accessories.

4.2.2.1. LIFEPAK 10 (-47 & -59) with Pacemaker Option.

**Warning:** Do not use pacemaker in flight. It may cause electromagnetic interference with aircraft systems.

### 4.2.3. Components, Controls, and Indicators.

4.2.3.1. Power Panel. The power switch is located on the top of the instrument just left of the paddles. It is a five (5) position switch with one (1) OFF position, three (3) battery positions, (one for each battery with a corresponding LED for each battery), and an AUX position for operating the LIFEPAK 10 (-59) from auxiliary power.

4.2.3.2. Paddles. The paddles are located at the front right of the instrument and are labeled STERNUM and APEX. Controls for defibrillation and recording are found on the paddles. The STERNUM paddle has a rotary control to select defibrillation energy levels, and a discharge push button. The APEX paddle has a defibrillator charge switch, a charge indicator light, a record switch toggles the recorder on and off, and a discharge push button.

4.2.3.3. Main Control Panel. The main control panel is located at the front left of the instrument. Eight (8) push buttons are on the main control panel to control the operation of the monitor, cathode ray tube, and recorder. The push buttons are labeled:

4.2.3.3.1. ECG-SIZE.

4.2.3.3.2. QRS VOL.

4.2.3.3.3. CAL.

4.2.3.3.4. Code Summary.

4.2.3.3.5. LEAD Select.

4.2.3.3.6. Record.

4.2.3.3.7. SYNC.

4.2.3.3.8. FREEZE.

4.2.3.4. Displays. The display is located on the front left of the instrument just above the main control panel. The display consists of the cathode ray tube display (cardioscope) on the left, and the status display to the right.

4.2.3.5. Recorder. The ECG recorder is located at the left rear on top of the instrument.

4.2.3.6. Battery Compartment. The battery compartment is located on top of the instrument to the rear, and is designed to contain three (3) batteries.

**CAUTION:** Use only Physio-Control batteries with Physio-Control instruments.

**NOTE:** All battery wells should be filled with batteries prior to use.

4.2.3.7. ECG Connector. The ECG connector is a 6-pin connector located on the forward right side of the instrument.

#### **4.2.4. Battery Support System.**

4.2.4.1. The Battery Support System is a companion instrument to the LIFEPAK 10 monitor/defibrillator, and is used to charge and evaluate the rechargeable FASTPAK batteries. Individual sets of indicators for each battery compartment show the state of the batteries in the compartments. The main components are the battery components, the control panel, and the test load pads.

4.2.4.2. The control panel has three (3) battery charge indicators which show the state of batteries in the battery compartments. Possible displays are faulty, ready, or charge. A digital display on the panel indicates defibrillator energy selected by use of the test load select switches, or defibrillator energy delivered.

#### **4.2.5. Power Source.**

4.2.5.1. The LIFEPAK 10 (-43) monitor/defibrillator will be operated on battery power only. Three (3) rechargeable FASTPAK batteries are installed in the battery compartment, with each battery providing 45 minutes of monitoring, or 25 defibrillator discharges at 360 joules when fully charged. Batteries are charged in the Battery Support System which charges a battery in approximately 70 minutes, and has the capacity to charge three (3) batteries simultaneously. The Battery Support System operates on 120 VAC/50-400 Hertz (Hz) electrical power.

4.2.5.2. The LIFEPAK 10 (-59) will operate on three (3) rechargeable FASTPAK batteries in the same manner as the LIFEPAK 10 (-43) and will also operate on an Auxiliary Power Module when battery power is not required. The Auxiliary power Module operates on 115 VAC/60 Hz only and is capable of slowly charging up to three (3) batteries in 24 hours. Fully charged batteries will provide same capabilities as the LIFEPAK 10 (-43).

**NOTE:** The Auxiliary Power Module will trickle-charge FASTPAK batteries installed in defibrillator/monitor. Auxiliary Power Module will not maintain batteries. Batteries can only be maintained by using the battery support system. Failure to properly maintain batteries may result in possible device shut down during patient care. See operation manual for proper care and operation of FASTPAK batteries.

#### **4.2.6. Pre-flight.**

4.2.6.1. Ensure the inspection/calibration sticker on the LIFEPAK 10 is current, and that both the LIFEPAK 10 monitor/defibrillator and the Battery Support System.

**NOTE:** LIFEPAK 10 (-43) PLACARD – NOTE: THIS UNIT PASSES MIL-STD-461B CAT AIE FOR RADIATED AND CONDUCTED EMISSIONS.

**NOTE:** LIFEPAK 10 (-47 and -59) DOES NOT require a placard.

4.2.6.2. Inspect the LIFEPAK 10 monitor/defibrillator for any signs of physical damage; paddles for pitted electrode pad, cleanliness, integrity of cables and switches, and the recorder for ease of door operation and positive latching.

4.2.6.3. Without batteries installed, cycle the power switch to verify that the knob is not loose and that the switch indexes properly. Turn the switch to off and check all controls for proper operation.

4.2.6.4. Inspect all cables and accessories for damage and/or wear, the Battery Support System for signs of damage such as cracks or broken battery pins in the battery compartments, and inspect the Battery Support System Alternating Current (AC) power cord for any physical damage.

4.2.6.5. Ensure that three (3) batteries are in the LIFEPAK 10 monitor/defibrillator battery compartment, and three (3) batteries are in the Battery Support System for ALL AE missions.

4.2.6.6. Ensure the accessories are stored and taken with the LIFEPAK 10 monitor/defibrillator, and inspect them for damages. Two (2) rolls of ECG recording paper, Patient lead cable, Pediatric electrode pads (silver/silver chloride pads), Adult electrode pads (silver/silver chloride pads), Electrode paste or gel, and pediatric paddle attachments.

4.2.6.7. Switch LIFEPAK 10 monitor/defibrillator on and observe five (5) second self diagnostic test. All indicator lights and all status display messages will illuminate. The service indicator will remain illuminated if a failure is detected in the self test. Have the instrument examined by MERC personnel before further use!

4.2.6.8. When operating the LIFEPAK 10 (-59) with an Auxiliary Power Module, ensure the power module cable is securely plugged into the defibrillator/monitor AUX connector on side of unit.

4.2.6.9. Connect power cord to rear of power module and plug the other end into 115VAC/60Hz power source.

4.2.6.10. Turn power switch, located on back of unit, to the "ON" position. A green power light will illuminate on front of unit.

4.2.6.11. Amber lights, located on front of unit will illuminate when batteries are charging. A fully depleted battery will recharge in 24 hours.

**WARNING:** The Auxiliary Power Module may be connected to the defibrillator monitor (LIFEPAK 10-59) at all times. The Auxiliary Power Module will not over charge batteries.

4.2.6.12. Turn defibrillator/monitor power switch to AUX position to operate from AC power. Observe self diagnostic test.

4.2.6.13. Turn defibrillator/monitor power switch to battery power position to complete preflight procedures.

4.2.6.14. Select LEAD to paddles and gently shake the paddles. This should produce interference on the cardioscope. Place the paddle electrodes together and observe the cardioscope for a flat horizontal line. Ensure an adequate amount of paper is in the recorder by opening recorder door. To open the door, lift up on the forward (slotted) edge and remove the paper roll to inspect it. Replace a paper roll by inserting it into the recorder with the grid facing forward. Pull a short amount of paper out, and close the paper carrier by pulling the rear recorder door forward, and push the forward edge of the front door down until it locks.

**CAUTION:** Use paper designed for thermal array recorders. Use of other types of paper may damage the print head.

4.2.6.15. Defibrillator testing is accomplished by delivering a charge from the defibrillator to the TEST LOAD pads on the Physio-control Battery Support System: Connect the Battery Support System to a 120 VAC/50-400 Hz power source. Select 360 joules by using the TEST LOAD select controls. Position the defibrillator paddles so the APEX paddle is centered on the right TEST LOAD PLATE and the STERNUM paddle is centered on the left TEST LOAD PLATE.

**WARNING:** Paddle surfaces should not come in contact with any other surface of the battery support system.

4.2.6.16. Select 360 joules on the STERNUM paddle rotary switch, then press the charge button on the APEX paddle. The available energy displayed on the STATUS DISPLAY will scroll to verify the selected energy is achieved. 360 joules should be achieved in less than 10 seconds. Push the APEX paddle discharge button only, and verify the unit does not discharge. Push the STERNUM paddle discharge button only, and verify the unit does not discharge. Apply firm pressure to both paddles on the TEST LOAD PADS, press RECORD on the APEX paddle, then press both discharge buttons simultaneously. The delivered energy will be displayed on the Battery Support System, and the recorder will print "Defib @360J". Switch the RECORDER and the LIFEPAK 10 monitor/defibrillator OFF.

**WARNING:** To ensure proper safety precautions are followed, before discharging paddles clear the area around the Battery Support System. This will eliminate the possibility of injury due to arcing or defective equipment.

4.2.6.17. Secure the LIFEPAK 10 monitor/defibrillator and Battery Support System to an equipment litter using aluminum equipment brackets and litter straps. If equipment brackets are not available:

4.2.6.17.1. For each instrument, secure a folded blanket to the equipment litter with two (2) litter straps, then thread a third strap through the blanket securing straps.

4.2.6.17.2. Place the instrument on the blanket and straps, then secure the third strap across the top of the instrument.

4.2.6.17.3. For the Battery Support System, place a fourth strap around the litter and the instrument.

4.2.6.17.4. For the LIFEPAK 10 monitor/defibrillator, place a fourth strap through the carrying handle, thread it underneath the unit, and secure it to the litter.

4.2.6.17.5. Plug the Battery Support System into a 120 VAC/50-400 Hz power source on the aircraft.

**4.2.7. Operation. WARNING:** Do not use in the presence of flammable gas.

4.2.7.1. Monitor.

4.2.7.1.1. ECG monitoring may be done through the external paddles, or through a 3-lead patient cable. To monitor through quick-look paddles, turn on the monitor, select paddles on LEAD SELECT, apply conductive gel to paddles and place paddles firmly on the patient's chest. Place the APEX paddle on the patient's lower left chest, and the STERNUM paddle near the upper sternum of the patient's right chest. Observe the cardioscope to see the patient's rhythm.

**WARNING:** Keep hands and paddles free of gel. Failure to do so may create a shock hazard.

4.2.7.1.2. The 3-LEAD patient cable allows monitoring of LEADS 1, 2, or 3. Use of a patient cable other than the LIFEPAK 10 shielded 3-Lead patient cable may provide less than optimum performance and/or erroneous ECG data.

4.2.7.1.3. Attach the 6-pin patient cable to "ELECTRICALLY ISOLATED ECG" jack on the right side panel of the LIFEPAK 10. Attach electrodes to the lead wires, and apply electrodes to the appropriate sites on the patient.

4.2.7.1.4. Lead placement:

4.2.7.1.4.1. WHITE ("RA") - Right mid clavicular line below the clavicle.

4.2.7.1.4.2. BLACK ("LA") - Left mid clavicular line below the clavicle.

4.2.7.1.4.3. RED ("LL") - Between the 6th and 7th intercostal space on the left mid axillary line.

4.2.7.1.5. Turn power ON, select the appropriate lead, and adjust the "ECG SIZE" if necessary while observing the rhythm on the cardioscope. LIFEPAK 10 monitor/defibrillator will automatically power with an ECG gain of x1. "ECG SIZE" may need to be adjusted if QRS complex is not clearly visible on cardioscope.

4.2.7.1.6. Monitoring Pacemakers. The LIFEPAK 10 monitor/defibrillator will detect the pacer impulse of internally implanted pacemakers and, therefore, will not utilize the pacer impulse for heart rate calculation or synchronization. Large amplitude pacemaker spikes can over-load the QRS complex detector circuitry so that no paced QRS complexes are counted resulting in "blanking" (heart rate displays "--") of the heart rate display. To minimize ECG pick up of the pacemaker impulse when monitoring patients with internal pacemakers, then place the ECG electrodes so that a straight line drawn between the positive electrode and negative electrode intersects a line between the pacemaker generator and the heart at right angles. Electrode placement will not be as critical when the pacemaker is bipolar. If internal pacer pulse artifact continues to disrupt the heart rate display or SYNC function when monitoring with the FAST-PATCH adapter, monitoring with the 3-lead patient cable may improve pacer rejection.

4.2.7.1.7. Recording of the ECG can be accomplished in any lead. Push the record switch on the main control panel, or on the APEX paddle to begin recording. The annotating recorder prints the time, date, ECG lead, ECG size, heart rate, defibrillation/synchronization, and code summary. Updated annotation information is printed every 20 seconds when the recorder is on. Push the record switch a second time to turn the recorder off.

4.2.7.2. Defibrillator.

4.2.7.2.1. Apply conductive gel to paddles then turn the monitor/defibrillator power on.

**WARNING:** To be safely defibrillated, the patient must be positioned so that no part of the body contacts the aircraft floor. A dry woolen or cotton blanket must be placed under the patient's body for electrical insulation. If any part of the patient contacts the floor, the distribution of current may be affected, resulting in the patient receiving less than the programmed amount of defibrillating current and possible skin burns. also, when monitoring electrodes are attached to the patient, the ground electrode possesses a ground potential.

**WARNING:** Keep hands and paddle handles free of gel.

4.2.7.2.2. Select the energy to be delivered with the ENERGY SELECT switch on the STERNUM paddle, and press the CHARGE switch on the APEX paddle. The charge indicator will flash, a climbing tone will be heard, and numbers will "scroll up" in the AVAILABLE ENERGY display until the selected energy is reached. Place STERNUM paddle on the patient's right chest near the upper sternum, and the APEX paddle near the cardiac apex on the lower left chest. Clear all personnel from patient contact, place firm pressure on the paddles and depress both discharge buttons simultaneously. If "ENERGY SELECT" is changed after charge is initiated, the energy display will blank while the energy is being discharged internally (limit internal discharges to no more than 4 per minute). The operator must re-initiate charge by pushing the "CHARGE" switch.

**WARNING:** If the paddle discharge buttons are not pressed within 60 seconds, stored energy will be discharged internally.

**NOTE:** The service indicator light may flash momentarily after the paddle discharge buttons are pushed.

**WARNING:** DO NOT discharge defibrillator paddles into open air, while facing together, or while they are stored in the paddle wells. To internally discharge an unwanted charge, rotate "ENERGY SELECT" or turn the "POWER" switch to the OFF position.

**NOTE:** The defibrillator WILL NOT discharge while the CHARGE INDICATOR is flashing, the energy display is flashing, numbers in the display are scrolling, or while energy display is blanked or indicates zero.

**4.2.8. Setting the Clock.** Hold down the RECORD button on the APEX paddle, and turn POWER on to activate the clock set mode. The number flashing in the heart rate field on the status display is the hour of the 24 hour clock. Press the increase of the "QRS VOL" button to change the hour until the correct hour is displayed (0-24). Press the increase of the ECG SIZE to make the minutes display in the available energy field flash. Press the increase of the "QRS VOL" until the correct minute is displayed (0-59). Press the increase on the "ECG SIZE" until the digits in the heart rate field flash. Press the increase on the "QRS VOL" until the correct month is displayed (0-12). Press the increase on the "ECG SIZE" until the digits in the available energy field flash. Press the increase of the "QRS VOL" until the correct day is displayed (0-31). Press the increase on the "ECG SIZE" until the digits in the heart rate field flash. Press the increase on the "QRS VOL" until the correct year is displayed. The year 2000 will be displayed as 00, 2002 will be displayed as 02, etc. Turn the power off to terminate the clock set mode. Switch on the monitor/defibrillator, and turn on the recorder to verify proper clock setting. The printed strip should verify proper time/date.

**4.2.9. Code Summary Critical Event Record.** Activate the code summary after resuscitation by pushing the "CODE SUMMARY" switch. The recorder will print a full report of the stored information. If power is removed, the code summary will be stored for five minutes then it will be erased.

**4.2.10. Pediatric Paddles.** The Pediatric Paddle attachments fit the standard adult external paddles of the LIFEPAK 10 monitor/defibrillator. They attach to the paddles, so they cover the entire paddle electrode surface. Remove pediatric paddles by pressing down on the rear tabs and sliding off the adult paddle as shown.

**WARNING:** DO NOT use conductive gel or saline pads between the standard paddles and the pediatric paddles. Use conductive gel or saline pads between the pediatric paddle electrodes and the patient.

**WARNING:** DO NOT use surgical lubricant on this device. Deliver energy by depressing the discharge buttons on the standard paddles.

#### **4.2.11. Reconditioning/ Shelf Life Procedures**

4.2.11.1. Reconditioning of the batteries must be accomplished every (3) months. In addition, a shelf life test must also be accomplished every six (6) months. May alternate shelf life test with the battery reconditioning procedure every three (3) months. Refer to manufacture's operating instructions for correct procedures.

### **4.3. Ultrasound Stethoscope Fetal Pulse Monitor - Medasonics Model FP3A.**

**4.3.1. Purpose.** The Medasonics Ultrasound Stethoscope is designed for detection of the fetal heart-beat and peripheral circulation in adults.

**4.3.2. Description.** The Medasonics Ultrasound Stethoscope consists of a monitor unit, and a headset that plugs into an output jack on the monitor. The monitor has a face plate at the narrow end of the instrument, a volume control knob, and two (2) output jacks on the wide end of the instrument. An ON button is mounted on the side of the instrument near the volume control knob. A stethoscope headset with a plug for connecting to either of the output jacks allows hearing the movements picked up by the monitor. The monitor and headset are stored in a vinyl carrying case.

**4.3.3. Power Source.** The power source is a 9-volt Alkaline Battery

**NOTE:** The battery should be replaced AT LEAST once a year, and whenever no sounds are audible and when the volume is up, and an adequate amount of coupling agent is used.

4.3.3.1. Unscrew the battery cover and lift it away from the instrument. Disconnect the battery from the contact clip, and connect a fresh battery. Place the battery with the contact clip toward the face plate (narrow) end of the instrument. Replace the battery cover and tighten the screw, but DO NOT over tighten it.

#### **4.3.4. Pre-flight.**

4.3.4.1. Inspect the monitor and headset for any signs of damage, and ensure that an adequate amount of coupling agent (Ultrasound Gel) is present.

**WARNING:** Do not use alcohol, K-Y jelly, or EKG gel as coupling agents. These substances may damage the monitor face plate. Water or soap solution may be used if a commercial coupling agent (ultrasound gel) is unavailable.

4.3.4.2. Ensure operation of the instrument by listening for blood flow in a Radial Artery: Connect the headset to the monitor and set the volume control to the mid-volume position. Palpate the radial artery and apply coupling agent over the artery. Put the headset on, and adjust it for comfort. Place the monitor face plate in the coupling agent, press and hold the ON button and search for vascular flow by slowly moving the instrument over the artery until the best sounds are heard. Angle the monitor as well, to receive the best signal.

**NOTE:** The monitor will remain on as long as the ON button is depressed, and for a few seconds after it is released.

4.3.4.3. If the sounds are audible, release the ON button, remove the headset and clean the gel from the instrument with a dry tissue. Store components in the carrying case.

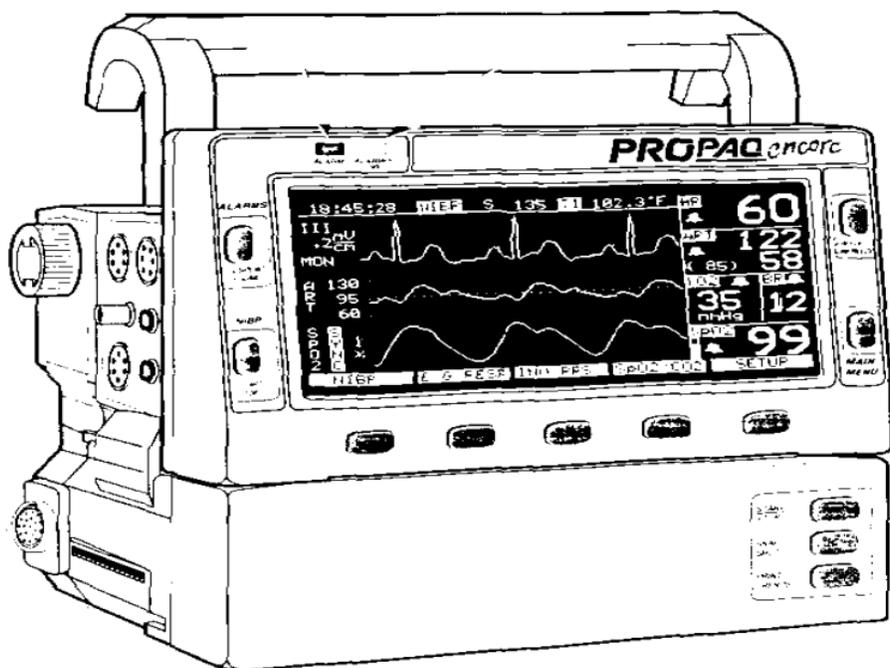
**4.3.5. Operation.** Spread a generous amount of Ultrasound Coupling Agent on the body surface to be examined, or place a small amount on the face plate. Plug the headset into either output jack on the monitor, set the volume control mid-volume and put on the headset. Place the face plate on the area to be examined, and press and hold the ON button. Search for sounds by moving the instrument over the area and trying various angles until the best sounds are obtained. Adjust the volume level as desired. Release the ON button when the examination is complete, and remove the headset. Clean the coupling agent from the monitor with a dry tissue, and from the patient with dry or damp tissues or wash cloths. Replace all components into the carrying case.

**NOTE:** If no sounds are heard when they are expected, check the instrument on a Radial Artery as in the Pre-Flight section. The Medasonic Ultrasound Stethoscope may also be used to monitor peripheral circulation in adults in some instances.

**CAUTION:** DO NOT clean the face plate with alcohol, immerse the monitor in liquid, or autoclave the monitor.

#### 4.4. PROPAQ ENCORE 206EL.

Figure 4.1. The Propaq Encore 206 EL with Expansion Module – Front View.



**4.4.1. Purpose:** The Propaq Encore monitors neonatal, pediatric and adult patient vital signs.

**NOTE:** Pediatric patients must meet minimum weight range of  $\leq 10$  Kg.

**4.4.2. Description:** The Propaq Encore, is durable, lightweight (13.5lbs), and portable patient monitor. Which has the capability to monitor blood pressure, body temperature, pulse oximetry (SpO<sub>2</sub>), expired carbon dioxide level (CO<sub>2</sub>), breath rate and heart rhythms (ECG) and is capable of non-invasive and invasive monitoring.

**4.4.3. Power Source:** 100-120 VAC/50-60 Hz (500mA), 12-28 VDC, or a battery pack. 3-Ampere fuse. The battery is at full capacity after eight (8) hours of recharging if the monitor is off. Typical monitoring time is about 3 hours when all patient channels are active and measurements are taken every 15 minutes and print strips are taken every 15 minutes, or 2 hours at 25° C. Battery voltage is displayed on the initial powerup screen and settings window.

**NOTE:** Flashing “LOW BATT” caution message means that you have 1.5 hours left.

**NOTE:** If the green Battery Charging lamp does not light when the AC adapter is connected, the fuse may be blown.

**4.4.4. Components:**

4.4.4.1. Propaq Encore Monitor with expansion module.

4.4.4.2. ECG cables.

4.4.4.3. Blood Pressure Cuffs, single-tube and connectors.

4.4.4.3.1. Adult (standard)(23-33cm) (reusable).

4.4.4.3.2. Adult (large)(31-40cm) (reusable).

4.4.4.3.3. Adult (thigh)(38-50cm) (reusable).

4.4.4.3.4. Small Adult/Child (17-25cm) (reusable).

4.4.4.3.5. Child (12-19cm) 008-0291-12 (reusable).

4.4.4.3.6. Infant: 008-0291-06 (8-13cm) (reusable).

4.4.4.4. Adult/Pediatric NIBP hose.

4.4.4.5. Infant NIBP hose.

4.4.4.6. Temperature.

4.4.4.6.1. Skin probe.

4.4.4.6.2. Oral probe.

4.4.4.6.3. Rectal probe.

4.4.4.7. SpO<sub>2</sub> Sensor:

4.4.4.7.1. Adult/Pediatric – Finger (reusable).

4.4.4.7.2. Pediatric/Infant – Toe (reusable).

4.4.4.7.3. Extension Cable, Oxygen Sensor.

4.4.4.8. CO<sub>2</sub> Sensor.

4.4.4.9. Battery Charger (100-120 VAC/50-60 Hz).

4.4.4.10. Printer.

4.4.4.11. Protective Case.

#### 4.4.5. NOMENCLATURE:

4.4.5.1. Front.

4.4.5.1.1. Alarm light.

4.4.5.1.1.1. A red light turns on when any alarm limit is violated.

4.4.5.1.2. Alarm(s) off light.

4.4.5.1.2.1. A yellow light turns on when any alarm limit is turned off.

4.4.5.1.3. Alarms suspend/resume button.

4.4.5.1.3.1. Stop the alarm tone.

**NOTE:** Suspending an alarm tone, suspends all alarm monitoring for 90 seconds or until the RESUME button is pressed.

4.4.5.1.4. NIBP start/stop button.

4.4.5.1.4.1. Starts and stops NIBP measurements. The Stop function will automatically vent the cuff.

4.4.5.1.5. Freeze/unfreeze button.

4.4.5.1.5.1. Freeze/Unfreeze: Freezes or “unfreezes” the waveforms. If only one or two waveforms are displayed and you press freeze, the frozen waveform(s) are shown along with an active waveform so you can continue to monitor the patient’s condition.

4.4.5.1.6. Main menu button.

4.4.5.1.6.1. Takes you back to the main menu.

4.4.5.1.7. Display window.

4.4.5.1.7.1. Either liquid crystal display (LCD) or electroluminescent (EL).

4.4.5.1.8. Buttons under the display window.

4.4.5.1.8.1. Changes functions according to the display window above each specific button.

4.4.5.2. Right side.

4.4.5.2.1. Monitor button.

4.4.5.2.1.1. Turns on/off.

4.4.5.2.2. Fuse.

4.4.5.2.2.1. 3 amp, slow blow fuse used to protect form power surges.

**NOTE:** Only replaced by a qualified service personal.

4.4.5.2.3. Power adapter (12-28v, 3mA)

4.4.5.2.3.1. 100-120VAC/ 50-60 Hz

4.4.5.2.4. Battery Charging Light. Green light indicates a power source is connected (AC or DC). Battery will continue to charge even though the monitor is turned off as long as an external power source is connected.

4.4.5.2.5. Defib synchro.

4.4.5.2.5.1. Connects and provides signal transmission to a LIFEPAK 5 or 6.

4.4.5.2.6. EKG x 1000.

4.4.5.2.6.1. Speaker.

4.4.5.3. Left side.

4.4.5.3.1. SpO2 Connector.

4.4.5.3.1.1. Nellcor SpO2 cable is connected.

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

4.4.5.3.2. INV, BP P1 Connector.

4.4.5.3.2.1. Measures arterial, pulmonary artery, central venous and intracranial pressures. Range is from -30 to 300mmHg.

4.4.5.3.3. ECG/EKG Connector.

4.4.5.3.3.1. Three lead electrodes.

4.4.5.3.4. NIBP PSNI Connector.

4.4.5.3.4.1. Single cuff hose is connected.

**WARNING:** Cuff pressures could injure neonates. Do not use on neonates.

4.4.5.3.5. Temperature Connectors.

4.4.5.3.5.1. Connect esophageal, rectal, needle and skin probes.

4.4.5.3.6. INV, BP P2 Connector.

4.4.5.3.6.1. Measures arterial, pulmonary artery, central venous and intracranial pressures. Range is from -30 to 300mmHg.

4.4.5.3.7. Printer.

#### **4.4.6. Alarm Tones:**

4.4.6.1. A steady, high-pitched alarm tone sounds whenever a limit is violated on most patient channels.

4.4.6.2. The tone for the SpO2 alarms is lower in frequency.

4.4.6.3. The tone for the Apnea alarm is one second on, one second off.

4.4.6.4. The alarm tone continues until:

4.4.6.4.1. The patient condition changes and no longer exceeds the limit.

4.4.6.4.2. You suspend the alarm tone by pressing the Suspend button.

4.4.6.4.3. You adjust the alarm limit so the vital sign does not exceed it.

**NOTE:** The life-threatening alarms cannot be turned off (i.e. the apnea alarm).

**WARNING:** Before you use on a new patient, always turn off for a few seconds. This clears the prior patient's trend values, alarm limit settings, and NIBP cuff inflation target.

#### **4.4.7. Alarm Status Window:**

4.4.7.1. Bells only appear when at least one limit is turned on and the vital sign parameter is being monitored.

4.4.7.2. The full bell shows you that all alarm limits are turned on.

4.4.7.3. The half bell indicates that at least one alarm limit is turned off.

4.4.7.4. The absence of a bell shows that no alarm limits are turned on.

#### **4.4.8. Alarms Menu:**

4.4.8.1. Located below the status window.

4.4.8.2. Lets you access other alarms functions to individually set alarm limits or automatically set them.

#### **4.4.9. Tone Volume:**

4.4.9.1. Volume can be adjusted to one of three volumes.

4.4.9.2. To adjust, press Setup, then more, then Next (to select Alarm Tone), and then the Change button to change the setting.

4.4.9.3. To suspend the alarm tone temporarily using the Suspend button.

4.4.9.3.1. The tone is suspended for 90 seconds.

4.4.9.3.2. You can "unsuspend" by pressing the Resume button in the Alarms Menu or the Resume key to the left of the screen, except for the NIBP.

**WARNING:** Suspending an alarm suspends ALL alarm tones for 90 seconds or until the Resume button is pressed.

**NOTE:** If you want to turn all limits on or off, without changing their values, press ALL ALRM in the Alarms Menu. The alarm status window lets you know when all alarms are on or off by the displayed bells.

#### **4.4.10. Changing Individual Limits:**

4.4.10.1. From the Main Menu, press Setup > Alarms.

4.4.10.2. Press Limits to display the alarm limits window and the Limits Menu.

4.4.10.3. Press Next Page to change to the desired alarm limit window.

4.4.10.4. Press the Next button to move the cursor.

4.4.10.5. Press Up or Down, or On/Off to set the limit to the desired limit value.

4.4.10.6. When the limit is set, select the next limit with the Next button. Or, to select another vital sign, press Next Page.

#### 4.4.11. Equipment alerts:

4.4.11.1. If an equipment alert condition is detected, a high-pitched alarm tone will sound for one second at five-second intervals. This alert tone will repeat until you respond to the equipment alert by pressing any button located at the bottom of the screen or until the equipment condition is corrected.

4.4.11.2. The equipment alert window will also appear on the display identifying the condition.

4.4.11.3. If the equipment condition also caused a patient alarm, you will need to first suspend the alarm tone by pressing Suspend, then take the required action.

#### 4.4.12. Preflight:

4.4.12.1. Ensure currency of inspection/calibration sticker decal on unit and that all component parts are complete and in serviceable condition.

4.4.12.2. While unplugged from external power, turn-on unit by depressing the ON/OFF button located on top right side of panel; the “Startup Screens” will appear in following order.

4.4.12.2.1. “Startup window ” displays information about the Propaq Encore and the monitor runs a diagnostic test to ensure proper functioning. The internal battery indicator must be adequately charged to  $\geq 7.8V$  (Volts) during preflight check.

**Table 4.1. Battery Voltage Effects on Operation, based on full EL configuration.**

Battery Voltage	Monitor Functioning and Messages	Approximate Operating Time at 25° C
$\geq 7.8V$	Monitor which is fully functional and displaying no error messages	4.5 hrs
$< 7.8V$	Flashing LOW BATT message	1.5 hrs
$< 7.6V$	LOW BATT, NIBP DISABLED, PRINTER DISABLED Equipment alerts; NIBP and Printer are disabled. NOTE: If NIBP measurement or print-out is in progress it will continue until voltage falls below 7.3V.	45 mins
$< 7.4V$	VERY LOW BATT, NIBP DISABLED, PRINTER DISABLED Equipment Alerts	15 mins
$< 7.3V$	VERY LOW BATT, NIBP DISABLED, PRINTER DISABLED, CO2 HEATER DISABLED Equipment Alerts	5 mins
$= 7.0V$	Unit Shutdown	

4.4.12.2.2. A few seconds later, the top two lines of the screen are replaced with text indicating the current patient mode (Adult, pediatric, or neonatal).

**WARNING:** The factory default setting is Adult Mode.

**NOTE:** If the patient Mode is changed, alarms will change to default for that Mode.

4.4.12.3. Ensure the battery is properly charging. Plug in unit AC power cord, to three-prong male adapter end into the electrical port next to the green battery LED on the right side of the unit and lock in place.

4.4.12.3.1. Plug in the gray power cord into the “Universal Power Adapter” and the other end into approved 100-120VAC/50-60 Hz power source. Depress On switch located on Universal Power Adapter “Green battery LED charging light will illuminate on Monitor and Universal Power Adapter.

**NOTE:** Internal battery will recharge while plugged-in to FULL over 8-12 hours if monitor is On, and 6-8 hours with monitor Off.

4.4.12.4. Ensure following accessories are in the carrying case and that the case is in good repair:

4.4.12.4.1. Blood pressure cuffs: Adult standard, large, thigh, Small adult/Child, Child, Infant, and Adult/Pediatric NIBP hose, Infant NIBP hose.

4.4.12.4.2. ECG Cable 3 or 5 lead; 6ea Adult and Pediatric electrode pads (silver or silver chloride pads).

4.4.12.4.3. SpO<sub>2</sub> Sensors: Adult/Pediatric, one Finger Clip-on type and Pediatric/Infant, Wrap around type and Sensor Extension Cable.

4.4.12.4.4. Temperature: Oral, Skin and Rectal probes.

4.4.12.4.5. Additional features may include an Expansion Module, with the following capabilities:

4.4.12.4.5.1. Printer; requires additional roll of paper.

4.4.12.4.5.2. Mainstream Capnography; requires CO<sub>2</sub> sensor cable and airway adapters.

**NOTE:** The CO<sub>2</sub> adapters may be gas sterilized for reuse.

#### **4.4.13. Operating Instructions:**

4.4.13.1. Monitor Setup.

4.4.13.1.1. Statscale: automatically readjusts all waveform scales.

4.4.13.1.2. Alarms: allows access to the Alarm Menu.

4.4.13.1.3. Wave Sel: allows you to turn on and off desired waveforms or NIBP numerics for display.

4.4.13.1.4. Trends: allows access to the Trend settings and display.

4.4.13.1.5. More: this displays the next setup menu and a status window.

4.4.13.1.6. Next: selects the new setting in the status window.

4.4.13.1.7. Change: changes the currently selected display setting.

4.4.13.1.8. Printer: allows access to the Printer Menu.

4.4.13.2. Printer functions.

4.4.13.2.1. Press Setup > More > Printer.

- 4.4.13.2.2. Next: selects the next setting in the status window.
- 4.4.13.2.3. Change: changes the currently selected display setting.
- 4.4.13.2.4. PR Trend: prints all trends turned on in the Printer Trend Select Window.
- 4.4.13.2.5. More: pressing the More buttons displays another menu and status window.
- 4.4.13.2.6. Prev Menu: returns you to the previous menu.
- 4.4.13.2.7. The front panel of the printer lets you control the basic printer functions.

#### **4.4.14. ECG Monitoring:**

**NOTE:** Monitor will automatically determine if only three lead wires are connected, and will automatically reduce the number of selectable leads to three (I, II, III).

**WARNING:** Use of ECG cables with loose or faulty detachable lead wires may cause erratic behavior of the ECG waveform, SpO<sub>2</sub>, C-Lock, and NIBP due to intermittent ECG lead wire connections.

- 4.4.14.1. Inspect the ECG cable for wear, breakage, or fraying. Replace the cable if it shows signs of any of these. Plug the ECG cable into the ECG connector on the Propaq's left side panel.
- 4.4.14.2. If the monitor is off, press the OFF/ON switch to turn it on.
- 4.4.14.3. Select the patient mode appropriate for the patient (adult, pediatric, neonatal).
- 4.4.14.4. Setting up the ECG channel:
  - 4.4.14.4.1. Press ECG to set the selections: ECG Size and ECG Lead.
  - 4.4.14.4.2. The More buttons displays the second ECG menu and a status window with selections for HR/PR Tone, Pacer Display, and ECG Bandwidth.

**NOTE:** If the patient has a pacemaker, you may want to turn on the Pacer indicator function. On the Pacer Display, vertical dashed lines indicate each time a pacemaker signal is detected when the Propaq Encore Pacer function is turned on. If the pacemaker contains sufficient energy, a "spike" will be produced. If the Pacer function is turned off, only the pacemaker spike is displayed.

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

#### **4.4.15. Noninvasive blood pressure (NIBP):**

**NOTE:** Neonatal Mode: use on infants up to about 44 weeks gestational age. Pediatric Mode: use on larger infants and small children up to about 9 years old. Adult Mode: full range of patient numerics and cuff pressures but limits the cuff sizes available to the standard child cuff and larger.

**WARNING:** Verify patient mode. Incorrect patient mode may result in inaccurate heart rates and inappropriate alarm settings.

**WARNING:** The following can adversely affect accurate measurement determination. Patients exhibiting cardiac arrhythmias, sudden changes in blood pressure, convulsions, shivering or other body motions.

People or objects bumping against the cuff, vibration, very weak pulses due to conditions; such as shock, if selected cuff size is too small or a cuff is too loosely applied (high readings may occur).

**WARNING:** The Propaq Encore monitor does not have automated arrhythmia analysis. Therefore, some ventricular tachycardias and ventricular fibrillation may not be interpreted correctly and may display an inaccurate heart rate.

4.4.15.1. Press NIBP button to display the status window and menu.

4.4.15.2. Start/Stop: starts and stops NIBP measurements. Any time the monitor is taking a non-invasive pressure measurement, the Start button changes to stop so you can stop the measurement in progress. Pressing Stop will automatically vent the cuff.

4.4.15.3. Auto/Man: This button switches the mode between Automatic and Manual Mode. The Manual Mode is the default unless you change it by reprogramming your monitor. Measurements can be taken at intervals of 1,2,3,5,10,15,30, and 60 minutes. Press Start to initiate a measurement.

4.4.15.4. Interval: Selects the interval at which NIBP measurements are automatically taken. The interval you select, ranging from one minute to 60 minutes is shown on the display next to the word TIME.

4.4.15.5. Turbo cuff: automatically starts NIBP measurements and continues to take as many measurements as possible within five minutes.

**WARNING:** The patient's limb should be periodically observed to ensure that the circulation is not impaired for a prolonged period of time.

**WARNING:** The Propaq Encore should never be used to monitor NIBP on one patient while simultaneously monitoring ECG on another patient.

**WARNING:** If a noninvasive blood pressure measurement is suspect, repeat the measurement. If you are still uncertain about the reading, use another method.

**WARNING:** Do not attempt to conduct NIBP TEST when the cuff is attached to the patient.

**WARNING:** Always place the monitor in Neonatal Mode when using on a neonate. If monitor is in Pediatric Mode and the cuff is placed on neonate, maximum pressure can exceed 150 mmHg.

#### 4.4.16. Pulse Oximetry (SpO<sub>2</sub>):

##### 4.4.16.1. Setting up the monitor for SpO<sub>2</sub>:

4.4.16.1.1. SpO<sub>2</sub> connector is located on the left side of the Propaq. Turn the locking ring around the connector counterclockwise until it stops.

4.4.16.1.2. Plug the sensor into the SpO<sub>2</sub> sensor extension cable and plug the extension cable into the Propaq, or plug the sensor directly into the SpO<sub>2</sub> connector.

4.4.16.1.3. Lock the connector by turning the locking ring clockwise until it stops.

4.4.16.1.4. SEARCH is displayed in the SpO<sub>2</sub> numeric window while the channel tries to detect blood pulsing through the measurement site. Once the measurement has been established; the saturation value is displayed in the numeric window.

4.4.16.1.5. From the Main Menu, press SpO<sub>2</sub> and then Size to adjust the size of the waveform for best viewing.

4.4.16.1.6. Adjust the placement of the sensor until a good SpO<sub>2</sub> waveform is displayed.

4.4.16.1.7. Size: selects the SpO<sub>2</sub> waveform size (1X, 2x, 4X, and 8X).

4.4.16.1.8. More: displays the next SpO<sub>2</sub> menu.

4.4.16.1.9. Response: sets the time the Propaq Encore Pulse Ox takes to acquire the oxygen saturation value.

4.4.16.1.10. C-Lock: turns on and off the C-Lock function (use this function if you are monitoring ECG and SpO<sub>2</sub> and artifact is present).

**WARNING:** Incorrect application or use of a sensor can cause Tissue damage.

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

#### 4.4.17. Temperature

4.4.17.1. Place probe on patient and plug into monitor.

4.4.17.2. To select the temperature in C\* or F\*, press SETUP, More, More, Services, Yes, More, More, Settings. Use the Next and Change buttons to select and set.

**NOTE:** Changing units does not clear trends.

4.4.17.3. Set the alarm limits.

4.4.17.4. Messages: "Probe not detected", Probe has been disconnected. "Probe short", verify the probe is properly inserted in the left side panel, if so, replace probe. "Calibration error, temp disabled", Propaq, can not accurately measure the temperature.

#### 4.4.18. CO<sub>2</sub>

4.4.18.1. Connect the mainstream CO<sub>2</sub> sensor or side stream CO<sub>2</sub> water trap.

**NOTE:** After you connect the sensor a waveform will be displayed without a value range briefly. It displays WARM UP or START UP for 20 seconds.

4.4.18.2. Press SpO<sub>2</sub>/CO<sub>2</sub> to display the first CO<sub>2</sub> menu.

4.4.18.3. Press Range until you see the desired waveform scale range on the screen.

4.4.18.3.1. Press mm/s to select either 3.13, 6.26 or 12.5mm/sec. The default setting is 6.25mm/sec.

4.4.18.3.2. Press More to view the CO<sub>2</sub> status window.

4.4.18.3.3. If either O<sub>2</sub> or NO<sub>2</sub> is being administered, press Gas comp to set the proper gas compensation. If no other gas is being administered, set to off.

4.4.18.3.4. Press Response to select either normal, slow or fast.

4.4.18.3.4.1. Fast setting (15 seconds) is recommended where a sudden in ETCO<sub>2</sub> is of concern, such as that induced by an air embolus in certain neurosurgical procedures.

4.4.18.3.4.2. Slow response (45 seconds) will decrease ETCO<sub>2</sub> false alarms when breath values vary from one to the next.

4.4.18.3.4.3. Default setting is normal (30 seconds).

4.4.18.3.5. Set the alarm limits for ETCO<sub>2</sub>, INCO<sub>2</sub> and breath rate.

**WARNING:** For patient safety, it is recommended that the breath rate alarm limits always be turned on and set properly.

4.4.18.3.6. Set the alarm limit for apnea delay- this is the maximum time allowed between two successive breaths before the alarm occurs.

4.4.18.3.7. Side stream Co<sub>2</sub> Monitoring.

4.4.18.3.7.1. Connect water trap by Firmly inserting the side stream CO<sub>2</sub> water trap into the connector on the left side.

4.4.18.3.8. Set up the CO<sub>2</sub> channel and set alarm limits as described above.

4.4.18.3.9. Connect to a non-intubated patient by positioning the cannula on the patient then connect the sample line to the watertrap.

**WARNING:** Do not connect sample line or patient input to the exhaust port.

4.4.18.3.10. Connect to an intubated patient by connecting the gas sampling elbow and elbow connector into the patient's breathing circuit. Connect the sample line to the elbow connector and the water trap.

**WARNING:** Do not connect sample line or patient input to the exhaust port.

#### **4.4.19. Displayed Messages.**

4.4.19.1. Altimeter failure- Range: Operating out side the ranges –2000 to 15000ft.

4.4.19.2. Altimeter failure- Rate: Ambient pressure is changing at a rate greater than 100mmHg/minute.

4.4.19.3. Degraded waveform, check adapter: Mainstream adapter is obstructed or the sensor has failed.

4.4.19.4. Lack of wave, Check adapter, and sensor: Either the airway adapter is obstructed or the CO<sub>2</sub> sensor has failed.

4.4.19.5. Low battery, heater disabled: Because of the low battery the waveform is displayed without a range.

#### **4.4.20. Printer (if applicable):**

4.4.20.1. Loading paper:

4.4.20.2. Lay the monitor on its back to gain access to the bottom of the printer.

4.4.20.3. Squeeze the locks on the paper door toward each other and pull the door toward you to open it.

4.4.20.4. Lift the paper roll from the holder and pull out any paper remaining in the printing mechanism.

4.4.20.5. Place the new paper roll onto the holder, as shown below, and pull out several inches of paper.

4.4.20.6. Slide the end of the paper into the slot of the printing mechanism until it extends out of the paper exit slot.

4.4.20.7. Close the paper door.

4.4.20.8. Place the monitor on its feet.

4.4.20.9. Simultaneously press the Start/Stop button and the Print Trends button to produce a test print.

4.4.20.10. Printing a single trend:

4.4.20.10.1. Press the Print button in the Trends Menu.

**NOTE:** If you want to print a trend different from the one displayed, press Next Trend until the desired trend is shown.

4.4.20.10.2. Press the Print button; this will print the displayed trend. If you want to print a trend different from the one displayed, press Next Trend until the desired trend is shown.

4.4.20.11. Printing several trends:

4.4.20.11.1. From the Main Menu, press Setup>More>Printer>More. The printer trend select window appears.

4.4.20.11.2. Using the Next and Change buttons, select each of the trends you want printed and turn them on. Turn off all other trends.

4.4.20.11.3. Each time you want to print the selected trends, press Print Trends.

#### **4.4.21. Securing:**

4.4.21.1. The unit may be secured with the hanging bracket permanently attached to the unit to a stanchion pole or litter brace. Use a litter strap to secure the unit around the hanging bracket. Do not obstruct your view by wrapping the strap over the display and buttons.

4.4.21.2. It may also be secured to an equipment litter with a litter strap over the top of the unit under the hanging bar.

#### **4.4.22. Disassembly and Storage:**

4.4.22.1. Remove all cables from the unit. Remove the NIBP hose and cuff. Plug in the AC power cord to recharge the battery pack. The monitor and accessories should be wiped with a nearly dry cloth containing one of the mild cleaning solutions: warm water, hydrogen peroxide solution, Coverage, Liquid Soap, Wex-cide, Formula 409, Fantastik, Windex, Cidex, and T.B.Q. Thoroughly wipe off any excess residual cleaning solution from the Propaq. Do not allow cleaning solutions or water to run into the crevices or connector openings.

**CAUTION:** The side panel connectors of the unit have been specially designed to prevent water or other liquids from entering the monitor. However, liquids can get into the connectors. If liquid does get into the right side panel connectors, it will drain through a hole in the bottom of the panel. If moisture gets into any side panel connector, the connectors must be dried with warm air, and then all monitoring functions should be checked for proper operation.

4.4.22.2. Clean the Durasensor oxygen transducers with an isopropyl alcohol pad. Do not immerse.

4.4.22.3. The cuff may be cleaned using common hospital disinfectants, including Cidex, bleach (1:10) solution, isopropyl alcohol, Lysol solution, PhisoHex, Quadricide, Virex, and Vesphene. Wash gently with the solution, and then rinse. Do not allow the solution to enter the cuff tubes, as this will interfere with the functioning of the cuff.

## Chapter 5

### INCUBATORS USER'S GUIDE

#### 5.1. AIRBORNE LIFE SUPPORT SYSTEMS (ALSS) Model 185.

**5.1.1. Purpose.** The ALSS Model 185 Infant Transport Incubator provides a controlled environment for supporting an infant's thermal requirement during transportation. The ALSS Incubator has provisions for humidification and an enriched oxygen environment in the infant chamber.

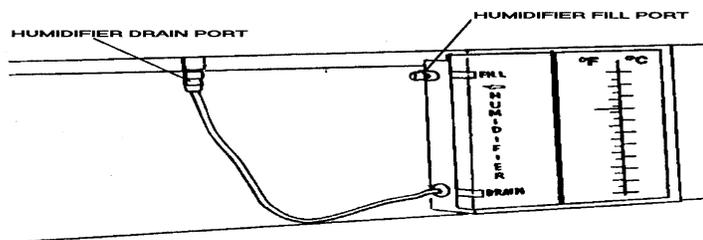
**5.1.2. Description.** The ALSS Incubator mounts to a frame and has a carrying handle at each end. The infant chamber is enclosed on four (4) sides and the top by a clear plexiglass hood with access doors. An external observation light, IV pole, and power switch are on the right rear of the incubator. There is storage capability for two (2) "D" or "E" size oxygen cylinders at the left front and rear. Secure oxygen cylinders with the two (2) sets of quick release clamps. Release the clamps by lifting the locking latch lever. Close the clamps by lowering the locking latch lever. Adjust the clamps by lifting the lever, and loosening or tightening the wing nut, then lowering the lever to close the clamp. Located on the front right of the incubator are a control and information panel, an AC power cable, and circuit breakers. A double-walled hood with access doors covers the infant mattress and tray. The hoods are assembled one over the other and secured together by four (4) hood securing knobs.

**5.1.3. Components.** Accessory pouch with hook and pile straps for securing to the carrying handle contains:

- 5.1.3.1. An oxygen regulator for the oxygen cylinders.
- 5.1.3.2. A wrench for the oxygen cylinder valve and regulator.
- 5.1.3.3. A 50 cubic centimeters (cc) Luer-Lock syringe.
- 5.1.3.4. Two (2) humidification sponges with precut notches.
- 5.1.3.5. An extra mattress cover (pillowcase).
- 5.1.3.6. Store and transport the incubator in the "Footlocker Type" protective carrying case.

**5.1.4. The Control/Indicator Panel.** The controls on this panel are the on/off switch, the test switch, and the temperature control thumb wheel switch. The on/off, or power switch controls power to the incubator. The test switch is used to test the LED on the indicator panel, and the audible alarm. The temperature control switch is used to select a temperature for the infant chamber in the incubator. The temperature range setting is 30.0 to 39.9 degrees centigrade (°C). The indicators are divided into three areas. On the left of the panel are the alarm display LED's, the power display LED's on the right, and the infant chamber temperature display is centered on the lower portion of the panel.

**5.1.5. Humidifier Fill and Drain Ports (Figure 5.1).** Humidifier fill and drain ports are located to the left of the control/indicator panel, with the drain port at the end of a drainage tube.

**Figure 5.1. Humidifier Fill and Drain Ports.****5.1.6. The Hood Assembly.**

5.1.6.1. Is secured to the incubator by four (4) slide-latches.

5.1.6.2. An infant support tray and mattress are under the hood area. The tray secures to the incubator by four (4) swell-latches found at the corners of the tray under the mattress. The latches loosen by raising the levers. Then lift the tray straight up.

**NOTE:** Adjust the swell latches by tightening or loosening the nut. Do not make the swell latches too tight.

5.1.6.3. Underneath the infant tray from right to left is the humidifier reservoir with sponge, heater, blower, and temperature probes to the left forward corner.

**5.1.7. Alarms.** There are seven (7) alarm conditions to alert the operator to possible problems.

**WARNING:** The activation of any alarm indicates a need to completely assess the infant and closely monitor its temperature.

**5.1.7.1. The alarms and their significance:**

5.1.7.1.1. **HIGH TEMPERATURE ALARM.** The High Temperature Alarm illuminates when the temperature in the infant chamber exceeds 38.5 °C. An intermittent audible alarm accompanies the alarm. The incubator remains fully functional. Used with a physician's orders, ignore the alarm to warm a cold infant. Monitor the infant's temperature closely.

5.1.7.1.2. **SYSTEM FAIL ALARM.** The System Fail Alarm activation accompanied by a continuous audible alarm indicates the secondary sensor has detected an incubator temperature greater than 39.2 °C. The incubator heater is disabled until the temperature is below 39.2 °C. Monitor the infant's temperature closely.

**NOTE:** Activation of this alarm may indicate a problem with either the temperature sensors or the control circuitry. The incubator should be inspected by MERC personnel before any additional patient use.

5.1.7.1.3. **HIGH TEMPERATURE AND SYSTEM FAILURE ALARM.** This alarm, accompanied by a continuous audible alarm, indicates that the primary temperature sensor detects a temperature over 39.0 °C. The incubator's heater system will be disabled until the temperature is below 39.0 °C. Monitor the infant closely at all times.

5.1.7.1.4. **AIR FLOW ALARM.** This alarm, accompanied by a continuous audible alarm indicates an air flow blockage by some object such as a blanket. The heater system will be disabled until the incubator cools, and the obstruction is cleared.

5.1.7.1.5. **SENSOR FAIL ALARM.** This alarm, accompanied by a continuous audible alarm, indicates a possible failure of the primary temperature sensor or control circuitry. Sensor Fail, High Temperature, and System Fail occurring together, or Sensor Fail and System Fail occurring together indicate a primary sensor problem, and will disable the heater.

**NOTE:** The activation of any of the three (3) alarm conditions with sensor fail requires the incubator be checked by MERC personnel.

5.1.7.1.6. **LOW BATTERY ALARM.** Activation of this alarm along with an intermittent audible alarm indicates that about 15 minutes of operation remains.

5.1.7.1.7. **POWER FAIL INDICATOR.** This LED illuminates when the battery voltage falls below a fixed point, indicating that the battery has reached its safe discharge limit. Power to maintain the temperature in the infant chamber is no longer available, and all power to the incubator (other than this indicator and audible alarm) is disabled. The indicator illuminates as long as the power switch remains on. Power indicators illuminate when the power switch is "ON" to show which power source is being utilized to supply power to the incubator. The battery charge indicator illuminates whenever the battery is being charged.

**5.1.8. Power Sources.** Power sources for the ALSS Model 185 Infant Transport Incubator are 115 VAC/50 - 400 Hz, and an internal battery. When AC power is connected to the incubator, it will automatically power the incubator, and charge the battery. AC power is supplied by plugging the AC power cable on the right end panel into a 115 VAC/50 - 400 Hz source. The battery will automatically power the incubator if the power switch is turned "ON" and no AC power is supplied to the incubator. A fully charged battery will operate the incubator for three (3) hours with an ambient temperature of 20 °C (68 °F) and the infant chamber at 37.0 °C (after warming initially to 37.0 °C on AC power). Battery charging times with the incubator switched "OFF" are 10 hours to 90% capacity, and 16 hours to 100% capacity.

**NOTE:** When not in use, the incubator should be plugged into an AC power source to recharge the battery. Always recharge the battery after each use of the incubator. Incubators stored on the C-9A aircraft will need, at a minimum, a 24 hour charge on a monthly basis.

### **5.1.9. Pre-Flight.**

5.1.9.1. Ensure that all four (4) hood securing knobs and all four (4) slide-latches are in the locked position prior to moving the incubator.

5.1.9.2. Ensure the inspection/calibration sticker has a current date.

5.1.9.3. Inspect the incubator for any signs of damage. If either hood is cracked, do not use the incubator.

5.1.9.4. Inventory the accessory kit for all items and ensure they are serviceable.

5.1.9.5. Ensure the oxygen cylinders are secured and have at least 1000 pounds per square inch (psi) pressure, and that a plastic washer is in place between the regulator and the oxygen cylinder valve outlet.

5.1.9.6. Connect the incubator to 115 VAC/50-400 Hz source.

**NOTE:** On the aircraft, ensure electrical power is available, and the outlet has been checked by the electrical cable assembly set (ECAS) AC tester. For C-130 and C-141 aircraft only, plug in the appropriate AC electrical cord and plug the incubator power cable into the ECAS cord.

5.1.9.7. Switch the incubator "ON" and ensure the AC OP Indicator Illuminates.

**NOTE:** The ALSS Model 185 temperature sensors detect temperatures within the normal operating range of 50 o Fahrenheit and greater. When the sensors detect a temperature below normal, it displays "System Fail" or "Sensor Failure" until the temperature returns to a normal setting. This may take up to two (2) hours. To preclude this from happening, after cold weather storage, remove the hoods, remove the infant support tray, and turn the incubator "ON" using AC power. This allows the incubator to warm to room air, and should take about 15 minutes. Replace the infant support tray and hoods after the 15 minute period.

5.1.9.8. Open the porthole on the right of the front panel of the hood, and place an ungloved hand over the right end of the infant support tray and ensure airflow is present. Close the porthole.

5.1.9.9. Set the temperature control to 37.0 °C and observe for a rise of temperature on the incubator temperature display. Test the observation light by switching it "ON" then "OFF". Press and hold the test switch and ensure all LED's illuminate and the audible alarm sounds.

5.1.9.10. Disconnect the incubator from AC power and ensure the battery operation LED illuminates. Repeat the pre-flight test from checking airflow at the right end of the infant tray to pressing the test switch to ensure proper operation on battery power. Reconnect the incubator to AC power and switch "OFF" the incubator and ensure the battery charge LED is illuminated.

5.1.9.11. Install a humidity sponge in the humidity tray with the sponge cutout facing to the right only if use is imminent.

5.1.9.12. Check the condition of the oxygen cylinder tank clamps, and that the IV pole is secured in its storage bracket on the rear panel of the incubator. Ensure the mounting straps are in place at the end corners of the frame, and that they are serviceable and not damaged.

#### **5.1.10. Operation.**

5.1.10.1. Place the incubator to the center, or towards one end of the litter if additional medical equipment for the infant dictates it not be centered. Loosen the incubator's litter mount straps by depressing the release lever on the strap buckles. Press the litter pole clips onto the litter poles directly below the end corners of the incubator and tighten the straps. It is recommended that the litter pole clips be placed straight down from the end corners of the incubator.

**WARNING:** Failure to follow the manufacturer's securing directions may result in premature wear of the securing strap, and the incubator being unsecured.

5.1.10.2. The incubator requires one (1) litter space and may be placed in any tier.

**NOTE:** When the incubator is placed in the sidewall stanchion on C-130 or C-141 aircraft, condensation will possibly occur between the incubator hoods from the cooler airflow along the fuselage coming in contact with the warm incubator hood.

5.1.10.3. Connect the incubator to an appropriate AC power source (115 VAC/ 50-400 Hz).

**NOTE:** If the incubator is going to be operated on battery power, it is recommended that the incubator be warmed up to the desired operating temperature on AC power first. This will maximize the length of time battery power will be available.

5.1.10.4. Install a humidification sponge. Fill the humidification reservoir with 150 cc of sterile distilled water. Water for the initial wetting of the sponge may be introduced directly into the reservoir by removing the hoods and the infant support tray. Alternatively, the reservoir may be filled by syringe through the luer fitting marked fill (to the left of the control panel). In either case the filling should not exceed 150 cc of water. The fill rate should not be greater than 100 cc per minute (50 cc per 30 seconds).

**NOTE:** Do not overfill the humidification reservoir.

5.1.10.5. When the reservoir is filled with 150 cc of water, the incubator will provide a 45% humidification level for eight (8) hours in C-130 or C-141 aircraft. Should the infant require a humidification level greater than 45%, additional humidity may be introduced into the infant chamber by the use of a rubber access port and an external humidification/nebulization source. Replenishing the water without disturbing the infant requires that the reservoir first be drained of all water not absorbed by the sponge. This is accomplished through the luer fitting marked drain (to the left of the control panel). The incubator must be level or slightly elevated at the rear. Open the drain line by disconnecting it from the male luer fitting mounted on the frame. Use the 50 cc syringe to apply suction to the drain fitting, and measure the quantity of water drained. Repeat this procedure until no water appears in the syringe. If the total quantity of water collected exceeds 5 cc, replenishment of water is not necessary. Use the syringe to inject through the fill port a quantity of water equal to the quantity collected during the draining procedure. If the quantity collected is 1 cc to 5 cc, replenish with no more than 30 cc of water. If less than 1 cc is collected, replenish with no more than 60 cc of water. This prevents possible over-filling due to water retained in the sponge from the previous filling. Any subsequent refilling should observe this procedure. Check the humidity sponge in this manner every 4-5 hours.

5.1.10.6. Set the temperature selector to 37.0 °C. Switch the incubator "ON". The incubator heater takes about 10 minutes to reach this temperature when the ambient temperature is 20 °C. After initial warm up, set the incubator temperature as ordered by the physician. If a temperature has not been ordered, use the neutral thermal environmental temperature chart ([Table 5.1.](#)). Setting the incubator temperature within the recommended range will decrease thermal stress to the infant.

**NOTE:** Take the temperature of the infant every hour unless directed otherwise by the medical attendant. Document on AF Form 3856, Aeromedical Patient Intake/Output Record.

**NOTE:** Avoid exposure to direct sunlight as this may cause significant temperature increases within the infant chamber. This may be avoided by covering the plexiglas hood with an item such as a folded bed sheet.

5.1.10.7. If oxygen is required, the use of a humidifier/nebulizer is recommended. Connect a flow meter to an oxygen source, and a humidifier/nebulizer assembly to the flow meter. Use oxygen connector tubing connected to the humidifier/nebulizer outlet and placed through a rubber access port to deliver humidified/nebulized oxygen to the infant chamber. It takes approximately 10-15 minutes for oxygen concentrations to stabilize in the chamber.

**NOTES:**

Any time an infant is on oxygen, an oxygen monitor will be used to monitor the percentage of oxygen in the incubator.

**WARNING:** Only the minimum number of oxygen bottles required for the incubator and the mission will be carried. Excess oxygen bottles are considered hazardous cargo.

5.1.10.8. **Table 5.2.** gives approximate oxygen percentages, in the incubator, corresponding to delivered oxygen flow rates.

**Table 5.1. Neutral Thermal Environmental Temperature Chart.**

<b>Ages and Weight</b>	<b>Range of Temperature (°C)</b>	<b>Ages and Weight</b>	<b>Range of Temperature (°C)</b>
<b>0-6 hours</b>		72-96 hours	
under 1200 grams (gm)	34.0-35.4	under 1200 gm	34.0-35.0
1200-1500 gm	33.9-34.4	1200-1500 gm	33.0-34.0
1501-2500 gm	32.8-33.8	1501-2500 gm	31.1-33.2
over 2500 and > 36 weeks	32.0-33.8	over 2500 and > 36 weeks	30.0-32.8
<b>6-12 hours</b>		4-12 days	
under 1200 gm	34.0-35.4	under 1500 gm	33.0-34.0
1200-1500 gm	33.5-34.4	1501-2500 gm	31.0-33.2
1501-2500 gm	32.2-33.8	over 2500 and > 36 weeks	
over 2500 and > 36 weeks	31.4-33.8	4-5 days	30.0-32.6
<b>12-24 hours</b>		5-6 days	
under 1200 gm	34.0-35.4	6-8 days	30.0-32.2
1200-1500 gm	33.3-34.3	8-10 days	30.0-31.8
1501-2500 gm	31.8-33.8	10-12 days	30.0-31.4
over 2500 and > 36 weeks	31.0-33.7	<b>12-14 days</b>	
<b>24-36 hours</b>		under 1500 gm	32.6-34.0
under 1200 gm	34.0-35.0	1501-2500 gm	31.0-33.2
1200-1500 gm	33.1-34.2	over 2500 and > 36 weeks	30.0-31.8
1501-2500 gm	31.6-33.6	<b>2-3 weeks</b>	
over 2500 and > 36 weeks	30.7-33.5	under 1500 gm	32.2-34.0
<b>36-48 hours</b>		1501-2500 gm	30.5-33.0
under 1200 gm	34.0-35.0	<b>3-4 weeks</b>	
1200-1500 gm	33.0-34.1	1200-1500 gm	31.6-33.6
1501-2500 gm	31.4-33.5	1501-2500 gm	30.0-32.7
over 2500 and > 36 weeks	30.5-33.3	<b>4-5 weeks</b>	
<b>48-72 hours</b>		1200-1500 gm	31.2-33.0
under 1200 gm	34.0-35.0	1501-2500 gm	30.0-32.2

Ages and Weight	Range of Temperature (°C)	Ages and Weight	Range of Temperature (°C)
1200-1500 gm	33.0-34.0	<b>5-6 weeks</b>	
1501-2500 gm	31.2-33.4	1200-1500 gm	30.6-32.3
over 2500 and > 36 weeks	30.1-33.2	1501-2500 gm	30.0-31.8
In general, the smaller infants in each weight group will require temperatures in the higher part of the temperature range. The younger infants in each range will require temperatures in the higher ranges.			

5.1.10.9. If the oxygen cylinders stored in the incubator clamps are used as the oxygen source no humidification, apart from the initial humidification, will be possible.

5.1.10.10. If the IV pole is to be used, remove it from its storage retainer on the rear of the Incubator by sliding it out. Insert the IV Pole into the IV Pole Securing Hole by the Lamp Base. Pull out the Securing Knob on the rear panel directly below the securing hole allowing the IV Pole to slide to the base of the hole. Release the securing knob and rotate the IV pole until the Securing Pin engages the hole in the IV pole, locking it in place. Pull up on the pole to ensure it is secure.

5.1.10.11. Place the infant in the infant chamber through the front access door onto the mattress in the support tray. The infant's head may be positioned either fore or aft in the aircraft. Place the securing straps through the appropriate sets of slots in the support tray and secure the infant without over tightening the straps.

**Table 5.2. ALSS Oxygen Percentages.**

Oxygen Flow Rate	Oxygen Percentage (Approximate)
1 Liter	24.6 %
2 Liter	33.7%
3 Liter	39.0 %
4 Liter	44.6 %
5 Liter	49.7 %
6 Liter	55.5 %
7 Liter	59.6 %
8 Liter	64.5 %
9 Liter	69.5 %
10 Liter	75.0 %
15 Liter	90.7 %

**NOTES:**

To minimize heat and oxygen concentration loss, close the access doors and/or portholes immediately upon completion of the task.

The USAF Occupational and Environmental Health Laboratory (OEHL) has determined that noise levels in the infant chamber are not high enough to produce a significant risk of hearing damage due

to the relatively short period of exposure. OEHL advises not taping ear plugs over infants ears as they are of little or no value.

Use the observation lamp when ambient lighting is insufficient for observation of the infant. The light is not intended for continuous use, and may become hot after 15 minute of use.

**CAUTION:** Do not touch or hold the halogen bulb with bare fingers as a shortened bulb life span will result.

**WARNING:** Unless absolutely necessary, do not remove the hood assembly as it can separate and fall on the infant, another patient, a crewmember, or the aircraft floor.

#### **5.1.11. Storing and Securing.**

5.1.11.1. The incubator is stored in its carrying case as follows: Remove the regulator from the oxygen cylinder, wrap it in a towel or pillow case and store it in the accessory kit. Ensure the power switch is in the "OFF" position, and secure the power cord on the retainer on the right end panel. Ensure the incubator is clean, and place the hood cover over the hood, securing it to the handles. Place the incubator in the bottom section of the carrying case, carefully place the top section over the incubator and bottom section and secure both sections with the case latches. If storing in Aft cargo section of a C-9A, place incubator into permanently mounted carrying case.

5.1.11.2. To secure the case on an aircraft floor: Run the cargo tie-down strap through a side carrying handle, over the top of the case and down through side handle catty-corner to the first handle. It is recommended that two (2) cargo tie-down straps be used for each case, with the straps crossing on the top of the case. Secure the straps to tie-down devices on the aircraft floor.

## Chapter 6

### INFUSION USER'S GUIDE

#### 6.1. IVAC MedSystem III.

**6.1.1. Purpose.** The IVAC MedSystem III is an Intravenous (IV) Multi-Channel Infusion Pump designed to accurately infuse I.V solutions, blood, and administer patient internal supplementation.

**6.1.2. Description.** IVAC MedSystem III is a portable multi-channel IV infusion pump. Contains the following features:

6.1.2.1. Multi-Channel Fluid Delivery System: Combines three independent infusion channels with a full range of delivery rates.

6.1.2.2. Dose Rate Calculator (DRC): Pump will calculate volumetric or dose rate based on values entered for patient weight, drug concentration and dosing parameters.

6.1.2.3. Secondary Mode: Allows user to program two (2) different rates of infusion to run sequentially on the same channel.

6.1.2.4. Free Flow Protection: Administration Sets contains a cassette that provides protection from free-flow conditions. When the cassette is removed from the pump, the cassette's slide clamp is pulled to full extension, occluding the tubing and preventing fluid from flowing.

6.1.2.5. Monitoring System: Continuously monitors pump conditions and alerts user of malfunction with adjustable audio tones and visual messages.

6.1.2.6. Internal Battery: A fully charged battery will provide six (6) to eight (8) hours of operating time with rates at 125 ml/h per channel and backlighting usage of two (2) minutes per hour.

6.1.2.7. Six Device Types: Preset parameters that accommodate specific clinical applications; General Purpose, Neonatal, Controller Pressure, Operating Room General Purpose II, and Operating Room II.

6.1.2.8. Full Range Of Delivery Rates: Rates from 0.1 to 999 ml/h.

6.1.2.9. Rotating Pole Clamp: Pump is capable of being secured during operation.

#### 6.1.3. Front Panel Display.

6.1.3.1. Instrument Control Keys.

6.1.3.1.1. One/Off Recharge Key. Turns pump on and off.

6.1.3.1.2. Standard Display Key. Displays view window of infusion settings for all channels.

6.1.3.1.3. More Options Key. Displays additional soft key functions.

6.1.3.1.4. Start/Stop Key. Starts and stops infusion on selected channel.

6.1.3.2. Standard Display Page.

6.1.3.2.1. Status Line. Located along the top line of the viewing window. Displays infusion status: Infusing; Stopped; Standby; KVO; ALARM; FAULT; and SERVICE for each channel.

**NOTE:** Status line for selected channel is highlighted.

- 6.1.3.2.2. Infusion Rate. Displayed below the Status Line along top of the viewing window.
- 6.1.3.2.3. Volume Remaining. Displayed below Infusion Rate in the center of the viewing window.
- 6.1.3.2.4. Volume Infused. Displayed below Volume Remaining in the center of the viewing window.
- 6.1.3.2.5. Prompt Line. Located below Volume Infused along bottom of viewing window. Displays messages that prompt the user to make programming choices and/or take appropriate actions.
- 6.1.3.2.6. Soft keys Prompts. Located along bottom of viewing window. Displays function of specific soft key:
  - 6.1.3.2.6.1. STNDBY: Appears when Start/Stop key is pressed during infusion.
  - 6.1.3.2.6.2. Cntrst: (Contrast) Brightens or dims display.
  - 6.1.3.2.6.3. GP II: Indicates full name of selected Device Type on the Prompt Line.

**NOTE:** Additional soft key prompts are displayed by pressing More Options key.

#### **6.1.4. Programming Page.**

- 6.1.4.1. Status Line. Located along top of viewing window. Displays infusion status for selected channel.

**NOTE:** Selected channel is indicated by the letter displayed at the beginning of the first five lines in viewing window.

- 6.1.4.2. Infusion Rate. Displayed along top of viewing window under Status Line.
- 6.1.4.3. Volume Remaining. Displayed in the center of the viewing window under Infusion Rate..
- 6.1.4.4. Time Remaining. Displayed in center of the viewing window under the Infusion Rate.
- 6.1.4.5. Volume Infused. Displayed in the center of the viewing window under Time Remaining.
- 6.1.4.6. Date/Time. Displayed along the bottom of the viewing window under Volume Infused. Identifies when volume infused was last cleared and when infusion began.
- 6.1.4.7. Prompt Line. Located along bottom of viewing window under Date/Time. Displays messages that prompt the user to make programming choices and/or take appropriate action.
- 6.1.4.8. Soft Key Prompts. Located along bottom of viewing window, above Soft keys. Displays function of specific soft key:
  - 6.1.4.8.1. SELECT: Moves highlight bar through the programmable infusion parameters.
  - 6.1.4.8.2. ↑ - Increases highlighted value.
  - 6.1.4.8.3. ↓ - Decreases highlighted value.
  - 6.1.4.8.4. FAST ↑ - Increases highlighted value at greater increments.
  - 6.1.4.8.5. FAST ↓ - Decreases highlighted value at greater increments.

**6.1.5. Alarms:** Pump will sound four rapid beeps, infusion stops, and will rapidly flash red light on channel key.

6.1.5.1. AIR IN LINE: Air detected in fluid pathway during infusion, or air sensor is dirty.

**NOTE:** To minimize formation of micro bubbles, set up pump at or slightly below IV site.

6.1.5.2. AIR IN LOWER TUBING: Air bubbles detected in fluid pathway with a total volume exceeding the air in line threshold setting.

**NOTE:** To minimize formation of micro bubbles, set up pump at or slightly below IV site.

6.1.5.3. BATTERY DEPLETED: Insufficient battery power. Pump will shut down in **FIVE (5)** minutes.

6.1.5.4. CASSETTE JAMMED: Cassette piston is difficult to move or piston sleeve is loose.

6.1.5.5. CASSETTE NOT LATCHED: Cassette is partially disengaged or latching mechanism is dirty.

6.1.5.6. CASSETTE REMOVED: Cassette is removed from holder while channel is infusing.

6.1.5.7. CHECK FLUID SIDE: Possible upstream restrictions to flow.

6.1.5.8. FAULTY CASSETTE: Cassette may be damaged or inoperable. Possible dysfunction of cassette sensor located in holder.

6.1.5.9. FLUID-SIDE OCCLUDED: Upstream restriction to flow.

6.1.5.10. PATIENT-SIDE OCCLUDED: Downstream restriction to flow.

6.1.5.11. PUMPING LATCH CLOSED: Pumping latch jaw located to right of air sensor is closed or broken.

6.1.5.12. RATE/VOL SETTINGS CLEARED: Rates and/or volumes are incompatible with newly selected device type.

6.1.5.13. BLANK SCREEN: Safety checks built into software have detected an instrument error condition. Turn pump off, then on again. Press START/STOP key to resume infusing. If blank screen recurs or pump fails to turn on, return to MERC.

**6.1.6. Advisories:** Pump will sound two beeps, slowly flash the red light on the infusing channel's channel key; the infusion will continue.

6.1.6.1. CHECK AIR SENSOR: During installation of the cassette one of three problems may be detected:

6.1.6.1.1. Air is detected in tubing

6.1.6.1.2. Tubing collar is not properly seated

6.1.6.1.3. Air sensor is dirty or damaged

6.1.6.2. INFUSION COMPLETE VR=0: VR has counted down to zero. Channel is infusing at a KVO rate (3.0 ml/h).

6.1.6.3. LOW BATTERY: Pump has 30 minutes or less of battery power remaining.

6.1.6.4. CHANNEL NOT IN USE: Two minutes have elapsed since cassette was installed or infusion was stopped.

**6.1.7. Fault:** A numeric message is displayed, European siren sounds, red light rapidly flashes, and the infusion will stop.

6.1.7.1. CHANNEL OUT OR ORDER: Safety checks built into software have detected a faulty channel. Requires service.

6.1.7.2. FAULT NUMBER: Safety checks built into software have detected a fault condition. Requires service.

### **6.1.8. Alarm Response Keys**

6.1.8.1. QUIET: Silences advisories, alarms, and faults for two minutes. Soft key is accessible during alarm status.

6.1.8.2. CANCEL: Clears alarm and advisory messages and stops tone.

6.1.8.3. CLR AIR: Moves air bubbles past air-in-line sensor. Each press of the ClrAir soft key displaces 0.2 ml of air and fluid. Three beeps indicate when air bubble is no longer in front of the air-in-line sensor.

6.1.8.4. CONFIRM: Is present during Check Fluid Side alarms. Allows infusion to continue if no upstream occlusion is found and fluid is flowing in drip chamber.

6.1.8.5. RETRY: Resets resumable fault conditions. Used when attempting to re-establish normal operation of a channel.

6.1.8.6. SERVICE: Disables use of affected channel. Servicing of the pump is required before channel can be used.

### **6.1.9. Pre-Flight.**

6.1.9.1. Inspect infusion pump for signs of damage and cleanliness.

6.1.9.2. Ensure inspection and calibration date is current.

6.1.9.3. Depress the ON/OFF RECHARGE key. Infusion pump will automatically cycle through a "Homing Sequence". Observe the three red and three green Channel Indicator lights, located on the Channel Select Keys for proper operation. Lights should cycle on and go off and the cassette holders should move down and up. The display screen should cycle from Devise General Purpose Screen to the Standard Display Screen. Pump automatically defaults to channel A. Turn Pump "OFF" by Depressing and holding the ON/OFF RECHARGE key until display disappears.

**NOTE:** If there is a problem with the pump, a visual "Service" light will illuminate indicating which channel requires maintenance. If screen goes blank, all Channel Indicator lights remain on, and pump has a continuous audio alarm, indicates major pump failure. Return pump to MERC for service.

### **6.1.10. Set-up and Operation.**

6.1.10.1. Prepare infusion administration set for patient use. Close regulating clamp on tubing and prime set, tapping and inverting cassette and "Y" sites to expel air. Gently massage the pressure dome, top of cassette, to ensure no air bobbles are trapped.

**NOTE:** Use only IVAC 25 or 28 series administration sets with MedSystem III.

6.1.10.2. Press the ON/OFF key to turn pump "ON". Ensure slide clamp on cassette is pulled out completely. Insert cassette at an upward angle, then snap in place. The slide clamp must be flush

with cassette. Pull down gently on tubing collar and press with thumb to seat tubing collar in recess beneath cassette. Ensure the tubing collar is correctly seated. Pump will beep three times, indicating cassette proper placement.

6.1.10.3. Select channel that is being used by pressing desired channel key (A, B, or C) as necessary.

6.1.10.4. Press Select to move highlighted bar on screen to choose settings to change: i.e. Primary Rate, Primary Volume Remaining, Time, or to clear Volume Infused.

6.1.10.5. Use the  $\downarrow$ ,  $\emptyset$ , FAST $\downarrow$ , or FAST  $\emptyset$  keys to program new settings. To change the direction of the FAST keys, press the corresponding  $\uparrow$  &  $\emptyset$  keys.

6.1.10.6. Press ENTER when programming is complete and press START/STOP key to begin infusion.

6.1.10.7. Verification of settings can be accomplished by pressing the STANDARD DISPLAY key. Verify flow of solution from the drip chamber.

**6.1.11. Titration of Rate :** Accomplished by accessing desired channel by pressing channel key (A, B or C). Change the rate by using the  $\downarrow$ ,  $\emptyset$ , FAST  $\downarrow$ , or FAST  $\emptyset$  keys. Press enter.

#### **NOTES:**

Infusion does not stop as the rates are being changed and the new rate is in effect immediately upon pressing the ENTER key.

To recall a setting before ENTER is pressed, press MORE OPTIONS, then press RECALL

**6.1.12. Clear Volume Infused:** access the desired channel by pressing channel key (A, B, or C). Press SELECT until VOLUME INFUSED (VI) is highlighted. Press CLEAR to reset to zero. Press ENTER.

**NOTE:** Information does not clear from the Total Volume page.

**6.1.13. Clear Total Volume Infused For all Channels:** Press MORE OPTIONS until the TotVol shift key appears. Press TotVol. Press ClrTot. All values for each channel will clear and flash. Press ENTER.

**NOTE:** Information is also cleared from all channel pages A,B, and C.

**6.1.14. Temporarily Stop Infusion:** Access desired channel by pressing channel key (A, B, or C). Press START/STOP key.

6.1.15. A two-toned “Channel Not In Use” advisory will activate in two minutes if cassette remains in channel.

**6.1.16. Stop Infusion Indefinitely:** Access desired channel by pressing channel key (A, B, or C). Press START/STOP key. Press STANDARD DISPLAY key. Press STDNDBY.

6.1.17. **Program Secondary Infusion:** Select a channel by pressing desired channel key (A, B, or C). Press MORE OPTIONS, then press 2o SEC to access Secondary programming page.

**NOTE:** The Secondary page is reverse highlighted.

6.1.17.1. Press SELECT to change settings, using the  $\downarrow$ ,  $\emptyset$ , FAST $\downarrow$ , or FAST  $\emptyset$  keys.

6.1.17.2. Press ENTER when programming is complete and then open secondary roller clamp.

6.1.17.3. Press START/STOP key while on the secondary page to start the secondary infusion. Verify flow of solution from the drip chamber.

**NOTE:** Ensure primary container is at least eight (8) inches below the secondary container. Fluid in the secondary set stops when it reaches the level of the fluid in the primary container. When the Volume Remaining on the secondary infusion reaches zero, the primary rate resumes.

**WARNING:** Failure to enter a correct Secondary Volume Remaining may result in the secondary solution being administered at an incorrect rate.

**6.1.18. To Interrupt The Secondary And Return To The Primary Infusion:** Select channel by pressing desired channel key (A, B, or C). Press MORE OPTIONS, then press the 1o Pri soft key to access Primary Programming page. Press START/STOP key while on the secondary page to begin primary infusion.

**6.1.19. Programming For The Dose Rate Calculator (DRC).**

**NOTE:** Infusion must be stopped before accessing the Advanced Dose Rate Calculation feature. Infusion must be stopped to change the Drug Name, Patient Weight, or Drug Concentration Values.

6.1.19.1. Select Channel by pressing desired Channel key (A,B, or C).

6.1.19.2. Press MORE OPTIONS, then press CalcOn soft key to access DRC programming page.

6.1.19.3. Press SELECT and program settings using the  $\downarrow$ ,  $\emptyset$ , FAST  $\downarrow$ , or FAST  $\emptyset$  keys.

6.1.19.4. Press ENTER when programming is completed.

**NOTE:** To recall a setting, press MORE OPTIONS, then press RECALL before pressing enter.

6.1.19.5. Select Drug specific name or use Drug? to customize any dosing parameter, Press ENTER.

6.1.19.6. Select weight if applicable, press ENTER.

6.1.19.7. Select concentration, then press ENTER.

**NOTE:** If using Drug?, select concentration parameter.

6.1.19.8. Select diluent volume in milliliter, press ENTER.

6.1.19.9. Enter desired Dose Rate, press ENTER.

**NOTE:** If using Drug, first select each dosing parameter.

6.1.19.10. Press START/STOP key to start or stop infusion.

6.1.19.11. Verify settings on Standard Display page; Verify infusion status, (INFUSING< STOPPED< ALARM, KVO, STANDBY,FAULT, SERVICE); and Verify flow of solution from the drip chamber.

**6.1.20. Titrate Drug Infusion During DRC:** Press START/STOP key to change the Drug Name, Patient Weight, or Drug Concentration Values.

6.1.20.1. Dose is highlighted, use the  $\downarrow$ ,  $\emptyset$ , FAST  $\downarrow$ , or FAST  $\emptyset$  keys to program new settings. Press ENTER , then press START/STOP.

**6.1.21. Discontinue DRC:** Select Channel by pressing A,B, or C.

6.1.21.1. Press START/STOP to stop infusion.

6.1.21.2. Press MORE OPTIONS, then press CalcOff.

**6.1.22. KVO Status .** When the set volume has been infused, pump will automatically enter KVO status. With a channel infusing at KVO rate, the Green Light on the Channel key remains “ON”, the Red Light on Channel key “FLASHES”, and a two toned advisory sounds.

6.1.22.1. Press the appropriate channel (A, B, or C) twice and the VR will be highlighted.

6.1.22.2. Press REPEAT to recall previous VR or press the  $\downarrow$ ,  $\emptyset$ , FAST  $\downarrow$ , or FAST  $\emptyset$  keys to change VR. The Value will flash.

6.1.22.3. Press ENTER , then press START/STOP to resume infusion and stop KVO rate.

**NOTE:** If current infusion rate is set below KVO rate, channel will infuse at the lower rate.

**6.1.23. Securing.**

6.1.23.1. An adjustable pole clamp with a rotating latch is attached to the pump. To attach pole clamp, position clamp jaw over mounting surface and turn knob until clamp is tight and pump feels secure.

**6.1.24. Cleaning Procedures:** Refer to IVAC, MedSystem III Operators Manual for complete cleaning procedures.

**CAUTION:** Do not spray any solution into any part of the pump or use isopropyl alcohol on the pump's display screen. Use only solutions of non-abrasive, non-staining detergent that is well diluted with warm water.

6.1.24.1. Wipe Air Sensor Recess, Optomodule, and Valve Actuator with a lint-free swab dampened with cleaning solution using downward motion. Rinse thoroughly using a lint-free swab dampened with water.

**CAUTION:** Use of abrasives or abrasive cleaners on air sensor recess, may cause false Air-In-Line or Check Air Sensor alarms.

## **6.2. Medical Technology Products (MTP) Model 1001AF.**

**6.2.1. Purpose.** The MTP 1001AF Intravenous (I.V.) Infusion Pump is designed to accurately infuse I.V. solutions and blood by a continuous pumping action while in any position.

**6.2.2. Description.** The MTP 1001AF Infusion Pump has a flow rate range of .1 ml to 499.9 ml per hour. Located on the front panel are all controls and displays, the pump rotor, protective rotor door, an air detector, and a charging indicator.

6.2.2.1. Displays on the MTP 1001AF Infusion Pump are the:

6.2.2.1.1. Alphanumeric display.

6.2.2.1.2. Infusion Rate display.

6.2.2.1.3. Total Volume to be Infused display (1. - 9999. ml).

6.2.2.2. Controls are the:

6.2.2.2.1. “Standby Off/On” power switch.

6.2.2.2.2. “Start/Stop” switch.

6.2.2.2.3. “Infusion Rate” switches.

6.2.2.2.4. “Volume To Be Infused” switches.

6.2.2.3. The rear panel contains a mounting clamp, power connector jack, nurse call jack, and a transformer charger attachment eye (an optional item that allows the transformer to be attached to the pump when present).

6.2.2.4. A carrying handle is attached to the sides of the unit.

6.2.2.5. The Alphanumeric display shows "Test", "OK", "Set" after the unit is powered on. When the pump is started, the display shows "Rate" then the programmed rate in milliliters per hour (ml/hr), then "Volume" then the total volume to be infused. All alarm conditions are shown on the display when they are detected.

6.2.2.6. Switches are used to enter the infusion rate. One (1) set of switches marked "+" increases the digit directly over the switch, and another set marked "-" decreases the digit under the switch. The rate may be varied between 0.1 ml/hr and 499.9 ml/hr.

6.2.2.7. Switches are used to enter the total volume to be delivered. This value may vary from .1 ml. to 9999 ml. The values for the infusion rate and total volume to be infused are displayed between their corresponding sets of switches.

6.2.2.8. The “Standby - Off/On” switch is the main power switch for the infusion pump, and the “Start/Stop” switch starts and stops the pump, and silences audible alarms for 60 seconds.

6.2.2.9. The pump rotor on the right of the front panel rotates in a counter clockwise direction. An air detector is located at the pump chamber outlet slot, and a protective door covers the pump rotor and the pump chamber inlet and outlet slots. When the total volume to be infused has been delivered, the pump automatically switches to a “Keep Vein Open (KVO)” infusion rate. The Alphanumeric display will alternate "KVO" and the total volume infused, and an audible chime will sound. The KVO rates depend on the flowrate programmed into the pump and are:

6.2.2.9.1. Flow Rate Entered KVO Flow Rate.

6.2.2.9.2. 499 ml/hr - 5 ml/hr = 1 ml/hr.

6.2.2.9.3. 4 ml/hr or less = 0.5 ml/hr.

### 6.2.3. Alarm Systems.

6.2.3.1. Alarm conditions detected activate an audible alarm, and a visual display of the detected condition. The pump switches to a KVO rate for Tamper and Low Battery Alarms, and stops infusion for all other alarm conditions.

**NOTE:** When an alarm is activated, the audible portion may be silenced by depressing the Start/Stop switch once, then press the start/stop switch again to restart infusion.

6.2.3.2. The visual portion will remain on the LED display, alternating with the volume infused. If the alarm condition is not corrected within 60 seconds, the audible alarm will be reactivated.

6.2.3.3. Four alarm conditions are recognized by the MTP 1001AF. These conditions, their visual displays, and their causes are as follows:

6.2.3.3.1. Occlusion, displayed as "OCC", indicates excessive resistance to flow from the pump to the patient.

6.2.3.3.2. Air in the pump set, displayed as "AIR\*", indicates bubbles in the clear outlet connector of the silicone rubber pump chamber (pump tubing).

6.2.3.3.3. Low battery, displayed as "-BAT" and the accumulated volume infused, indicates a low battery condition.

6.2.3.3.4. The Tamper alarm is activated if the rate and/or total ml switches are pressed during infusion. The display will be either "Rate" and the originally entered flow rate, or "Total" and the originally entered total volume to be infused.

6.2.3.4. Alarms are corrected as follows:

6.2.3.4.1. Occlusion Alarm. Depress the Start/Stop switch to silence the alarm. Check the tubing set for kinks, a closed or partially opened clamp, or a clogged I.V. filter if one is used. Check the I.V. catheter/needle for correct positioning, and that infiltration is not occurring. Correct any problems and depress the Start/Stop switch to restart the infusion.

6.2.3.4.2. Air Alarm. Depress the Start/Stop switch to silence the alarm. Depress the Start/Stop switch a second time to resume pumping. Remove the air bubble at the Post "Y" site by aspirating it with a sterile needle and syringe. If the bubble is large, or if there are numerous bubbles, repeat "AIR\*" alarms will occur. Continue to depress the start/stop switch until all the air has passed the sensor, then remove it as previously described.

6.2.3.4.3. Low Battery. Silence the alarm by depressing the Start/Stop switch once, then depress it a second time to resume the infusion. The pump will continue the infusion at the selected flow rate, and display the volume infused and "-BAT" for 10 minutes, then it will switch to the appropriate KVO rate without activating the audible alarm. At this time the display will show "-BAT" "KVO" "Volume infused". The KVO rate will continue until the battery is totally depleted, or an AC power source is provided, and the selected flow rate resumed. If AC power is supplied to the pump within 10 minutes of the initial "-BAT" indication, the alarm will clear automatically.

**NOTE:** After the pump has been in a "-BAT" condition, it should remain connected to an AC power source for 18 hours prior to being used in a battery mode, and 24 hours to become fully charged.

6.2.3.4.4. Tamper Alarm. Depress the Start/Stop switch once to silence the audible alarm. Reset the rate and/or total ml values to those displayed on the Alphanumeric display. Depress the Start/Stop switch to restart the infusion at the selected values.

**NOTE:** Alarms can be heard from 10-12 feet away on the C-9A aircraft, but cannot be heard on the C-130 or C-141 aircraft.

**6.2.4. Power Source.** The MTP 1001AF infusion pump may be operated on 110-115 VAC/50-400 Hz, or its internal battery. When the battery is completely discharged, it must be charged 24 hours to become fully charged or a minimum of 18 hours prior to battery use. The battery is always being charged whenever the pump is connected to a 110-115 VAC source, whether the pump is operating or not. When fully charged, the battery will power the pump for approximately 30 hours.

**6.2.5. Pre-flight.** Inspect the infusion pump for signs of damage, and for cleanliness. Ensure the inspection and calibration is current. Connect the pump to a 110-115 VAC/50-400 Hz source and ensure the charging indicator illuminates. Depress the Standby-Off/On switch to turn on the electrical power to the pump. The pump will perform a self-test, and if all systems are functional, the display will read "Test," "OK," and then "Set". Enter a flow rate and total volume to be infused and depress the Start/Stop switch to start the pump. Ensure the pump rotates in a counterclockwise direction. Disconnect the AC power and ensure the pump continues to operate, then depress the Standby - Off switch to turn the pump off. Ensure a sufficient quantity of I.V. infusion tubing is available.

**6.2.6. Set-up and Operation.** For AC power operation, connect the Transformer/Charger to the Charger/Power receptacle on the rear of the pump. Connect the Transformer/Charger to 110-115 VAC/50-400 Hz. Mount the pump using the mounting bracket on the rear of the pump. It fits up to 1 1/4 inch wide objects.

6.2.6.1. On C-9A aircraft, the MTP 1001AF may be mounted on an overhead console or a cantilever arm with a litter strap looped through the MTP 1001AF handle for extra security.

6.2.6.2. On C-130 and C-141 aircraft, the MTP 1001AF may also be mounted on the Evans seat rail, with a strap looped through the pump handle and around the rail for added safety.

6.2.6.3. Connect the pump set to the fluid container according to the instructions provided with the pump set. Open all clamps to allow the fluid to prime the I.V. pump set completely. Close the post pump clamp once all the air is purged from the pump set and check the set for leaks.

6.2.6.4. Install the pump set onto the pump rotor.

**NOTE:** The pump chamber consists of a blue inlet connector, a silicone rubber tubing segment, and a clear outlet connector. The blue connector (fluid container side) is to be installed in the upper slot of the rotor panel. The clear connector (patient side) is to be installed in the lower slot of the rotor panel. These connectors are designed to eliminate the possibility of installing the pump chamber backwards. Do not force a connector into the wrong slot as damage may occur.

6.2.6.5. Place the blue inlet connector into the upper slot of the rotor panel with the silicone rubber tubing towards the rotor, and press the connector into the slot (**Figure 6.1.**).

**WARNING:** Press only the blue plastic inlet connector, do not press on the silicone rubber chamber or the plastic I.V. tubing.

6.2.6.6. Gently tuck the first inch of the silicone tubing into the tubing track (**Figure 6.2.**) of the pump rotor. While guiding the silicone tubing into the tubing track with a finger. Avoid kinking, twisting, or pinching the tubing between the rotor and the wall of the tubing track, and ensure the rotor turns freely. Open the post pump clamp, then press the clear outlet connector into the lower slot on the rotor panel, in the same manner as the blue connector in the upper slot.

Figure 6.1. MTP Rotor Panel.

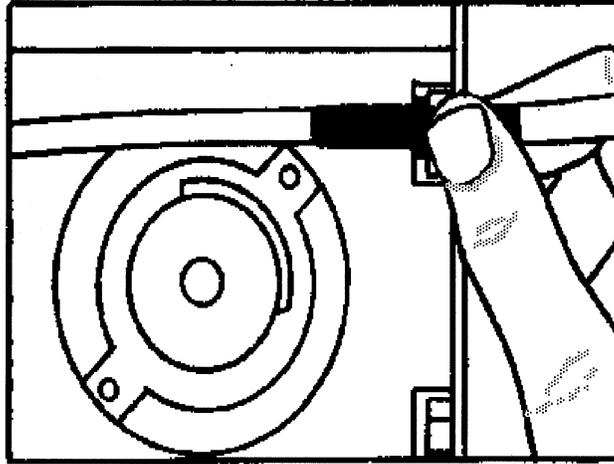
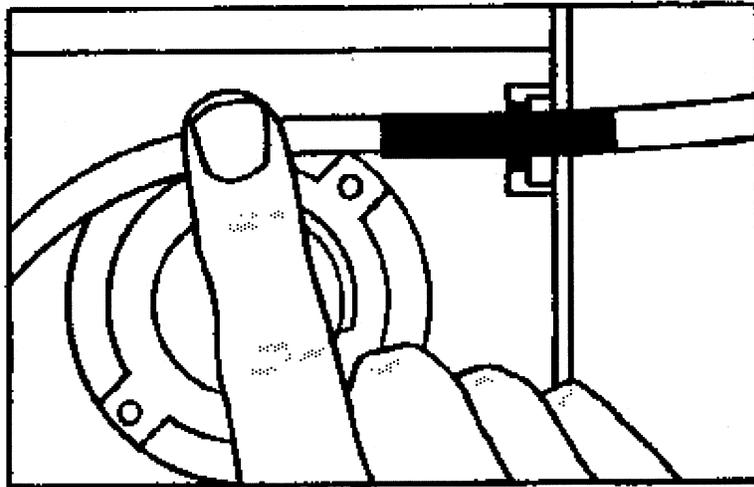
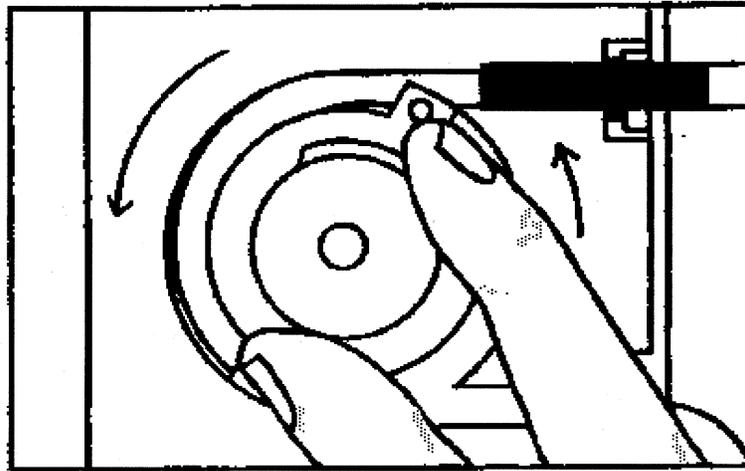


Figure 6.2. MTP Silicone Tubing.



6.2.6.7. Rotate the pump rotor counter clockwise, slowly, one half turn, then slowly rotate the pump rotor one full turn counterclockwise, ensuring that the tubing is properly placed in the track, and that the rotor turns smoothly ([Figure 6.3](#)).

Figure 6.3. MTP Tubing Track.



**NOTE:** If the pre-pump clamp is left closed, the pump will operate without going into an alarm condition, and as a result fluid will not be infused. The silicone rubber pump chamber will collapse and the air alarm will activate and the pump will stop.

6.2.6.8. Connect the I.V. pump set to the patient access device (e.g., catheters).

6.2.6.9. Depress the Standby-Off/On switch and wait for the pump to complete its self-diagnostic tests. The pump will display "Test," "OK," then "Set" if all systems are functional. If a problem is detected, the problem will be displayed (e.g. "Fix," "Air," "BAT"). The problem must be corrected before continuing. Once "Set" is displayed, enter the rate of infusion and total volume to be infused.

**NOTE:** Ensure all clamps on the I.V. pump set are open.

6.2.6.10. Press the Start/Stop switch to begin the infusion. The display will show "Rate" then the rate entered, then "Total" and the total volume entered. Verify that the desired flow rate and total volume to be infused match the entered values. If the entered rate or volume is not correct, press the Start/Stop switch, enter the correct rate or volume and press the Start/Stop switch again. The pump will again "echo" the entered values on the display, then begin infusing at the entered rate.

**NOTE:** Never set the total volume to be infused greater than the volume that is contained in the I.V. solution container. If the total volume to be infused is set at 000 the pump's ability to go into an automatic KVO rate will be overridden. The pump will sense an empty container by the presence of air in the pump chamber. The pump will automatically stop and sound an audible alarm, and the display will alternate "Air\*" and the total volume infused.

6.2.6.11. The pump will continue to infuse until the amount infused displayed equals the volume entered as the total volume to be infused. When these values are equal, the pump automatically switches to a KVO rate. The display will alternately show "KVO" and the total amount infused, and an audible alarm will sound three (3) times every fifteen seconds. The volume administered during the KVO mode will be added to the total volume infused. The KVO rates are automatic, but a different rate may be selected by pressing the Start/Stop switch then changing the flow rate on flow rate display, and restarting the pump.

6.2.6.12. Resume infusion after "KVO" has started by stopping the pump with the Start/Stop switch. Increase the total volume to be infused as indicated. Continue the infusion by pressing the Start/Stop switch.

**NOTE:** If the total ml display is set to less than the amount shown on the Alphanumeric display, the Alphanumeric display will switch to "ERR".

6.2.6.13. The infusion may be interrupted by depressing the Start/Stop switch once. The pump will stop, and the display will show "Stop" and the volume infused alternately. Depress the Start/Stop switch again to resume the infusion. If the infusion is interrupted for greater than sixty seconds, an audible alarm will sound to signal that the pump has been stopped for longer than a minute. The alarm may be silenced by pressing the Start/Stop switch, but it will reactivate after 60 more seconds.

6.2.6.14. Change the flow rate and/or total volume to be infused by interrupting the infusion then selecting the rate and/or total volume to be infused. Resume the infusion by depressing the Start/Stop switch.

**NOTE:** If this procedure is not followed exactly, the tamper alarm feature of the MTP 1001AF will be initiated.

6.2.6.15. To completely erase the previous total volume infused, the Stand by-Off/On switch must be turned off.

### **6.2.7. Terminating I.V. Administration.**

6.2.7.1. Stop the infusion by pressing the Start/Stop switch. Close the clamps on the I.V. pump set, then disconnect the I.V. pump set from the patient. Record the total volume infused from the Alphanumeric display. Remove the blue inlet connector from the upper slot of the rotor panel and pull the silicone tubing from the track while rotating the pump rotor counterclockwise. Remove the clear outlet connector from the lower slot of the rotor panel and dispose of the I.V. pump set. Depress the Standby-Off/On switch to turn power to the pump off.

### **NOTES:**

The I.V. pump set may be removed from the pump without disconnecting it from the patient, allowing infusion by gravity to occur if needed.

**WARNING:** If any condition arises that may cause harm to the patient, stop the pump, remove the I.V. tubing from the pump, and infuse by gravity. Use the tubing clamps to regulate the infusion rate.

## Chapter 7

### MISCELLANEOUS USER'S GUIDE

#### 7.1. Collins Traction.

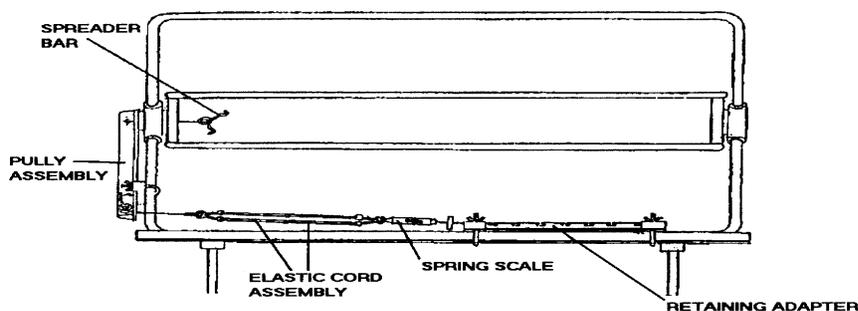
**7.1.1. Purpose.** The Collins Traction Device (**Figure 7.1.**) provides constant traction for patients during transportation on a Stryker "A" Frame.

**WARNING:** The Collins Traction Device should be applied at the originating facility but when necessary may be applied on the fight line only with a physician present.

**7.1.2. Description.** The Collins Traction Device consists of six (6) components:

- 7.1.2.1. Spreader Bar.
- 7.1.2.2. Pulley Assembly with Clevis Device.
- 7.1.2.3. Elastic Cord Assemblies.
- 7.1.2.4. Spring Scale Assembly.
- 7.1.2.5. Retainer Adapter.
- 7.1.2.6. Canvas carrying case for Collins Traction Storage.

**Figure 7.1. Collins Traction Attached To Stryker "A" Turning Frame.**



**7.1.3. Pre-flight.** Inventory the components to ensure they are all present. Check for elasticity of Elastic Cord Assemblies, and ensure all other components are serviceable. The North Atlantic Treaty Organization (NATO) Traction Device is usually carried with the Collins Traction. Ensure it is present and serviceable. A Head Harness is also usually carried with the Collins Traction.

#### 7.1.4. Set-up and Operation.

7.1.4.1. Attach the Retainer Adapter to the horizontal portion of the runner of the Stryker "A" Frame, about four (4) feet from the end of the frame the Pulley Assembly will be attached to. Remove the Clevis device from the end of the cable on the Pulley Assembly, and pass the cable through the orifice in the hub of the Stryker "A" Frame. Reattach the Clevis device to the cable and secure it to the Spreader Bar on the patient's harness. A physician must maintain traction on the patient while the traction is being set up.

7.1.4.2. Insert the fitting guiding the cable at the upper end of the Pulley Assembly into the orifice of the frame hub and fasten the assembly to the frame with the J-Bolt on the assembly. Attach the Elastic Cord Assemblies to the ring at the end of the cable on the Pulley Assembly. If up to 30 pounds (lbs) of traction is required, use one (1) elastic Cord Assembly. Use two (2) Cord Assemblies if 30 to 60 lbs of traction is required.

7.1.4.3. Attach the Elastic Cord Assemblies to the ring at the top of the scale. Pull on the handle at the base of the scale until the desired amount of traction is indicated. Attach the ring at the handle end of the scale to the appropriate notch in the Retainer Adapter to maintain the required traction. Check for patient comfort, traction applied, and cable alignment on the Pulley Assembly. The Clevis Device must be at least one inch away from the hub on the Stryker "A" Frame.

## 7.2. Digital Thermometer.

**7.2.1. Purpose.** Digital thermometers are used to provide quick, accurate, easy to read displays of patient temperatures.

**7.2.2. Description.** Digital thermometers vary in specific design, but generally have a probe that resembles a regular glass thermometer, attached to a larger portion that has a display screen, an on/off switch, and houses a battery. Probe covers are provided to cover the probe while the thermometer is being used.

**7.2.3. Pre-flight.** Switch on the thermometer to ensure it will power on, then switch it off. Consult the instructions for the specific type of thermometer being used, to determine what is required for an adequate functional check. Inspect the thermometer for any signs of damage. Ensure adequate quantities of probe covers are available.

**7.2.4. Operation.** Place a probe cover on the thermometer, switch it on and place the thermometer in position for the type of temperature that is required (oral, axillary, or rectal). Oral temperatures are not recommended for children less than three (3) years old.

**CAUTION:** Closely supervise all patients using digital thermometers to prevent the sensor or sensor probe from being bent, bitten, or dropped.

## 7.3. NATO Litter.

**7.3.1. Purpose.** The NATO Litter is used to provide a safe means of transporting non-ambulatory patients.

**7.3.2. Description.** The NATO Litter consist of two types. The first one is made up of two (2) parallel poles connected by two (2) collapsible spreader mechanisms, one at each end of the poles, and with a canvas cover attached to the poles. The second NATO Litter is a DECON Litter that is made up of two (2) parallel poles with adjustable handles, connected by two (2) collapsible spreader mechanisms and a decontaminable polypropylene cover. Litter pole length can be adjusted from 90 inches to 94.4 inches to accommodate placement in helicopter.

**7.3.3. Pre-flight.** Open the litter and inspect it for damage. Ensure the litter handles and spreader mechanisms are intact. Inspect handle locking mechanisms for proper operation on the DECON Litter.

**NOTE:** The canvas may have a tear up to one inch long. Any longer tear will require that the canvas be replaced.

**NOTE:** Only canvas litters or DECON Litters with the polypropylene cover will be used in AE. Litters made of nylon mesh or any other material are not to be used. Any patient brought to the flightline on a nylon mesh litter will be transferred to a canvas/DECON litter prior to enplaning.

#### **7.3.4. Operation.**

7.3.4.1. Open the litter, engage spreader mechanism, and place litter mattress, with its valve open, on it.

7.3.4.1.1. Ensure adjustable handles on DECON Litter are secured in the extended position.

**NOTE:** May only use “Black” DECON Mattress with DECON Litter. Mattress comes with straps attached to each corner for securing to DECON Litter.

7.3.4.2. Dress the litter with top and bottom sheet and one blanket. Fold the top sheet and blanket toward the foot of the litter..

7.3.4.3. Place the pillow case on the pillow and place the pillow at the head of the litter. Fold the second blanket and place under the pillow.

7.3.4.4. The patient is placed on the litter, covered with the sheet and blanket as necessary, and secured to the litter with two (2) litter straps. The straps are placed mid-thigh and on the upper chest of the patient. Secure the litter straps so the buckles are on the aisle side of the litter, and lay the excess strap flat over the patient. DO NOT tie the excess strap in a knot.

**NOTE:** Although hospital personnel normally set up patient litters, AECMs are responsible for ensuring that the litters have been correctly prepared prior to enplaning.

**NOTE:** In addition to the NATO Litter, a litter mattress, two (2) sheets, two (2) blankets, a pillow, pillow case, and two (2) litter straps are required to prepare the litter.

**NOTE:** A minimum of three (3) people must be used when lifting litter patients into or out of an ambulance or any vehicle that does not have a ramp.

#### **7.4. NATO Litter Backrest.**

**7.4.1. Purpose.** The NATO Litter Backrest is used to provide elevation for a patient’s head while on a NATO Litter.

**7.4.2. Description.** The NATO Litter Backrest is composed of a metal U-shaped frame that clamps to a NATO Litter by spring mechanism in two (2) positions: 30 degrees and 90 degrees. A canvas cover fits over the frame and provides a surface for the mattress to rest on.

#### **7.4.3. Pre-flight.**

7.4.3.1. Check the NATO Litter Backrest Frame for any damage or if it has been stretched open too far.

7.4.3.2. Check the NATO Litter Backrest cover for any tears in the material.

#### **7.4.4. Operation.**

7.4.4.1. Raise the head end of the litter mattress and clip the backrest frame to the litter in either the 30 degrees or 90 degrees position. The frame is reversed to produce one angle or the other. Slide the backrest cover over the frame with the cover flap to the foot end of the litter. Tuck the flap smoothly under the mattress and lower the mattress into the backrest. Tuck the sheets

between the mattress and the backrest. Position the patient so their hips are over the backrest cover flap. Ensure that the patient's head does not extend above the top of the backrest frame. Secure the patient with a minimum of two (2) litter straps. Place one (1) strap across the patient and litter at mid-thigh. Place the other strap across the patient's chest in the axillary region, then thread the strap through the stirrups and secure it.

**NOTE:** The NATO Litter Backrest can be set for 30 degree or 90 degree elevation. However, the 90 degree position CANNOT be used for takeoff or landing, or carrying a patient on the litter.

**NOTES:**

A three (3) or four (4) person carry will be used when enplaning/deplaning a litter patient with a backrest in place. In the interest of safety, AECMs may revert back to a two (2) person carry once inside the aircraft. Backrest will not be in the 90 degree position.

**WARNING:** Ensure that the patient can reach their emergency oxygen mask when the backrest is in place.

**NOTE:** The NATO Litter Backrest can be used with the Overweight Patient Litter (OWL).

## **7.5. NATO Traction Device.**

**7.5.1. Purpose.** The NATO Traction Device provides a quick, simple means of applying traction to litter patients. The device can be used to provide traction to a patient's head or lower extremities.

**7.5.2. Description.** The NATO Traction Device consists of two (2) metal cups connected by a bungee cord, and with an S-Hook on the bungee cord.

### **7.5.3. Pre-flight.**

7.5.3.1. Inspect all component parts for any signs of damage or missing parts. Ensure that the bungee cords are not frayed in any manner or are loose at their attaching points of the litter cups.

**NOTE:** The NATO Traction Device is normally stored with the Collins Traction Device.

### **7.5.4. Set-up.**

7.5.4.1. Secure the metal caps to both of the litter pole handles, at either end of the litter (**Figure 7.2.** and **Figure 7.3.**).

7.5.4.2. Maintain the traction on the patient while an assistant removes the original traction device.

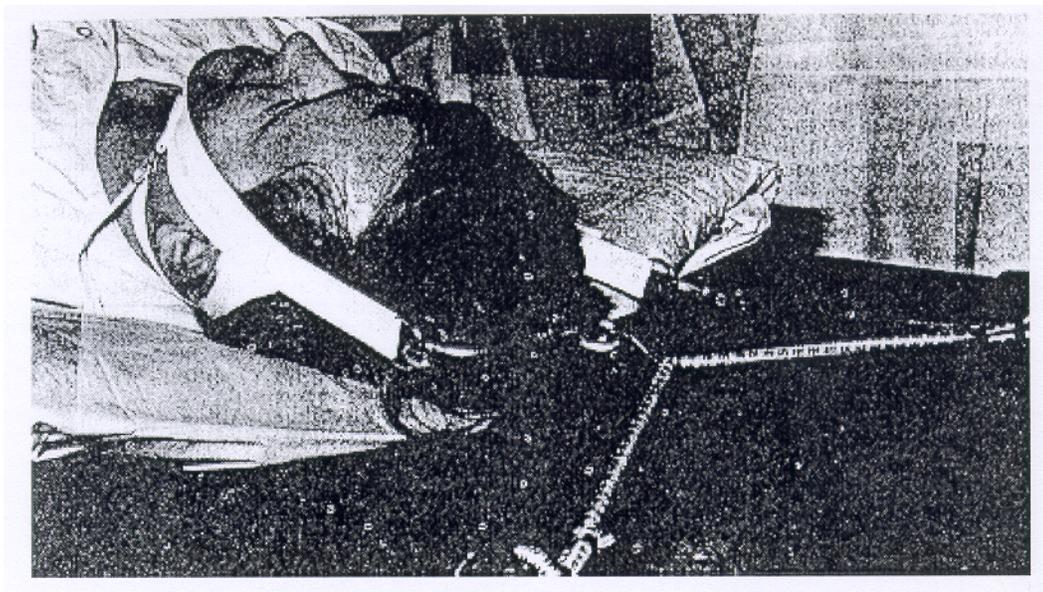
7.5.4.3. Attach the "S" hook to the patient's traction harness.

**NOTE:** 10 lbs of traction is obtained when the cord is extended to the edge of the litter canvas.

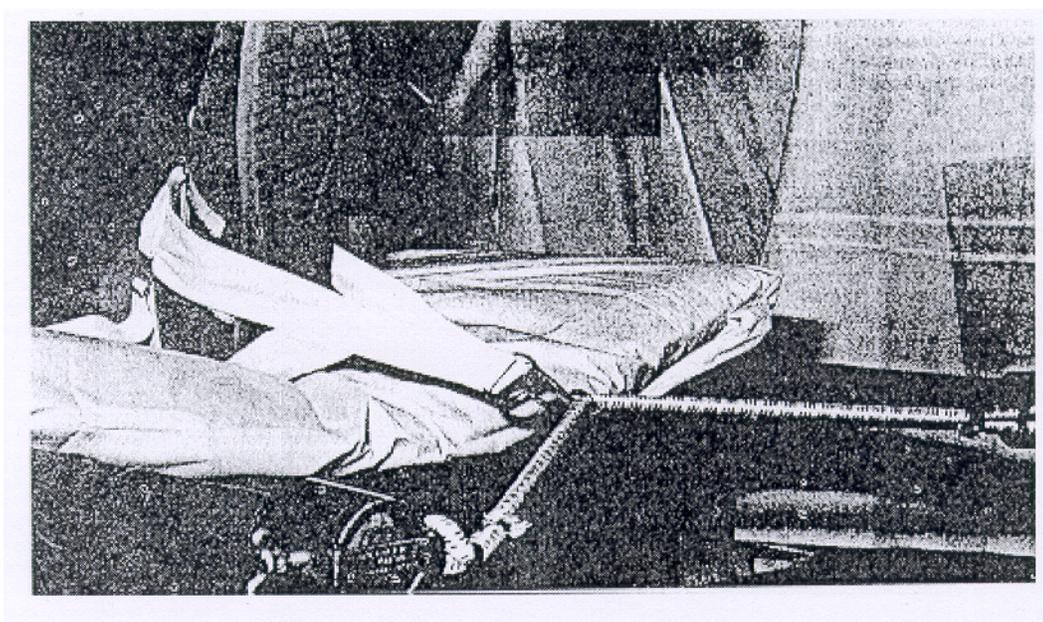
**NOTES:**

If unable to obtain traction, the bungee cords may be weak. Replace the entire NATO traction unit.

**Figure 7.2. NATO Traction Device Connected to Patient.**



**Figure 7.3. NATO Traction Device Attached to Litter.**



**7.5.5. Set-up:**

7.5.5.1. Loosen retention bolts on the metal cups.

7.5.5.2. Place cups on the ends of the litter poles.

7.5.5.3. Tighten retention bolts on the metal cups.

**7.6. Overweight Patient Litter (OWL).**

**7.6.1. Purpose.** The OWL is used to transport non-ambulatory patients who weigh in excess of 250 lbs.

**7.6.2. Description.** The OWL is made of plywood secured to four (4) standard NATO Litter poles, and has two (2) litter poles with handles mounted at the normal width for securing in litter stanchions. The plywood extends over the poles by four (4) inches on either side of the litter, and along with the handles provide lifting points for a maximum of 12 litter bearers.

**7.6.3. Operation.** Dress the OWL using a standard litter mattress in the same manner as a NATO Litter. Place the patient on the litter and secure them with a minimum of three (3) litter straps placed through the hand-holds on the sides of the litter.

**NOTE:** A minimum of a six (6) person lift and carry is mandatory. Hand-holds are available for a maximum of 12 litter bearers.

7.6.3.1. The OWL is enplaned in the same manner as all other litters. Securing the litter on the aircraft is as follows:

7.6.3.1.1. On the C-9A aircraft, secure the litter in any lower litter position in any litter tier.

7.6.3.1.2. On C-130 aircraft, secure the litter in any center line litter tier to allow for ease of enplaning and deplaning. the stirrup shoring should be resting on the aircraft floor. A blanket can be placed under the shoring if desired.

7.6.3.1.3. On C-141 aircraft, the litter can be secured to a lower bulkhead tier. It can be secured to a center line tier above the stanchion restraint cable, but that position is not recommended.

**NOTE:** The Overweight-Patient Litter is extra wide (30 inches), and will extend into the aircraft cabin aisle. If a litter patient is not being transported over the patient on the OWL, an empty litter must be placed over it for safety.

**NOTE:** A NATO Litter Backrest may be used with the OWL. Insert the Backrest Frame Clamps through the hand-holds at the head end of the litter.

7.6.3.2. When transporting the OWL by ground transportation, a vehicle that will accommodate the 84 inch X 30 inch litter and an attendant must be used. A request for a suitable vehicle to accommodate the OWL must be made in the OFFLOAD Message.

**NOTE:** It is the responsibility of the medical crew to instruct personnel assisting with the enplaning or deplaning before the patient is moved.

**WARNING:** NEVER set the OWL on top of bus seats, as there is no way to adequately secure the litter

## **7.7. Stryker "A" Frame Turning Bed.**

**7.7.1. Purpose.** The Stryker "A" Frame Turning Bed is used to transport patients who are paralyzed, have traumatic back or spinal cord injuries, spinal fractures, or extensive soft tissue injuries. The turning frame allows the patient to be turned either from the supine to prone position or vice versa. The frame allows the application of Collins Traction to patients requiring traction, while maintaining the ability to turn the patient.

**7.7.2. Description.** The frame consists of two (2) support runners connected to two (2) turning disc assemblies (**Figure 7.4.**), an overhead frame, an anterior patient frame, and a posterior patient frame. The assembled frame is supported on a carriage base. The posterior and anterior frames fit over bolts attached to the turning discs which attach to a hub which has a locking pin to lock the disc in place when the frames are horizontal. The posterior and anterior frames are secured to the bolts on the turning disc by knurled nuts, while the distance between both frames is controlled by spacing nuts on the bolts. The support runners and overhead frame fit into sleeves on the turning discs and are secured by Allen screws in the sleeves. Receptacles in the horizontal part of the support runners provide for installation of arm supports. A foot support attaches to the posterior frame by spring action. On aircraft, the carriage base is placed on wooden support blocks (Approx. 2" X 4" X 4") or folded blankets to protect the aircraft floor.

**7.7.3. Pre-flight.** Ensure all screws on the frame are tight and that the frame is securely assembled. Ensure all equipment to include two (2) arm supports, a foot support, extra pillows for padding and two (2) stabilizer bars or straps are available and secured to a litter. Ensure an Allen wrench for the screws is available. Inspect the carriage base and ensure it is securely assembled and is serviceable. Ensure a Collins Traction device is available.

**NOTE:** The operation of the Stryker "A" Frame Turning Bed is broken down into three (3) areas: Enplaning, In-flight, and Deplaning.

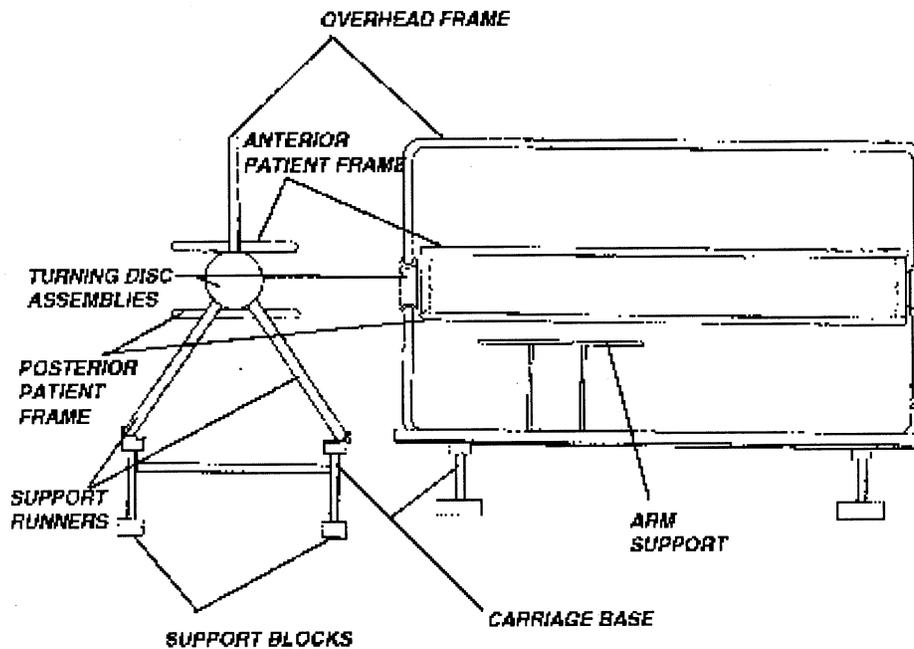
**7.7.4. Enplaning. CAUTION:** Do not place the frame directly on the floor of the aircraft. Remove the wheels from the carriage base and place wooden blocks (or other insulating material) under the legs of the carriage base to lesson vibration to the patient and prevent aircraft floor damage.

**NOTE:** The Stryker "A" Frame requires a complete litter tier. Prior to enplaning ensure the pre-flight is accomplished, and brief the patient before attempting any procedures.

**WARNING:** If the patient is in traction, ensure that swinging weights are not used. Use only Collins Traction.

7.7.4.1. Ensure the patient is properly secured to the posterior frame using three (3) litter straps. Place two (2) around the patient and the posterior frame with one (1) high on the chest, and the other in the mid-thigh position. The third strap is placed in the center of the frame, and encircles the posterior frame and the overhead frame.

**Figure 7.4. The Stryker "A" Frame and Components - Side View.**



**NOTE:** When securing the third strap, lift up on the posterior frame slightly. This strap reduces vibration during patient movement, and on the aircraft.

7.7.4.2. Ensure stabilizer bars are installed on diagonally opposite corners, between the support runners and the posterior frame. If stabilizer bars are not available, use litter straps around the support runner and the posterior frame at diagonally opposite corners of the frame.

7.7.4.3. Secure the anterior frame and all other equipment on an equipment litter and secure this litter high in the assigned tier. If the Stryker "A" Frame is brought with wheels, remove them and secure them in a safe place on the aircraft. Place the legs of the carriage base into the wooden support blocks on the floor beneath the equipment litter. Use a minimum of four (4) persons to enplane a patient on a Stryker "A" Frame.

**WARNING:** Any personnel participating in moving the patient must be instructed on the proper techniques. These instructions should state that the overhead frame is not used for lifting or carrying the frame.

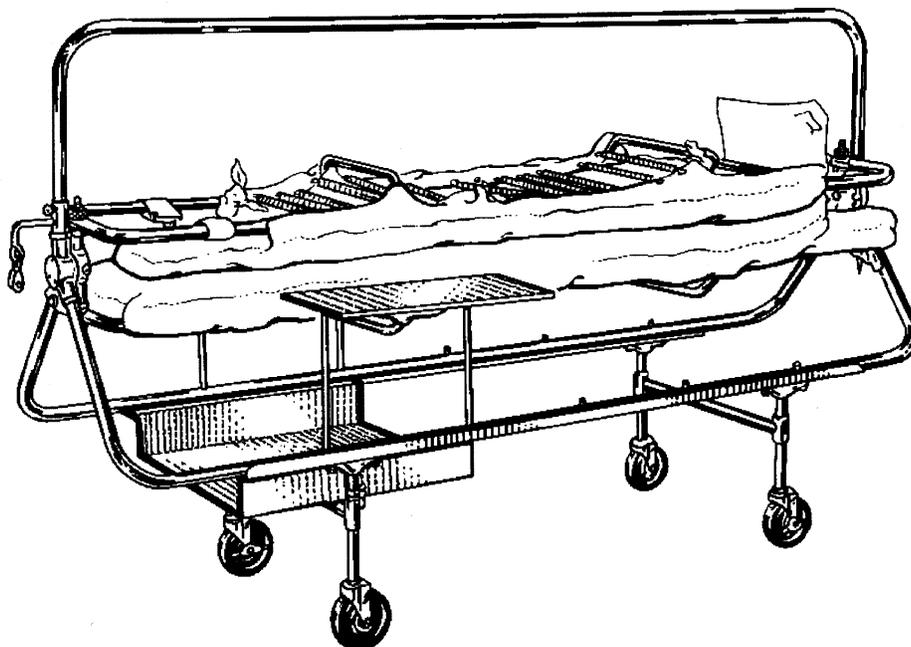
7.7.4.4. Place the Stryker "A" Frame on the carriage base and secure it to the floor using a cargo tie-down strap at each end (**Figure 7.5**). Connect the hook end of a tie-down strap to a D-ring secured below the end of the Stryker "A" Frame. Wrap the strap around the vertical portion of each support runner twice, leaving no slack in the strap. Connect the ratchet end of the strap to the D-ring, take up the slack, and tighten both cargo tie-down straps at the same time. Make the straps snug, but do NOT over tighten them as it may result in bending the frame.

7.7.4.5. Set foot support on the posterior frame if needed. Place arm supports in receptacles on support runners as needed. Use a litter strap around the arm support and carriage base to secure the support.

**NOTE:** A seven (7) foot Stryker "A" Frame may be placed and secured in the cantilever arms on the C-9A aircraft. The frame is placed on the carriage base and the height of the arms adjusted to fit the frame. Cargo tie-down straps are not required.

**7.7.5. In-flight.** During flight, the patient is usually left in the prone position for an hour, and in the supine position for two (2) hours unless otherwise ordered.

**Figure 7.5. The Stryker "A" Frame and Components - Top View.**



**NOTE:** This should be ordered by the patient's physician.

#### **7.7.6. Turning the Patient.**

7.7.6.1. Turning the patient safely requires two (2) medical crew members working together as a team. The crewmember located at the patient's head is responsible for briefing the patient and evaluating all medical equipment being used on the patient. This crewmember also coordinates the activities of the team in performing the turn.

7.7.6.2. Brief the patient on the turning procedure. Note the location of intravenous (I.V.) insertion site and ensure the tubing is free to accomplish the turn without disconnecting the I.V. tubing. In general, turning the patient to the opposite side of the I.V. insertion will allow enough free tubing to accomplish the turn without accidentally disconnecting the I.V. tubing. Foley catheters do not need to be clamped shut or disconnected for turning. The drainage tube should be routed between the patient's legs and the collection bag placed between the end of the frame the patient is on, and the vertical portions of the support frame. Collins traction will not be affected by turning the frame. Remove the support, arm support, and pillows as appropriate, and secure them on the equipment litter. Gently remove the litter strap secured around the overhead frame and the frame the patient is on, using both crew members. Remove one other litter strap from the patient, and pad the patient with pillows to ensure comfort and security of the patient. Remove the lock nuts from the turning disc bolts using both hands, and keep them in your hands. NEVER lay them on the

floor or place them in a pocket. Remove the anterior or posterior frame (as appropriate) from the equipment litter, working together as a team. Place the frame over the patient and secure it with the lock nuts. Remove the remaining litter strap from the patient and place three (3) litter straps so they encircle the anterior frame, the patient, and the posterior frame. Position the straps high on the chest, at the hips, and above the knees. Release the stabilizer bars or straps in unison and assume a squatting position near the end of the frame. One crew member should be at each end of the Stryker "A" Frame (Head and Foot ends). When ready to turn the patient, both crew members pull out the locking pins at their end of the frame and tilt the patient frames slightly in the planned direction of the turn and release the pin.

**NOTE:** The locking pins will remain unlocked until the turn is complete.

7.7.6.3. With both hands on the same patient frame, the crewmember at the head calls the turn which is then made quickly, smoothly, and uninterrupted.

**WARNING:** Never stop the turn part way.

7.7.6.4. Immediately ensure that the locking pins have returned to the locked position, and visually and verbally check the condition of the patient. Ensure that Foley catheter tubing and I.V. tubing and insertion sites are not twisted or disconnected. Remove all three (3) litter straps from around the frames and patient. Remove the lock nut from the head end of the frame, and resecure the chest strap around the patient and the frame they are on. Remove lock nut from foot end of frame, remove frame from bolts on turning discs and resecure on equipment litter using both crew members. Replace lock nuts on turning disc bolts, then remove and resecure padding as necessary. Replace the litter straps at the mid-thigh area and over the overhead frame. Replace the stabilizer bars or straps simultaneously. Replace foot support and arm supports as required.

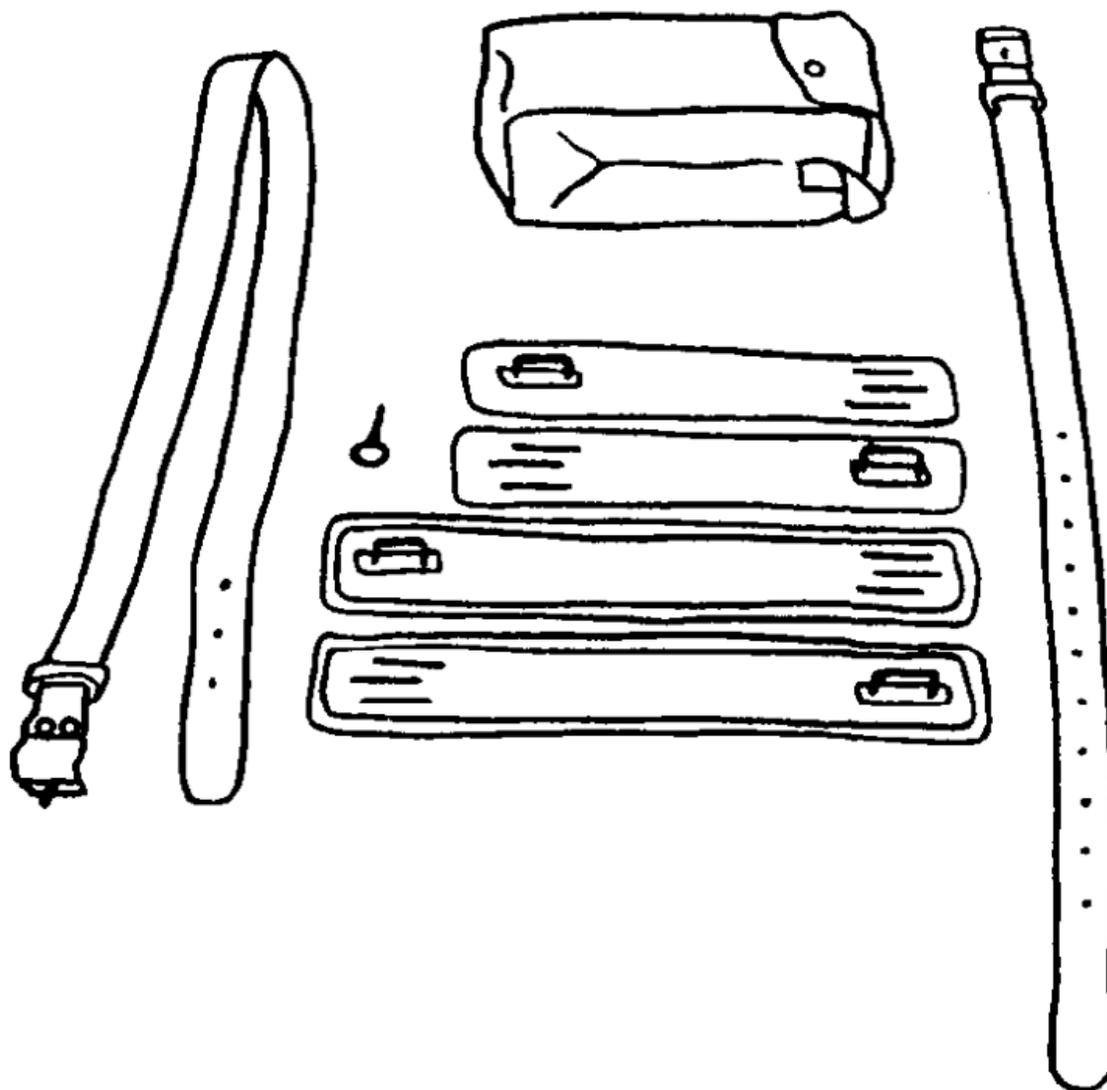
**7.7.7. Deplaning.** Brief the patient on the deplaning procedure, and ensure the turning frame assembly, stabilizer bars or straps, and all litter straps are tight and secure. Ensure that I.V. tubing, Foley catheter tubing and collection bag, and Collins Traction are secure if applicable. Remove arm supports if used, and secure them on the equipment litter. Remove both cargo tie-down straps simultaneously if used, or release cantilever arms. Deplane the Stryker "A" Frame and patient, using at a minimum a four (4) person carry after ensuring that all personnel are briefed in proper lifting and carrying techniques. Deplane the equipment litter with all Stryker "A" Frame parts and accessories including the wheels if present, and deplane the carriage base.

## **7.8. Leather Restraint Set.**

**7.8.1. Purpose.** Restraint sets provide physical restraint of patients who are mentally compromised and who are at risk of injuring themselves or others.

**7.8.2. Description.** The restraint sets are comprised of two ankle cuffs, two wrist cuffs, one short and one long leather strap, one restraint key, and a carrying case. Figure 7.6. shows the cuffs, straps and key. The cuffs and straps are made of leather and have metal attachments for connecting straps to cuffs, and for locking straps.

**7.8.2.1.** Cuffs are made with a metal loop at one end, and three adjustment slots at the other end. The straps are made of leather and are made to fit through the metal loops of the cuffs.

**Figure 7.6. Leather Restraint Set.**

## LEATHER RESTRAINT SET

**7.8.3. Pre-Flight .** Inspect the components for any damage. Ensure that all components are present and that the restraint lock key is not bent.

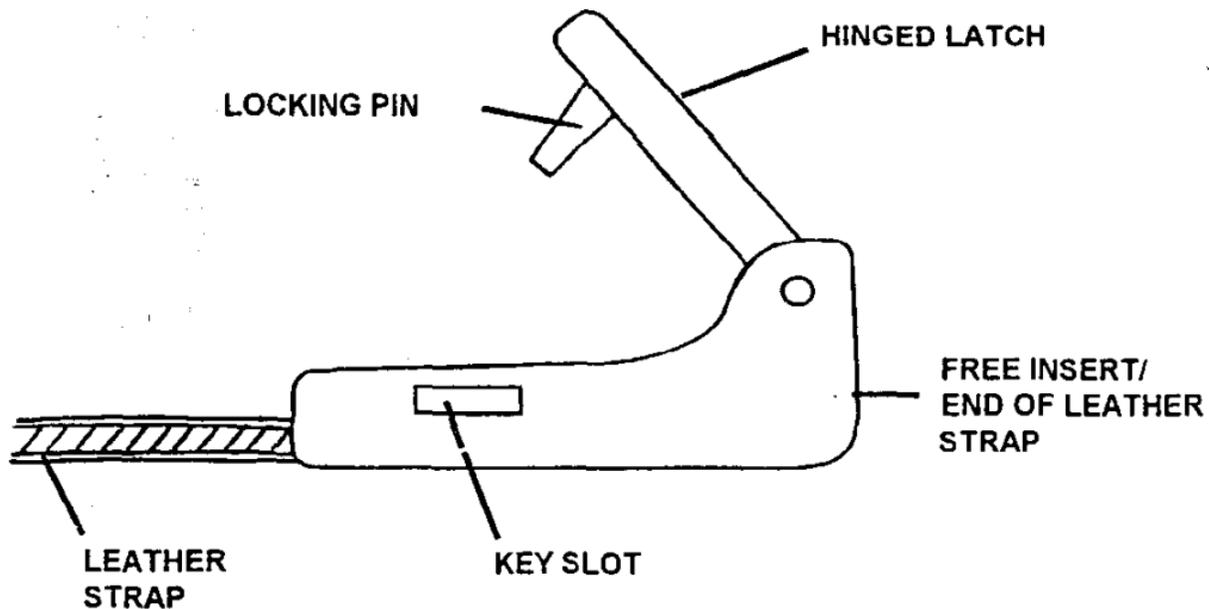
**7.8.4. Operation.** Place a wrist cuff around each wrist with the metal loop on the inner side of the patient's wrist, and slide one of the three slots over the metal loop to produce a snug fit around the wrist. Use padding as necessary to prevent skin irritation and to provide a snug fit. Thread the long strap through the metal loop on the wrist cuff by the aisle, starting on the side closer to the elbow. Extend the strap across the patient's body and thread it through the metal loop on the other wrist cuff

from the hand side. Pass the strap behind the patient and slide the end through the metal locking device (**Figure 7.7.**). Do not secure the strap to the litter.

**WARNING 1:** Restraints are placed on patients who pose a threat of injury to themselves or others. Care must be exercised during placement of the restraints to protect all persons involved. Use at least two persons to apply the restraints.

**WARNING 2:** The restraints are never used to secure the patient to the litter.

**Figure 7.7. Locking Device on Leather Straps .**

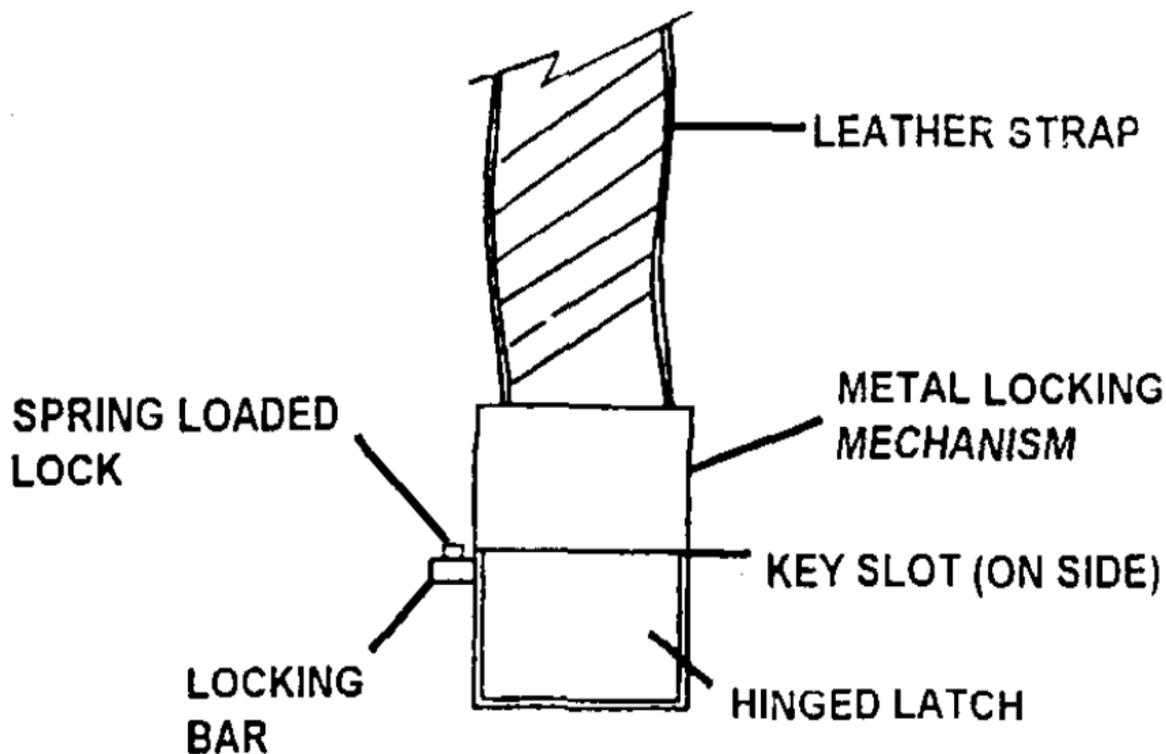


### LOCKING DEVICE ON LEATHER STRAPS

**NOTE:** Place locking device toward the aisle.

7.8.4.1. Adjust the strap so the patient is able to touch his or her face, then lock the strap in place. The locking mechanism (**Figure 7.8.**) is locked by pushing in the spring loaded latch and sliding in the locking bar after the hinged latch has been rotated into the closed position.

Figure 7.8. Locking Device on Restraint Straps.



7.8.4.2. The ankle restraints are placed in a similar manner with the cuffs placed around the ankles with the metal loop positioned to the inner portion of the leg. The short strap is threaded through both loops and adjusted to allow a reasonable walking step to be taken, then locked.

7.8.4.3. The locking devices are opened by sliding the restraint key into the key slot, on the metal locking device. To release the spring loaded lock, push the locking bar out to the open position, lift the hinged latch, and slide the strap to loosen or tighten it as necessary.

7.8.4.4. Since the cuffs are snug on the wrists and ankles, check circulation to all extremities at least hourly. Check security of the locking devices at least hourly as well, and ensure the cuffs remain snug.

**7.8.5. Summary.** Restraints are used to physically restrain patients who are a threat to themselves and/or others. The restraint set provides for restraint of arms and legs while allowing some movement of limbs to the patient.

### 7.9. Century "Smart Move" Infant/Toddler Car Seat.

Figure 7.9. The Century "Smart Move" Infant/Toddler Car Seat – Front View.



**7.9.1. Purpose:** The Century "Smart Move" Car Seat is certified for restraint of infants and toddlers during transport in motor vehicles and aircraft.

**7.9.2. Description:** The Century Car Seat accommodates infants and toddlers from birth to 40 lbs. or 40 in. Car seat may be positioned forward or aft facing according to occupant's size. Seat belt threading points are available for both positions. The car seat has four adjustable seating positions numbered 1-4 on the left side. Two reclining positions (#1-fully reclined and #2-semi-reclined) provide a maximum 47 degree recline and do not lock in fixed position. On impact, the reclined seat automatically adjusts to an upright position for greater protection. Two sitting positions (#3-semi-upright and #4-upright) provide some upright adjustment and lock in fixed position. Either of two Blue Release Levers (one front and one rear) may be used to rotate the car seat to the selected position. An adjustable Five-Point Harness restrains the occupant as follows: A Two-Piece Harness Tie connects the shoulder straps at the chest (two points), and two Metal Tongues slide down the shoulder straps and plug into the Crotch Strap Buckle between the legs (three points). Both buckles have push button, quick release mechanisms for rapid operation. The Shoulder Harness is threaded through one of three sets of matching slots in the seat back to accommodate shoulder height. The Crotch Strap extends

upward from the seat bottom and is not adjustable. On the back of the car seat, the Shoulder Harness attaches to a Metal Splitter Plate connected to a black Quick Adjustment Strap. The black Quick Adjustment Strap and Release Tab are located at the front of the car seat and rapidly tighten or loosen the Harness Straps. A Level Indicator is located on the left side of the seat to ensure proper positioning when securing the seat (rear-facing only). And finally, a removable Infant Support Pillow supports neck and body alignment of smaller occupants. Turning the pillows inside out provides some adjustment to accommodate larger infants.

**7.9.2.1.** Cuffs are made with a metal loop at one end, and three adjustment slots at the other end. The straps are made of leather and are made to fit through the metal loops of the cuffs.

### **7.9.3. Components:**

7.9.3.1. Plastic Seat Frame and Styrofoam Liner (white).

7.9.3.2. Headrest Foam (yellow).

7.9.3.3. Seat Cover with four Attachment Clips.

7.9.3.4. Adjustable Infant Support Pillow with four Velcro Attachments.

7.9.3.5. Harness Strap with sliding Two-Piece Harness Tie (connects at chest) and two sliding Metal Tongues (connect to Crotch Strap Buckle).

7.9.3.6. Crotch Strap and Buckle secured by Metal Crotch Strap Clip underneath seat.

7.9.3.7. Locking Clip stored on bottom of seat (used on Combination Lap/Shoulder Belt with sliding Latch).

7.9.3.8. Quick Adjust Strap (long black) connected to Metal Splitter Plate.

7.9.3.9. Quick Release Pull Tab (short black).

7.9.3.10. Level Indicator. (left side of car seat)

### **7.9.4. Preflight.**

7.9.4.1. Observe the back of the Car Seat for manufacturer's "Do Not Use After" date, which is imprinted on the plastic of the seat back.

7.9.4.2. Inspect the Car Seat Frame, Styrofoam Liner, and Headrest Foam for general cleanliness and damage.

7.9.4.3. Observe Seat Cover's four attachment clips for serviceability and secure attachment.

7.9.4.4. Inspect Infant Support Pillow and four Velcro Connectors for cleanliness and function.

7.9.4.5. Test Front and Rear Release Levers lockup and release in all four-seat positions.

7.9.4.6. Confirm spring operation by manually pushing seat from reclining positions #1 and #2 to sitting position while observing spring resistance and return to selected position.

7.9.4.7. Confirm positive seat lock in fixed sitting positions #3 and #4.

7.9.4.8. Ensure Harness Straps are not frayed and stitching is intact.

7.9.4.9. Confirm Shoulder Harness Straps are threaded through matching slots (same height).

- 7.9.4.10. Inspect rear of seat for proper positioning of Harness Loops on Splitter Plate (right on first, then left with both inside splitter plate).
- 7.9.4.11. Examine Crotch Strap Clip underneath seat for secure attachment on metal plate.
- 7.9.4.12. Clear Buckle and Harness Tie of loose objects, food particles, or any other debris.
- 7.9.4.13. Connect Buckle of the two piece shoulder harness and, pull to test secure latching, and confirm function of quick release mechanism.
- 7.9.4.14. Connect metal tongues of shoulder harness to crotch strap buckle, and pull to test secure latching, and test quick release button on crotch strap.
- 7.9.4.15. Pull long black Quick Adjust Strap, observe harness tightening, and test lock-up by pulling shoulder harness.
- 7.9.4.16. Pull Quick Release Tab and pull shoulder harness to confirm proper release.
- 7.9.4.17. Visualize Level Indicator for movement of indicator ball.

### **7.9.5. Operation:**

**NOTE:** The manufacturer's instructions were written for forward facing Motor Vehicle and Civilian Aircraft Seats. Therefore, Aeromedical Evacuation Applications may appear to be in conflict with strict interpretation of manufacturer's instruction manual and instruction stickers located on the car seat. Refer to this equipment guide for Aeromedical Evacuation applications.

**WARNING:** Preterm or low birth weight infants may be at special risk in a vehicle or aircraft. According to the American Academy of Pediatrics, these infants may suffer breathing difficulties while reclined in a car seat. Manufacturer advises the physician or hospital staff evaluate the infant and recommend proper car seat or bed before leaving the hospital. In the Aeromedical Evacuation Environment, the AECM shall secure the infant and ensure the airway is protected. Any questions or concerns should be addressed to the Flight Surgeon.

**NOTE:** Car seats will always be placed along the fuselage of the C-9A. For all aircraft, car seats will not be secured in seats adjacent to an "Emergency Exit" or interfere with the distribution of "Emergency Oxygen Masks."

**NOTE:** When using car seat in reclined or semi-reclined positions, it is necessary to recline passenger seat, impeding egress behind it. Therefore, that seat will be kept vacant.

- 7.9.5.1. NATO Litter/Backrest Configuration.

**Figure 7.10. The Century Car Seat attached to NATO Litter/Backrest – Aft facing View.**



7.9.5.1.1. Litter/Backrest combination faces aft with backrest 90° upright at forward end of litter.

7.9.5.1.2. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.9.5.1.3. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.9.5.1.4. Now tighten litter strap one so that the buckle is beneath the bottom of the car seat's base so that it does not interfere with rotation of the car seat mechanism.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.9.5.1.5. Car seat is placed on the litter/backrest in the aft facing position and held firmly against the backrest and litter.

7.9.5.1.6. Level indicator is observed for green alignment.

7.9.5.1.7. Third litter strap is threaded through seat the car seat belt slots closest to backrest and passed through the litter stirrups to be buckled and tightened.

7.9.5.1.8. Wrap both ends of the second strap over the outside corners of the car seat's base and return to the stirrups for securing (a fourth strap is required to extend the strap for securing).

7.9.5.1.9. Rock car seat back and forth and side to side to ensure little or no movement occurs.

7.9.5.1.10. Re-check level indicator.

**CAUTION:** Cargo tie down straps if used should only be ratcheted tight enough to allow minimal movement of car seat in all directions. Over tightening can overstress molded plastic parts of the car seat resulting in weakening or damage.

7.9.5.2. Side facing troop Seat Configuration.

**Figure 7.11. The Century Car Seat attached to troop seat – Side View.**



**NOTE:** This method of securing is not intended for the troop seats on the C-17.

7.9.5.2.1. Car seat is always positioned aft facing on side facing Troop Seat.

7.9.5.2.2. Level car seat.

7.9.5.2.3. Take down the seat back webbing for two side-by-side seats.

7.9.5.2.4. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to it self, but do not tighten completely.

7.9.5.2.5. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.9.5.2.6. Tighten litter strap #1 so that the buckle is beneath the bottom of the car seat's base ensuring it does not interfere with rotation of the care seat mechanism. Place the car seat on a wool blanket.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.9.5.2.7. Place litter strap #3 through the seatbelt slots located at the back of the car seat.

7.9.5.2.8. Bring strap #3 around the front and the back of the seat bottom tubes and secure tightly below the seat.

7.9.5.2.9. Wrap both ends of strap #2 over the outside corners of the car seat's base and place around the front and the back of the seat bottom tubes. Secure tightly below the seat.

7.9.5.2.10. Level car seat. Ensure rotation of car seat is not impeded.

#### 7.9.5.3. Aft Facing Blue Seat Configuration.

**WARNING:** Car seat and occupant face aft regardless of age and size (40 lb., 40 in. maximum).

**NOTE:** Occupants up to 30 lbs. or 12 months will use reclined (#1) or semi-reclined (#2) position.

**NOTE:** Occupants over 30 lbs. or 12 months will use semi-upright (#3) or upright (#4) position.

7.9.5.3.1. To install Car Seat. Squeeze blue lever at front or rear of car seat and Move Car Seat to appropriate Reclined or Upright Position (#1-#4) by aligning pointer to desired position and confirm positive lock.

**NOTE:** Because of car seat design, you may experience some movement of the pointer in positions #1 and #2 during vehicle seat belt tightening. This is normal as long as the pointer stays within the red zone for the selected position.

7.9.5.3.2. Thread litter strap through openings closest to seat back (over top of blue recline lever and beneath straps) and buckle around the passenger seat.

7.9.5.3.3. Press down firmly in center of car seat to compress passenger seat cushion as you tighten the litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.9.5.3.4. Place aircraft seat belt around the front of the car seat and tighten securely.

**WARNING:** Car seat must be able to rotate freely from a Reclined to an Upright Position on impact. The seat frame or base must not be blocked in any way that could obstruct rotation.

7.9.5.3.5. Test for secure installation by pulling front to back and twisting side to side to assure seat has little or no movement.

**WARNING:** Level Car Seat. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone. Car seat must be properly leveled. If reclined excessively the results

may contribute to injury or ejection. If placed in excessive upright position breathing difficulties may occur. Re-check level indicator once car seat is snugly anchored and infant is positioned in car seat.

#### 7.9.5.4. Forward facing blue seat.

**WARNING:** Forward facing toddlers more than 20 lbs. must have car seat in semi-upright (#3) or upright (#4) position.

**NOTE:** Toddlers 20-30 lbs capable of sitting upright unassisted will be placed in the semi-upright (#3) or upright (#4) position and will face forward.

**NOTE:** Infants from birth to 20 lbs or up to 12 months will face aft and be secured in the following manner.

7.9.5.4.1. First litter strap is secured around the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.9.5.4.2. Thread second litter strap through the first litter strap at the back of the car seat base for future use.

7.9.5.4.3. Thread litter strap through car seat seatbelt slot closest to aircraft seat back.

7.9.5.4.4. Press down firmly in center of car seat to compress passenger seat cushion as you tighten litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.9.5.4.5. Take litter strap #2 and anchor it around the front post beneath foot of passenger seat.

7.9.5.4.6. Level car seat

7.9.5.4.7. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone.

7.9.5.4.8. Ensure rotation of the car seat is not impeded.

### 7.9.6. Place Child in Car Seat.

7.9.6.1. Harness Straps must be placed in top, middle, or bottom set of matching slots, at or just below the top of the child's shoulders (see Section 7.6.5.3. Changing Harness Strap Slots).

**WARNING:** Do not use strap covers, blankets, thick cushions, or padding under harness straps or child. They interfere with proper fit of harness straps and child could be ejected.

7.9.6.2. Loosen Harness Straps by pulling and holding the short black tab of the Quick Release Strap while pulling gray Harness Straps.

7.9.6.3. Unbuckle Harness Tie at chest by pressing tab and pulling apart.

7.9.6.4. Press Red Button on Crotch Strap Buckle and remove Harness Tongues.

7.9.6.5. Place child in car seat with child's bottom and back firmly against the back of the car seat.

7.9.6.6. Place child's arms through Harness Straps and insert both Harness Tongues into Buckle.

**WARNING:** Child must be dressed in clothing with arms and legs that will not interfere with Buckling Latch Tongue

7.9.6.7. Pull up on Tongues to ensure Buckle is locked.

7.9.6.8. Position Harness Tie at mid chest or 3 inches below child's chin in order to keep Harness Straps snug on child's shoulders (helps to prevent ejection).

7.9.6.9. Lock Harness Tie at chest by snapping halves together and pull to confirm lock up.

7.9.6.10. Pull Quick Adjust Strap located at front of seat to tighten Harness Straps (long black strap with gray tab).

7.9.6.11. Harness Straps must be snug against child with just enough room for you to insert one finger between each Harness Strap and child's chest.

**WARNING:** Do not use Harness Straps that are loose or unbuckled. Harness Straps must be snug and positioned over shoulders or child could be seriously injured.

7.9.6.12. Use the Infant Support Pillow or two rolled towels if necessary to support baby's head and body.

### **7.9.7. Changing Harness Strap Slots.**

7.9.7.1. Loosen Harness Straps by pulling and holding the Quick Adjustment Tab (short black tab at lower front) while pulling gray Shoulder Harness.

7.9.7.2. Place Car Seat in Upright Position (#4) and remove both Harness Strap Loops from the Splitter Plate on the back of the seat.

7.9.7.3. Pull Harness Straps out of current slots and move to appropriate set of matching slots.

7.9.7.4. Re-attach Harness Strap Loops to Splitter Plate using one of the following steps:

7.9.7.4.1. Infants or Small Toddlers: Place top loop of right harness strap onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

7.9.7.4.2. Toddlers: Use the bottom loops of harness straps onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

**CAUTION:** Make sure ends of straps are behind opening of Splitter Plate and not twisted. Make sure the black Splitter Plate Strap/Quick Adjust Strap passes between Adjuster Lever and Car Seat Frame (i.e. not entangled with the operating mechanisms) and strap is not twisted.

### **7.9.8. Re-attach seat pad.**

## Chapter 8

### POWER USER'S GUIDE

#### 8.1. Electrical Cable Assembly Set (ECAS).

**8.1.1. Purpose.** The ECAS accomplishes two functions. First, its adapters connect to aircraft outlets and provide standard "household" 3-pin outlets for alternating current or "twist lock" outlets for direct current. Second, it provides extension cords to distribute electrical power from the adapter outlets.

**8.1.2. Description.** The ECAS consists of AC and DC adapters and extension cords. The adapters connect to aircraft electrical outlets and provide an outlet that aeromedical equipment or an extension cord may be plugged into. AC adapters plug into 4-pin aircraft electrical outlets supplying 115 VAC/400 Hz, and provide a 3-pin (household type) outlet supplying 115 VAC/400 Hz. DC adapters plug into 2-pin aircraft electrical outlet supplying 28 volts direct current (VDC), and provide a 2-terminal "twist-lock" outlet supplying 28 VDC. An AC or DC electrical tester is used to ensure the proper electrical source is present when an adapter is connected to an aircraft outlet.

**8.1.3. Components.** Components of the Electrical Cable Set are:

8.1.3.1. One (1) carrying case.

8.1.3.2. Four (4) 25 foot AC electrical cords with four (4) grounded outlets each (Yellow cables).

8.1.3.3. Two (2) 30 foot DC electrical cords with two (2) "twist-lock" outlets each (Orange cables).

8.1.3.4. Four (4) AC adapters for C-130 and C-141 aircraft (Yellow cable).

8.1.3.5. Four (4) AC adapters for C-130 aircraft (Yellow cable).

8.1.3.6. Two (2) DC adapters for C-130/C-141 aircraft (Orange cable).

8.1.3.7. One (1) AC adapter for KC-135 aircraft (Yellow cable).

8.1.3.8. One (1) AC electrical tester.

8.1.3.9. One (1) DC electrical tester.

**8.1.4. Pre-flight.** An operational check-out of the system should be done every 60 days, unless the unit has been operated on a mission.

8.1.4.1. Open the case by rotating the eight (8) latches around the mid-line of the carrying case and separating the top of the case from the bottom. Invert the top of the case, exposing the inner door. Open the inner door by depressing both spring-loaded latches and lifting the door.

8.1.4.2. Inspect the adapters and electrical testers in the top of the case, and the extension cords in the bottom of the case. Ensure all components are present, and observe for any defects.

8.1.4.3. If any of the following defects are found, send the defective component for repair:

8.1.4.3.1. Nicks or cuts in the cord insulation or wires.

8.1.4.3.2. Cracks in either tester or in the cord outlet boxes.

8.1.4.3.3. Loosening or disassembly of MS (circular cannon-plug) connectors.

8.1.4.3.4. Loosening of electrical receptacle/plug hardware.

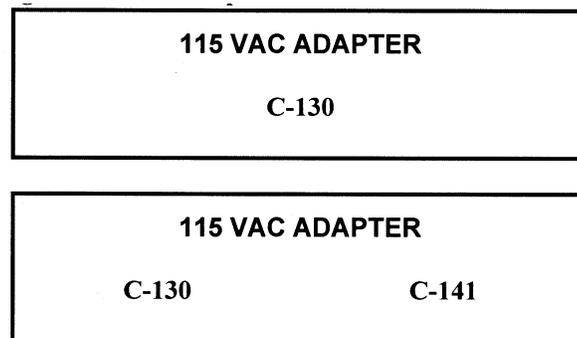
8.1.4.3.5. Carrying case damage or broken latches.

**8.1.5. Set-up and Operation. WARNING:** Nomex gloves must always be worn when handling electrical cords. This will not prevent an injury but may lessen the effect.

**CAUTION:** Failure to follow the operating instructions prior to the connection of any medical equipment to an extension cord may cause electrical damage to that piece of medical equipment or the aircraft's electrical system.

8.1.5.1. Select the appropriate adapter for the equipment to be used (i.e. AC or DC adapter). For AC adapters, identify if adapter is for C-130, or C-130 and C-141 aircraft, and use appropriately. Adapter is marked "C-130" or "C-130/C-141" on label affixed to cable. See [Figure 8.1.](#) for markings on AC adapters.

**Figure 8.1. AC Adapter Labels.**



8.1.5.2. Ensure that aircraft power is available prior to plugging the adapter in to the aircraft outlet. Connect the adapter to the aircraft electrical outlet. If an extension cord is needed, plug the extension cord firmly into the adapter outlet. Ensure that the adapter and extension cord are locked together by the "grip" feature on the adapter and extension cord. Select the appropriate electrical tester, either AC or DC. Route the extension cord from the adapter across to a center stanchion, securing it with attached hook and pile fasteners. Before connecting medical equipment to electrical outlets the equipment must be turned off.

**WARNING:** The protected metal tip of the AC test probe is live (HOT) when the tester is plugged into a live electrical outlet. Do not touch the tip while the tester is plugged in.

### **8.1.6. Electrical Test Procedures.**

8.1.6.1. For AC outlets:

8.1.6.1.1. Plug the AC tester ([Figure 8.2.](#)) into the adapter, or outlet box if an extension cord is used.

8.1.6.1.2. Touch the protected metal tip of the test probe to an aircraft metal surface other than an aluminum surface.

8.1.6.1.3. Determine the electrical status at that outlet using the following indications:

8.1.6.1.3.1. AC OK (115 VAC) - Green lights 1, 2, and 3 illuminated.

8.1.6.1.3.2. No ground - Green lights 2 and 3 illuminated. Indicates a faulty ground at that aircraft outlet.

8.1.6.1.3.3. Reversed Polarity - Green light 3 illuminated indicates a reversed polarity at that aircraft outlet.

**NOTE:** If reversed polarity is indicated, notify the flight crew to have the outlet repaired.

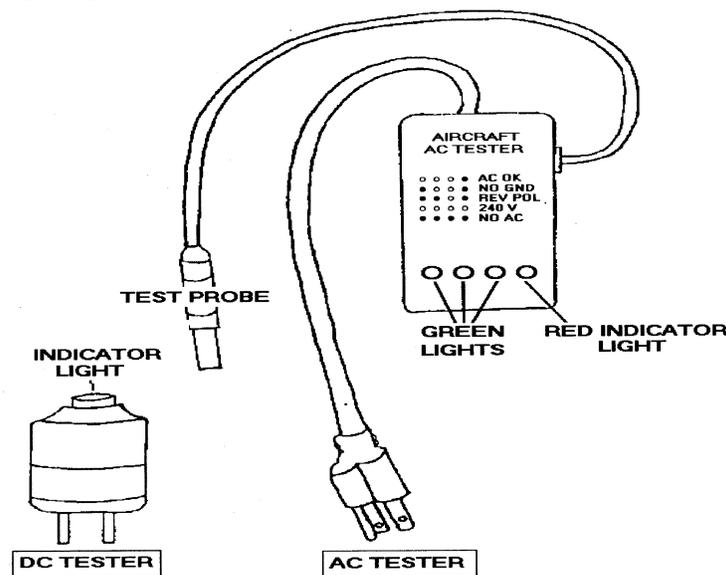
8.1.6.1.3.4. 40 VAC - Green lights 1, 2, and 3, and red light illuminated.

8.1.6.1.3.5. No AC power - No lights illuminated. Indicates no AC power at that outlet. Check with the flight engineer to ensure that the circuit breaker is set.

**NOTES:**

The various light combinations and their indications are placarded on the AC tester. Last, replace tester in the carrying case.

**Figure 8.2. DC and AC Testers.**



8.1.6.2. For DC outlets:

8.1.6.2.1. Plug the DC tester into the adapter, or outlet box if any extension cord is used.

8.1.6.2.2. If indicator light illuminates, DC power with the correct polarity is present.

8.1.6.2.3. If the light is not illuminated, this indicated no power at the outlet (ensure circuit breaker is set), or polarity is reversed (select another outlet).

8.1.6.2.4. Replace tester in the carrying case.

**NOTE:** If the outlet has reversed polarity, notify the flight crew to have the outlet repaired. If a fault is indicated at the extension cord outlet box, disconnect the extension cord from the adapter, and test the adapter at the aircraft outlet.

**8.1.7. Storage on the Aircraft.**

8.1.7.1. After adapters and extension cords are assembled and tested, close and lock the inner door, securing remaining adapters and the testers.

8.1.7.2. Place both halves of the carrying case together and close the latches, then secure the case on the aircraft.

8.1.7.3. To open the carrying case in-flight, first depress the pressure relief valve on the side of the case to equalize the pressure in the case with the pressure in the aircraft.

#### **8.1.8. Disassembly and Storage.**

8.1.8.1. Turn off medical equipment connected to the electrical cable assembly set outlets.

8.1.8.2. Disconnect extension cords from adapters and adapters from aircraft outlets.

8.1.8.3. Coil extension cords, and store in bottom of the carrying case.

8.1.8.4. Store adapters in top of the carrying case.

8.1.8.5. Close and lock inner door by depressing both spring-loaded latches.

8.1.8.6. Place the upper half of the case on the bottom half and close all eight latches.

**WARNING:** When removing the 115VAC/400 Hz cycle cannon plug on the C-141/C-130 aircraft from the outlet, turn the locking ring of the outlet body (near the bulkhead), and not the barrel of the ECAS adapter. Twisting the ECAS adapter may damage the cord and create a safety hazard.

## **8.2. Electrical Frequency Converter - Avionic.**

**8.2.1. Purpose.** To convert 115VAC/400 Hz (aircraft power) electrical current to hospital grade 115 VAC/60 Hz current via three (3) hospital grade duplex outlets. The portable power system is designed to provide up to thirty (30) amperes of total current load under normal conditions. Fifteen (15) amperes is the maximum that any one duplex receptacle assembly is designed to handle.

**CAUTION:** Do not exceed a total of 30 amperes, or 15 amperes for any one circuit (duplex outlet).

**8.2.2. Power Source.** 115VAC/400 Hz aircraft power (C-130, C-141B, other opportune aircraft).

**8.2.3. Components.** Portable Power System consisting of:

8.2.3.1. Carrier assembly.

8.2.3.2. Extension Cables.

8.2.3.3. Frequency Converter Model Number 4B3500-1A-MV-1564.

8.2.3.4. Power Distribution Assembly.

8.2.3.5. Input Power Cable (25 feet).

#### **8.2.4. Pre-flight.**

8.2.4.1. Ensure all components are in good condition. Inspect cable assembly for cuts, frayed wires, bent pins/damage to the electrical plugs.

8.2.4.2. Inspect the static converter/carrying case for signs of damage.

#### **8.2.5. Operation.**

8.2.5.1. AECMs will wear Nomex gloves during installation procedure.

8.2.5.2. Connect the 25 foot input power cable connector, part number MS3106R18-11S, into the MS3102R18-11P converter receptacle.

8.2.5.3. Connect the 25 foot input power cable connector, part number MS3108A18-10P, to an appropriate 115VAC/400 Hz aircraft electrical outlet.

**WARNING:** Make all connections with the portable power system off.

**CAUTION:** Use only connections specified in Avionic Instruments Portable Power System operation manual. Consult the manufacturer before making any connections not recommended here.

8.2.5.4. Turn on the portable power system.

**NOTE:** Following a change-over from ground power to auxiliary power unit (APU)/aircraft power, check converter and electrical loads to confirm proper operation and for any breaker switches that may have been tripped.

### 8.2.6. Securing Procedures.

8.2.6.1. Option A. Select a location close to power requirements and electrical source. Secure the portable power system to the aircraft floor using cargo tie down straps. The straps should be wrapped around the converters handles and secured with D-rings to the aircraft floor.

8.2.6.2. Option B. Select a location close to power requirements and electrical source. Mount aluminum equipment brackets to a standard NATO litter at a length equal to the length of the portable power converter. Place the portable power system on the equipment brackets. Using two (2) litter straps, secure the portable power system to the litter/equipment brackets.

8.2.6.3. The portable power system must be mounted so air flows unrestricted through the unit.

**CAUTION:** Avoid placement near sources of liquid contamination (i.e., humidification bottles, nourishment's, irrigation supplies). Immediately wipe up any spills on the portable power system.

**8.2.7. Cleaning.** With the unit unplugged from the aircraft, wipe the unit with a damp cloth.

## 8.3. Electrical Frequency Converter - Unitron (Baby Bertha).

**8.3.1. Purpose.** To convert 115 VAC/400 Hz (aircraft power) electrical current to hospital grade 115 VAC/60 Hz current via three (3) hospital grade duplex outlets. The portable power system is designed to provide up to 30 amperes of total current load under normal conditions. 15 amperes is the maximum that any one receptacle assembly is designed to handle. Electrical current drain requirements can usually be found on the equipment data plate. Simply add the values together to come up with the total amperage requirement.

**CAUTION:** Do not exceed a total of 30 amperes, or 15 amperes for any one circuit (outlet).

**8.3.2. Power Source.** 115 VAC/400 Hz aircraft power.

### 8.3.3. Components.

8.3.3.1. Unitron Portable Power System.

8.3.3.2. Carrier assembly.

8.3.3.3. PS-62-66D static converter.

8.3.3.4. Cable (input) assembly (25 feet).

### 8.3.4. Pre-flight Inspection.

8.3.4.1. Ensure all components are in good condition. Inspect cable assembly for cuts, frayed wires, bent pins/damage to the electrical plugs.

8.3.4.2. Inspect the static converter/carrying case for signs of damage.

### 8.3.5. Operating Instructions.

8.3.5.1. AECMs will wear Nomex gloves during installation procedure. Locate the portable power system near the load with the highest current (amperage) requirement. Secure per paragraph 8.3.6.

8.3.5.2. Connect the 25 foot input cable into the converter receptacle.

8.3.5.3. Connect the aircraft end of the cable to an appropriate 115 VAC/400 Hz aircraft electrical outlet.

**NOTE:** Cable ends are specific for the converter and the aircraft and can not be interchanged.

8.3.5.4. Plug the high current/critical unit load(s) directly into the duplex receptacle.

**NOTE:** If two widely separated loads require approximately the same current, place the portable power system near either the more frequently used unit or the more critical unit.

8.3.5.5. Utilize ECAS for power distribution throughout the aircraft and/or to units of less critical nature or lower current requirements.

8.3.5.6. Turn on the portable power system.

8.3.5.7. Electrical loads being powered should be turned on one at a time after the converter has been turned on.

8.3.5.8. Following a change-over from ground power to APU/aircraft power, check the converter and the electrical loads to confirm proper operation.

### 8.3.6. Securing Procedures.

8.3.6.1. Option A. Select a location close to power requirements and electrical source. Secure the portable power system to the aircraft floor using 5000 pound cargo tie down straps. The straps should be wrapped around the converters handles and secured with D-rings to the aircraft floor.

8.3.6.2. Option B. Select a location close to power requirements and electrical source. Mount aluminum equipment brackets to a standard NATO litter at a length equal to the length of the portable power converter. Place the portable power system on the equipment brackets. Using two (2) litter straps, secure the portable power system to the litter/equipment brackets.

**CAUTION:** Avoid placement near sources of liquid contamination (i.e., humidification bottles, nourishment's, irrigation supplies). Immediately wipe up any spills on the portable power system.

**8.3.7. Cleaning.** With the unit unplugged from the aircraft, wipe the unit with a damp cloth.

## Chapter 9

### PULSE OXIMETERS USER'S GUIDE

#### 9.1. Nonin 8600 Pulse Oximeter.

**9.1.1. Purpose.** Continuously monitors arterial hemoglobin oxygen saturation and pulse rate by non-invasive means.

**9.1.2. Description.** The Nonin 8600 is a noninvasive monitor. It is microprocessor controlled and determines arterial hemoglobin saturation (%SpO<sub>2</sub>) by measuring the absorption of red and infrared light passed through the tissue. Changes in absorption caused by pulsation of blood and changes in arterial oxygen content in the vascular bed are used to determine arterial saturation and pulse rate.

**9.1.3. Power Source.** 115 VAC/50-400 Hz and a five (5) cell rechargeable NI-Cad battery pack. Battery pack will operate for minimum of 30 hours from a fully charged battery. Requires 15 hours to charge a fully depleted battery. If portable operation is not necessary, continuous charging is recommended to assure a fully charged battery.

**NOTE:** Neither continuous charging or complete discharge will degrade battery capacity or battery life.

**NOTE:** The Nonin 8600 Oximeter has been approved for use in the AE environment when operating on its internal battery or with the Nonin Model 7708 AC adapter/battery charger.

#### 9.1.4. Components.

- 9.1.4.1. Oximeter, Pulse - Nonin 8600.
- 9.1.4.2. Sensor, Adult - 8000K.
- 9.1.4.3. Sensor, Infant - 8008J.
- 9.1.4.4. Patient Interface Cable - 8800I.
- 9.1.4.5. Battery Charger - P/N 7708 50-400HZ.
- 9.1.4.6. Securing Bracket.
- 9.1.4.7. Case.

#### 9.1.5. Front Panel Indicators.

9.1.5.1. Digital Displays. The oximeter is equipped with light emitting diode 7-segment digital displays for displaying oxygen saturation and pulse rate.

9.1.5.2. Patient Alarm Indicators. Each PATIENT ALARM is equipped with an PULSATING AUDIBLE alarm that can be disabled by using the Option Switch 1 on the rear panel and the Alarm Volume control.

9.1.5.2.1. SpO<sub>2</sub>% Display Flashing. Flashes "ON/OFF" when patient's SpO<sub>2</sub> level is AT/BELOW the lower alarm limit setting or AT/ABOVE the upper alarm limit setting.

9.1.5.2.2. Pulse Display Flashing. Is displayed by a flashing "Heart Icon" indicating that the patient's heart rate is AT/BELOW the lower alarm limit setting or AT/ABOVE the upper alarm limit setting.

9.1.5.3. Perfusion Indicator. Will blink green for each pulse during normal operation. When pulse becomes nondiscernible the perfusion indicator will blink red to indicate low perfusion. If condition persists for 20 seconds or longer the display will show dashes (---) and the numerical values will freeze on the last values. The display will exit the dash mode after three (3) discernible pulses have been found. An audible alarm will also sound until condition is corrected. When pulse pickup is marginal the perfusion indicator will blink yellow. When a red or yellow perfusion light is observed, the sensor must be repositioned.

9.1.5.4. Equipment Alarm Indicators. Each equipment alarm is indicated by a continuously sounding audible alarm as well as a visual alarm.

9.1.5.4.1. Self Test LED. Active whenever the unit is powered on. When a fault is found the self test indicator lights and an audible alarm sounds. This condition can only be cleared by cycling the power switch. This alarm cannot be shut off with the alarm volume control. If condition cannot be corrected, DO NOT USE THE OXIMETER, return unit to MERC.

9.1.5.4.2. Sensor LED. Is actuated whenever the system determines that the sensor is disconnected, damaged or dislodged. When a fault is found the red sensor indicator will light and the audible alarm will sound until condition terminates. If alarm condition persists for 10 seconds or longer the displays will show dashes (---) and the numerical values will freeze on the last values. The displays will exit the dash mode after three (3) discernible pulses have been found.

9.1.5.4.3. Battery Status Indicators. "Green" indicator shows battery charger is connected and supplying power. "Red" indicator shows the battery voltage is too low for proper operation. When "OFF", shows normal battery powered operation. If red or red/green condition is present, the audible alarm sounds continuously until the condition is corrected.

9.1.5.5. Equipment Status Indicator.

9.1.5.5.1. Audio Off. An amber LED flashes when the horn is temporarily disabled after activating the audio button. It will light continuously if audio has been completely disabled with option switch 1 and the alarm volume control is off.

### **9.1.6. Patient Alarm Switches.**

9.1.6.1. SpO2% High Switch. Located adjacent to the SpO2% display. Has settings of OFF, 99-85. An audible alarm and the SpO2 display will flash when saturation percentage is at or above settings.

9.1.6.2. SpO2% Low Switch. Located adjacent to the SpO2% display. Has settings of Off, 95-55. An audible alarm and the SpO2 display will flash when saturation percentage is at or below settings.

9.1.6.3. Pulse Fast Switch. Located adjacent to the pulse display. Has settings of OFF, 275 - 75 beats per minute. An audible alarm and the pulse display will flash when pulse rate is at or above settings.

9.1.6.4. Pulse Slow Switch. Located adjacent to the pulse display. Had settings of OFF, 110- 30 beats per minute. An audible alarm and the pulse display will flash when pulse rate is at or below settings.

9.1.6.5. Option Switches.

9.1.6.5.1. Option Switch #1. Located on back panel. In the down position, the audible alarm is prevented from being completely disabled via the front panel volume control dial. In the up position, it allows user to disable the audible alarm function with the alarm volume control dial.

**NOTE:** Refer to Nonin Instruction and Service Manual for proper operation.

9.1.6.5.2. Option Switch #2. Located on back panel. Allows user to double the averaging of the SpO<sub>2</sub> and pulse rate calculations.

**NOTE:** Refer to Nonin Instruction and Service Manual for proper operation.

9.1.6.5.3. Option Switch #3. Located on back panel. Not routinely used for AE missions.

**NOTE:** Refer to Nonin Instruction and Service Manual for proper operation.

9.1.6.5.4. Option Switch #4. Located on back panel. Not routinely used for AE missions.

**NOTE:** Refer to Nonin Instruction and Service Manual for proper operation.

9.1.6.6. Audible Pulse Tone. May set oximeter to emit a short tone on each pulse that is detected by rotating the pulse volume control on the front panel to an audible level. Tone varies in pitch with the O<sub>2</sub> saturation level. If pulse is lost, unit will beep at a higher pitch.

9.1.6.7. Audible Alarm Tone. An adjustable audible alarm located behind the front panel. Can be disabled by using option switch one (1) on the rear panel and the alarm volume control. Depressing the Audio button initiates a two minute period that the audio alarm will not sound.

9.1.6.8. Audio Button. Located on front panel. Momentarily pressing this button will disable the audio alarm for two (2) minutes. Pressing this button again will override the two (2) minute period, re-enabling the audio alarm.

### **9.1.7. Pre-Flight.**

9.1.7.1. Ensure currency of the inspection/calibration decal on unit and that all component parts are complete and in serviceable condition.

9.1.7.2. Plug the 8 pin female latching connector of the Patient Interface Cable into front of monitor. Connector will only fit one way. Connect sensor (Adult or infant) into opposite end of cable. Place sensor on appropriate finger.

9.1.7.3. Turn oximeter "ON" using the rocker switch on the front panel. Initially, the oximeter will cycle through its self test verifying that all panel lights operate and that the microcomputer can perform its control functions properly. The oximeter is functioning normally if, shortly after power "ON" the following occurs:

9.1.7.3.1. The red SELF TEST light extinguishes.

9.1.7.3.2. The PERFUSION light blinks green with each pulse.

**NOTE:** Should the SELF TEST sequence not complete properly DO NOT use the oximeter. Return unit to MERC.

9.1.7.4. To generate alarm for test purposes, ensure alarm volume control is not turned off, option switch # one (1) is not up or the two (2) minute audible disable period is not active. Momentarily disconnect the Patient Interface Cable from the monitor. You must first press the latches and then

pull the connector out. This generates a SENSOR alarm, the SENSOR LED will light and the audible warning alarm will be sound.

9.1.7.5. Switch unit off and secure all components.

### 9.1.8. Operating Instructions.

9.1.8.1. Set Alarm Limits.

9.1.8.2. Set Patient Alarm Condition Switches (SpO<sub>2</sub>% High/Low & Pulse Fast/Slow) as required

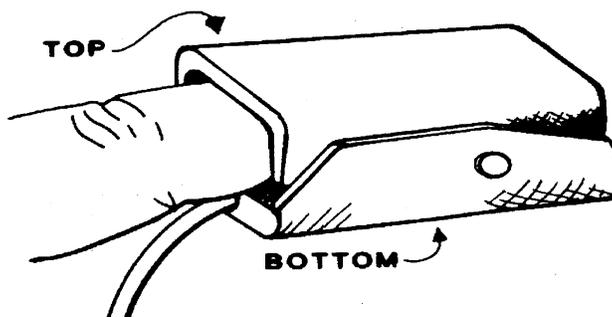
9.1.8.3. Connect the cable and sensor.

9.1.8.4. Secure appropriate sensor to patient. (See [Figure 9.1.](#) for adult and [Figure 9.2.](#) for infant)

9.1.8.4.1. The finger clip sensor Model 8000K is designed for spot check monitoring of pediatric and adult patients or continuous monitoring less than 30 minutes where patient movement is not expected and the patient's finger is large enough for the sensor to be attached securely.

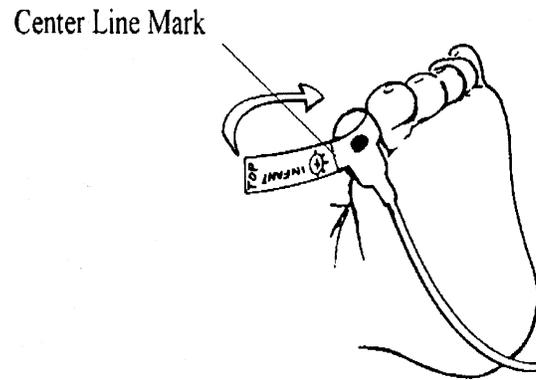
9.1.8.4.2. Insert finger (preferably left or right index finger) completely into the sensor (See [Figure 9.1.](#)). The thumb is specifically not recommended for use with the finger clip sensor.

**Figure 9.1. Adult Finger Clip Sensor Positioning.**



**NOTE:** For the best results, secure the sensor cable independently from the sensor, preferably around the base of the finger. Make sure that tape securing the cable does not restrict the blood flow.

9.1.8.4.3. The infant sensor, Model 8008J is designed for continuous monitoring of infants where finger tip monitoring is impractical. Position infant sensor on the big toe (See [Figure 9.2.](#)). Make sure that the emitter portion of the sensor is exactly aligned with the detector portion. Ensure the light emitter portion of the sensor is on the nail and the detector is on the opposite side.

**Figure 9.2. Sensor Placement On Big Toe.**

**NOTE:** Attach sensor using a Nonin 8000 FW sensor wrap, 3M Micropore tape, or equivalent by wrapping the tape or sensor wrap over the sensor assembly snugly, but not so tight as to restrict blood flow. For best results, secure cable independently from the sensor, preferably around patient's ankle or lower leg. Make sure tape securing the cable does not restrict the blood flow.

**CAUTION:** Sensor sites must be checked periodically to determine circulation, sensor positioning and skin sensitivity.

9.1.8.5. Turn Oximeter "ON".

9.1.8.6. Turn on the oximeter using the rocker switch on the front panel. Verify all front panel lights operate.

9.1.8.7. Red SELF TEST light extinguishes and the PERFUSION light blinks green with each pulse.

9.1.8.8. Verify Operation.

9.1.8.9. Observe sensor for proper position for at least three (3) minutes of continuous green blinking PERFUSION status light without any alarms. If light is blinking red or yellow, reposition the sensor.

**NOTE:** If a continuous green blinking PERFUSION cannot be achieved, return unit to MERC for maintenance.

9.1.8.10. The front panel will read the SpO<sub>2</sub>% on the top display and the Heart Rate on the bottom display.

9.1.8.11. Alarm Volume.

9.1.8.11.1. Adjust the alarm intensity by rotating the thumb wheel volume control on the front of the Oximeter. The "OFF" position is only effective when Option Switch #1 is in the "UP" position.

9.1.8.11.2. Pressing the AUDIO button starts a two (2) minute interval which silences the audible alarm. A flashing amber AUDIO OFF indicator light indicates this interval. Pressing the AUDIO button again will cancel the silence interval.

**CAUTION:** Not recommended to disable the audible alarm output when monitoring in critical situations.

#### 9.1.8.12. Audible Pulse Tone.

9.1.8.12.1. Will emit a short tone on each pulse detected. Turn the Pulse volume control until an audible pulse is heard with each beat.

**9.1.9. Unit Security.** The securing bracket may be attached to either side of oximeter unit as required.

#### 9.1.10. Disassembly and Storage.

9.1.10.1. Remove sensor from Patient Interface Cable. Remove Patient Interface Cable from oximeter unit. The oximeter may be cleaned with a mild detergent and a damp cloth.

**NOTE:** Do not use caustic or abrasive cleaning agents. Do not immerse or pour liquids on the Oximeter. No adjustments are necessary and opening the case is not recommended.

9.1.10.2. Clean the Nonin reusable sensors with an isopropyl alcohol wipe. Allow enough time for the sensor to dry thoroughly before reusing. They may also be sterilized as outlined in the Nonin Instruction and Service Manual and local procedural guidance.

## 9.2. Pulse Oximeter - BCI 1040A.

**9.2.1. Purpose.** The BCI 1040A Pulse Oximeter continuously monitors and displays arterial blood oxygen saturation and pulse rate non-invasively.

**9.2.2. Description.** The BCI 1040A Pulse Oximeter front panel houses Equipment Alarm and Status Indicators, Patient Alarm Indicators, the Perfusion Status Indicator, LED Display, and an Alarm Volume Control. Patient alarm threshold switches are located on the bottom, or back of the BCI 1040A. The power ON/OFF switch, a SaO<sub>2</sub> HIGH switch and a battery charger connection jack are located on the back of the unit. A sensor connection jack and reset switch are located on the front panel. Sensors and a patient cable are provided.

9.2.2.1. Front Panel. The following alarm indicators are located on the front panel:

9.2.2.1.1. Equipment Alarm Indicators. Each equipment alarm has a continuous audible alarm:

9.2.2.1.1.1. System CK LED. Activated when the unit is on. If an internal fault is found, the SYSTEM CK indicator illuminates and the alarm sounds. The alarm is cleared by cycling the power switch. DO NOT use the pulse oximeter if the problem can't be fixed.

9.2.2.1.1.2. Sensor LED. When the system detects that the sensor is disconnected, damaged, or dislodged the sensor alarm is activated and the alarm sounds until reset. If a sensor alarm condition persists for longer than 10 seconds the display shows dashes (---). Before the display goes to dashes, the numerical display will "FREEZE" with the last values. The display will exit the dash mode after three pulses are detected.

9.2.2.1.1.3. Battery LED. The battery LED is a three (3) color indicator showing battery condition:

9.2.2.1.1.3.1. GREEN - The battery charger is connected and supplying power.

9.2.2.1.1.3.2. YELLOW - The battery charger is connected and supplying power, but the voltage is too low for proper operation.

9.2.2.1.1.3.3. RED - The battery voltage is too low for proper operation.

9.2.2.1.1.4. The LED is OFF when normal battery powered operation exists.

**NOTE:** In YELLOW or RED condition, the alarm sounds until the condition is terminated.

9.2.2.1.2. Equipment Status Indicator Audible Off. An amber LED that flashes when the audible alarm is temporarily disabled, and is constantly illuminated when it is permanently disabled.

9.2.2.1.3. Patient Alarm Indicators: An audible alarm pulsating at one (1) second intervals:

9.2.2.1.3.1. O2 Alarm LED - Red LED indicates either the patient's SaO2 level is below the lower threshold, or has exceeded the upper threshold. The LED is continuously illuminated when the SaO2 falls below the lower threshold, and flashes each second if the SaO2 exceeds the upper threshold.

9.2.2.1.3.2. High Pulse LED - The red HIGH PULSE indicator illuminates, and the alarm sounds once each second when the pulse rate exceeds the set level for five (5) or more consecutive beats. The alarm continues until the condition terminates.

9.2.2.1.3.3. Low Pulse LED - The RED LOW PULSE indicator illuminates, and the alarm sounds once each second when the pulse rate falls below the set level for five (5) or more consecutive beats. The alarm continues until the condition terminates.

**WARNING:** Pacemaker patients - rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. DO NOT rely upon meter alarms. Keep pacemaker patients under close observation.

9.2.2.1.4. Perfusion Status Indicator: Flashes green for each detected pulse during normal operation. When the pulse becomes indiscernible, the indicator flashes red, indicating low perfusion, and the alarm sounds as the condition persists. If pulse detection is marginal, the PERFUSION STATUS indicator flashes yellow.

**NOTE:** If a red or yellow PERFUSION STATUS indicator is on, reposition the sensor. If a low perfusion condition exists for 10 or more seconds, the display shows dashes (---). The numerical values displayed "FREEZE" from the beginning of the low perfusion alarm until dashes are displayed. The display exits the dash mode after three (3) pulses are detected.

9.2.2.1.5. Reset Switch. Used to clear alarm indicators. Pressing the switch disables the audible alarm for two (2) minutes, and will clear the indicator, providing the alarm condition no longer exists. The AUDIO OFF indicator flashes while the audio alarm is disabled. Pressing the RESET SWITCH during the audio off interval reactivates the audible alarm. Pressing and holding this switch for three (3) seconds or longer will enable or disable a tone on each detected pulse.

9.2.2.1.6. Audible Alarm. Consists of a rotating shutter on the front of the alarm element, and is used to adjust the alarm volume.

9.2.2.1.7. LED Display. Displays the current oxygen saturation and pulse rate during normal operation.

9.2.2.1.8. Monitor Jack. Where the patient cable plugs into the pulse oximeter. The dots on the cable and jack must be aligned when inserting the cable plug into the jack.

9.2.2.2. Bottom Panel. Three (3) patient alarm threshold switches are located on the bottom of the pulse oximeter.

9.2.2.2.1. O2 ALARM Switch. Is the oxygen saturation switch, and has settings of 95- 60. A saturation percentage at or below the selected setting generates an audible alarm, illuminating the O2 ALARM indicator.

9.2.2.2.2. HIGH PULSE Switch. This switch has settings of OFF, 275- 125 beats per minute. A pulse rate at or greater than the selected setting will generate an audible alarm, illuminating the HIGH PULSE indicator.

9.2.2.2.3. LOW PULSE Switch. This switch has settings of 100- 30 beats per minute. A pulse rate at or lower than the selected settings will generate an audible alarm, illuminating the LOW PULSE indicator.

9.2.2.3. Rear Panel. Two (2) switches are located on the back of the pulse oximeter along with a battery charge jack.

9.2.2.3.1. POWER ON/OFF Switch. A slide switch that turns the pulse oximeter on and starts the system check function (self test). When OFF, power must remain off for at least two (2) seconds to allow the system check to reset.

9.2.2.3.2. SaO2 HIGH Switch. This HIGH oxygen saturation switch has settings of OFF, 95, and 97. An oxygen saturation at or greater than the selected setting will generate an audible alarm, illuminating the O2 ALARM indicator intermittently.

9.2.2.3.3. Battery Charge jack. Plugs into the battery charge jack, charging the battery regardless of the POWER ON/OFF switch position.

9.2.2.4. Top Panel. Contains a threaded receptacle where the mounting bracket attaches.

### **9.2.3. Power Source.** Power sources for the BCI 1040A Pulse Oximeter are:

9.2.3.1. A battery charger requiring 120 VAC/ 50-400 Hz that plugs into the back of the pulse oximeter.

9.2.3.2. An internal battery that powers the pulse oximeter for 20 hours when fully charged. Charging time is 15 hours, and is accomplished when the battery charger is connected.

### **9.2.4. Pre-flight.**

9.2.4.1. Ensure that the inspection is current and that all needed components are present and functional/serviceable:

9.2.4.1.1. Pulse oximeter.

9.2.4.1.2. Patient cable.

9.2.4.1.3. Sensors.

9.2.4.1.4. Clear tape strips.

9.2.4.1.5. Mounting bracket.

9.2.4.2. A functional check should be accomplished prior to flight: Set the pulse slow switch to 30 beats per minute, the pulse fast switch to 125 beats per minute, and the oxygen low alarm switch to 60. Set the oxygen high switch off. Place the finger clip sensor on finger, connect to the patient cable, and the cable to the pulse oximeter. Switch on and verify the self test. The BCI 1040A is functioning normally if shortly after power ON: The red self test light extinguishes or the perfusion light flashes green with each pulse. Switch the unit off and secure all components.

**NOTE:** If the SELF TEST sequence does not complete DO NOT use the oximeter. Turn in for maintenance.

### 9.2.5. Operation.

9.2.5.1. Set the patient alarm condition switches and HIGH SaO<sub>2</sub> ALARM switch as prescribed.

**NOTE:** The switches must be set in the detent position. Improper operation will result if the switches are set between detent positions.

9.2.5.2. Attach the sensor per instructions on selection and attachment of sensors. Connect the sensor to the patient cable, then insert the patient cable into the monitor jack on the front panel, matching the alignment dots on the plug and jack. Insert until the locking "click" is heard. Turn the monitor on. As the oximeter cycles through its self test verify all panel lights operate. Reposition the sensor, or try a different sensor type if the perfusion light illuminates red or yellow.

9.2.5.3. Adjust alarm volume.

9.2.5.4. Mount by attaching the mounting bracket to the top of the pulse oximeter with the bolt on the bracket. Attach the bracket to a litter pole and tighten the clamp knob to secure the assembly on the litter. Periodically check for security of the bolt and clamp assembly.

**9.2.6. Selection and Attachment of Sensors. CAUTION:** Use only BIOCHEM manufactured sensors. These sensors are manufactured to meet the calibration requirements for BIOCHEM Pulse Oximeters.

**CAUTION:** Each BIOCHEM sensor is designed for a specific clinical application. Optimal performance can only be attained by using each sensor appropriately.

**CAUTION:** Sensor sites must be checked periodically to determine circulation, sensor positioning, and skin sensitivity.

9.2.6.1. Sensors are designed for specific site placement, specific site and weight ranges, the duration of monitoring, and the amount of patient movement expected. Consider the following when selecting sensors:

9.2.6.1.1. The best performing sensor for most patients is the tape-on flex sensor used on the finger or toe.

9.2.6.1.2. The finger clip sensor performs best for most patients when used on fingers other than the thumb. This sensor is not recommended where motion is expected, or for long term monitoring; e.g. greater than 30 minutes.

9.2.6.1.3. Infant sensors are recommended for use on the great toe of infants greater than two (2) kilograms.

9.2.6.1.4. Neonatal sensors are recommended for use on the foot of infants less than two (2) kilograms.

**NOTE:** It is recommended that sensors be repositioned every eight (8) hours for patient comfort.

9.2.6.2. All BIOCHEM sensors are reusable. Clean them with an isopropyl alcohol wipe, and allow enough time for the sensor to dry before reusing. Specific sensors include:

9.2.6.2.1. Flex Sensor. This sensor is designed for use with adult and pediatric patients where moderate patient movement is expected. The sensor is attached by applying clear double stick tape to the smooth side of the sensor, then positioning the sensor on the top and bottom of the end of the finger or toe. Place the light emitter portion on the nail side of the digit, and the detector on the pad side. Secure the sensor with tape. Wrap the sensor snugly, but not tight enough to restrict blood flow.

**NOTE:** For optimum light transmission, attach the sensor on the finger or toe. For best results, securing the cable independently from the sensor. Ensure the tape securing the cable does not restrict the blood flow.

9.2.6.2.2. Finger Clip Sensor. This sensor is designed for spot-check monitoring of pediatric and adult patients, or continuous monitoring less than 30 minutes where patient movement is not expected. Insert the finger (preferably an index finger) completely into the sensor, keeping nail side facing the sensor top. The thumb is NOT recommended for use with the finger clip sensor. For best results, secure the sensor cable independently from the sensor, preferably around the base of the finger. Ensure the tape securing the cable does not restrict the blood flow.

9.2.6.2.3. Infant and Neonatal Sensors. These sensors are designed for continuous monitoring of infants and neonates where finger tip monitoring is impractical. Apply clear, double-stick tape to the smooth side of the sensor. Position infant sensors on the great toe or foot as using the following guidelines:

9.2.6.2.3.1. Foot Placement - Position the sensor as far forward on the foot as is practical, ensuring the emitter and detector are exactly aligned with each other. Ensure the emitter is on the nail or top side of the foot, and the detector is on the opposite side. Attach the sensor by wrapping tape over the sensor assembly snugly, but not tight enough to restrict blood flow. For best results, secure cable independently from the sensor, preferably around patient's ankle or lower leg. Make sure the tape securing the cable does not restrict the blood flow.

9.2.6.2.3.2. Toe Placement - On infants large enough to allow sensor placement on the great toe, that is the preferred sensor site. This placement provides increased light transmission compared to the foot placement.

### **9.3. BCI 3303 PulseOximeter User's Guide.**

**9.3.1. Purpose.** Continuously monitors arterial hemoglobin oxygen saturation, pulse rate, and pulse strength on neonate through adult patients by non-invasive means.

**9.3.2. Description.** The BCI 3303 Oximeter determines arterial hemoglobin saturation (SpO<sub>2</sub>), pulse rate and pulse strength by measuring wavelengths of red and infrared light passing through body tissue to a photodetector. The oximeter has three operating modes: Clinician Mode, Home-Use Mode, and Sleep Study Mode. Trend data is collected in all modes and may be down loaded to a printer. In the Clinician Mode (standard patient monitoring), SpO<sub>2</sub> and pulse rate is indicated by LED display.

Pulse strength is indicated by an eight-segment LED bar graph with adjustable brightness. The SpO<sub>2</sub> and pulse rate LED display features adjustable high and low alarm limits, with adjustable alarm volume (including off). A “beep” sounds with each pulse beat and has adjustable volume (including off). The pitch of the “pulse-beep” corresponds to increasing or decreasing SpO<sub>2</sub> values. The oximeter’s accuracy is  $\pm 2\%$  at 70-100% SpO<sub>2</sub> and  $\pm 3\%$  at 50-69% SpO<sub>2</sub>. It will operate accurately over an ambient temperature range of 32 to 104 F (0 to 40 C).

**Figure 9.3. BCI 3303 PulseOx With Connections**



**9.3.3. Power Source.** 105 VAC to 125 VAC/60Hz and a four (4) cell rechargeable NiMH (Nickel Metal Hydride) battery pack. Battery pack will operate for minimum of 24 hours from a fully charged NiMH battery. Requires 6 hours to charge a fully depleted battery. If portable operation is not necessary, continuous charging is recommended to assure a fully charged battery.

**NOTES:**

When BATT flashes, you must immediately charge the monitor's battery. Otherwise, the monitor turns itself off in approximately 30 minutes. Neither continuous charging or complete discharge will degrade battery capacity or battery life. The oximeter may be charged in flight and is fully charged when the charging light turns off. The AC power supply unit/cord will not connect to the C-9 wall outlets or Electrical Cable Assembly Set (ECAS) due to adapter design. AC power unit/cord will only fit and may only be plugged into the Avionic or Unitron Electrical Frequency Converter for in-flight charging (converter is required on aircraft that do not have 115 VAC/60Hz capability).

**WARNING:** The BCI 3303 Oximeter has been approved for use in the AE environment while operating on internal battery only. Do not connect the AC power supply to the monitor for patient use in the aircraft. Power surges or spikes will cause the monitor to display inaccurate readings.

**9.3.4. Components.**

9.3.4.1. Oximeter, Pulse – BCI 3303.

9.3.4.2. Probe, Adult (>45 Kg) - 3044: Probe, Adult (reusable); 3043: Universal “Y” (reusable); 3078: Probe Ear (reusable).

9.3.4.3. Probe, Pediatric (15-45 Kg) – 3044: Probe, Adult (reusable); 3043: Universal “Y” (reusable); 3078: Probe Ear (reusable).

9.3.4.4. Probe, Infant (3-15 Kg) – 3043: Universal “Y “ (reusable); 3025: Probe, Wrap, Infant (reusable).

9.3.4.5. Probe, Neonate (<3 Kg) – 3026: Probe, Wrap, Neonate (reusable).

9.3.4.6. 3311: Cable, Oximetry, 5 ft.

9.3.4.7. 8210: Battery Charger (105 to 125 VAC/60 Hz).

9.3.4.8. 3354: Pole Mount (BCI or Universal).

9.3.4.9. 3353: Protective Rubber Boot with Carrying Strap and Mounting Slide.

9.3.4.10. 3359: Analog Output Adapter.

9.3.4.11. Case.

**Figure 9.4. Pulse Ox Front Panel Indicators**



### **9.3.5. Front Panel Indicators.**

9.3.5.1. Probe/Printer Connector. The probe connects here, or an oximeter cable can be connected between the monitor and the probe. The printer is also connected here.

9.3.5.2. SpO2 Numeric display. A number shows the patient's SpO2 value in percent. Dashes (---) mean the monitor is not able to calculate the pulse rate value.

9.3.5.3. Pulse Rate Numeric Display. A number shows the patient's pulse rate value in beats per minute. Dashes (---) mean the monitor is not able to calculate the pulse rate value.

9.3.5.4. Power Supply Connector. The AC power supply connector is located on the lower right side.

9.3.5.5. Pulse Strength Bar Graph. The pulse strength bar graph "sweeps" with the patient's pulse beat. The height of the bar graph tells the strength of the patient's pulse.

9.3.5.6. Probe Light. SENSOR flashes on and off when the probe is not connected to the monitor, the probe is not attached to the patient, or the probe is not properly attached to the patient.

**WARNING:** While SENSOR is flashing, the monitor cannot measure the patient's SpO<sub>2</sub> or pulse rate. You must immediately check the patient's condition. After you have checked the patient's condition, you must correct the probe alert.

9.3.5.7. BATT Light. BATT flashes on and off when approximately 30 minutes of battery use remains. The monitor will continue to work until the battery becomes very weak. When the battery becomes very weak the monitor will automatically turn itself off.

**WARNING:** When the BATT flashes, you must immediately charge the monitors battery. Otherwise, the monitor turns itself off about 30 minutes after the BATT begins to flash.

9.3.5.8. POWER Light. The POWER light is green when the power supply is attached.

9.3.5.9. CHARGING Light. The CHARGING light is yellow when the battery is fast charging.

9.3.5.10. Alarm Silenced Light. The alarm silenced light flashes on and off when the alarm and alert tones are silenced for two minutes (press alarm silence). The alarm silenced light remains on when the alarm and alert tones are silenced indefinitely (press and hold alarm silence for a few seconds) until canceled, or until the monitor is turned off.

9.3.5.11. On Key. Pressing on turns on the monitor.

9.3.5.12. Off/Stby Key. Pressing the Off/Stby turns off the monitor.

9.3.5.13. I.D./Clear Key. While the probe is connected to the monitor: Pressing the I.D./Clear increases the patient number by one; the patient number is briefly displayed in the SpO<sub>2</sub> digits. Pressing and holding the I.D./Clear for about six seconds clears all the trend data and resets the patient number to one.

9.3.5.13.1. While the probe is not connected to the monitor: Pressing I.D./CLEAR cause the monitor to enter the trend view mode (two bar graph segments flash to indicate the view trend mode). During the view trend mode, the valid measurement for each patient number can be shown by pressing the up/down arrow keys. The display shows Pn (n = patient number) then the number corresponding to that patient number. If, after 20 seconds, no keys are pressed, the monitor exits the trend view mode.

9.3.5.14. Up/Down Arrow Keys. Up/Down arrow keys are used to adjust the following settings: brightness of the display; alarm limits; trend view patient numbers; SpO<sub>2</sub> and pulse rate averaging.

9.3.5.15. Alarm Silence Key. Momentarily pressing the alarm silence key silences the alarm tone for two minutes. Pressing and holding the alarm silence key for about three seconds silences the alarm tone indefinitely until it is canceled or the monitor is turned off.

9.3.5.16. Alarm Sel Key. Pressing the ALARM SEL cycles through each of the alarm limits for the setting.

9.3.5.17. Alarm Vol Key. Pressing the ALARM VOL key changes the alarm volume from soft to loud or loud to soft.

9.3.5.18. Pulse Vol Key. Pressing the PULSE VOL key change the pulse "beep" volume.

**NOTE:** The pulse volume is stored after the monitor is turned off.

9.3.5.19. AC Power Supply. AC power supply connection is located on the lower right side of the unit.

9.3.5.20. Probe/Printer Connector. Probe/printer connection is located on the top right side of the unit.

### **9.3.6. Patient Alarms.**

9.3.6.1. High SpO<sub>2</sub> Alarm. An audible alarm and the SpO<sub>2</sub> display will flash when saturation percentage is at or above settings.

9.3.6.2. Low SpO<sub>2</sub> Alarm. An audible alarm and the SpO<sub>2</sub> display will flash when saturation percentage is at or below settings.

9.3.6.3. High Pulse Rate. An audible alarm and the pulse display will flash when pulse rate is at or above settings.

9.3.6.4. Low Pulse Rate. An audible alarm and the pulse display will flash when pulse rate is at or below settings.

**NOTE:** Refer to BCI Instruction and Service Manual for additional information and proper operation.

### **9.3.7. Pre-Flight.**

9.3.7.1. Ensure currency of the inspection/calibration decal on unit and that all component parts are complete and in serviceable condition.

**NOTE:** The AC power supply cord will not fit the ECAS pigtailed or C-9A wall outlets except in the Special Care Area.

9.3.7.2. Connect the AC power supply to the monitor.

9.3.7.3. Ensure the POWER and CHARGING lights have illuminated.

9.3.7.4. Visually inspect the probe and oximeter cable for cracks, kinks, and fraying.

9.3.7.5. Connect the probe to the oximeter cable then connect the oximeter cable to the monitor.

9.3.7.6. Turn on the monitor.

9.3.7.7. Place probe on finger.

9.3.7.8. Measure the SpO<sub>2</sub>, pulse rate, and pulse strength bar graph.

9.3.7.9. Adjust the brightness of the LED display and change the pulse beep volume.

9.3.7.10. Turn off the alarm and the alert tones for two minutes.

9.3.7.11. Turn on the alarm and alert tones.

9.3.7.12. View the alarm limits.

9.3.7.13. Remove the probe from finger and ensure the PROBE/SENSOR alert illuminates.

9.3.7.14. Check the BATT attention.

9.3.7.15. Turn monitor off.

### **9.3.8. Operating Instructions.**

9.3.8.1. Press ON key and observe cycling of pulse bar graph light, software revision number, patient number and Clinician Mode (SpO2 and bpm) is displayed.

**NOTES:**

Should the oximeter inadvertently be placed in Home-Use or Sleep Study Mode, it may be returned to Clinician Mode as follows: Home-Use Mode-turn monitor off, press and hold the PULSE VOL key, then press the ON key, when H stops flashing and Pn lights steady, release the key. Sleep Study Mode-turn monitor off, press and hold the ALARM SILENCE key, then press the ON key, when SLP stops flashing and Pn lights steady, release the key.

Assigning patient numbers: the BCI 3303 monitor remembers all the trend data for up to 99 patients for a 24-hour period (advance by pressing I.D./Clear for successive patients). The monitor needs to be manually cleared of previous patient numbers at the beginning of the mission if trend data is to be collected (press and hold I.D. Clear until P1 appears). Otherwise, the monitor may turn on and used as is.

9.3.8.2. Set Patient Alarms (High/Low SpO2% & High/Low Pulse Rate) as required.

9.3.8.3. Connect the cable and probe.

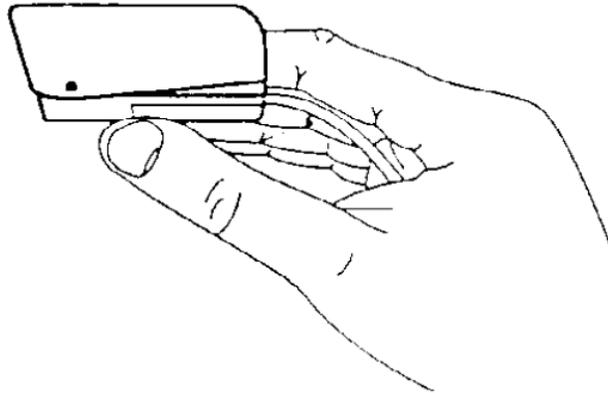
9.3.8.4. Secure appropriate probe to patient. (See [Figure 9.3.](#) for adult and [Figure 9.4.](#) for pediatric).

**WARNING:** Change sensor site and check skin integrity, circulatory status and correct alignment at least every four hours. When attaching probes with Microfoam tape or other approved adhesive tape, do not stretch tape too tightly due to possible circulation impairment, skin breakdown and blisters.

9.3.8.4.1. The finger clip probe (reusable) Model 3044 is designed for spot check monitoring of pediatric and adult patients or continuous monitoring less than 30 minutes where patient movement is not expected and the patient's finger is large enough for the probe to be attached securely.

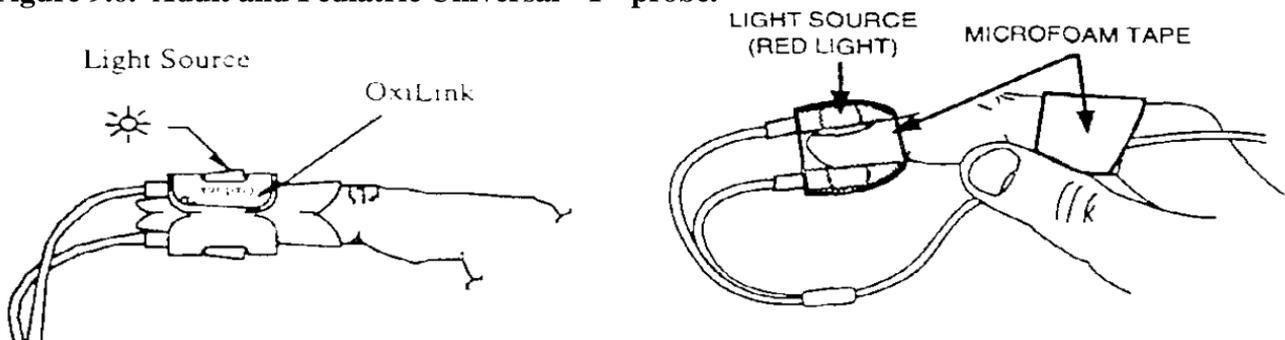
9.3.8.4.2. Insert finger (preferably left or right index finger) completely into the finger probe (See [Figure 9.3.](#)). The thumb is specifically not recommended for use with the finger clip probe.

**Figure 9.5. Probe For Adult or Pediatric Finger.**

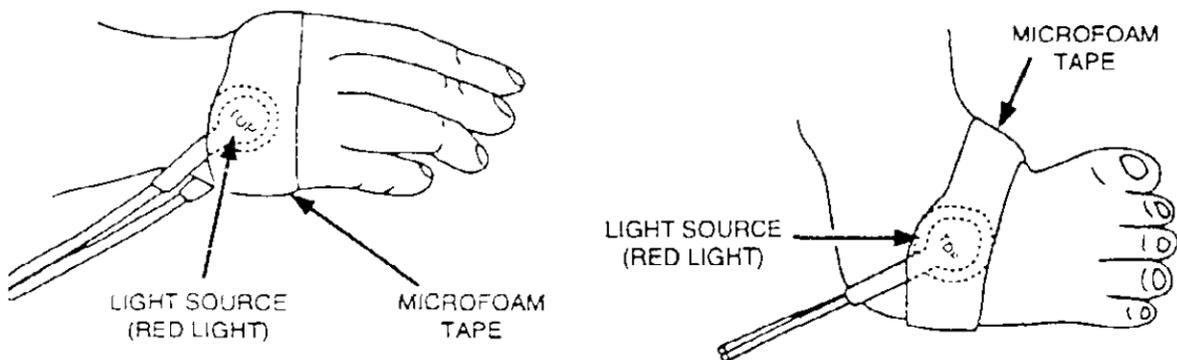


9.3.8.4.3. The Universal Y probe may be positioned on the Adult or Pediatric Finger, Infant Hand, or Infant foot and is designed for continuous monitoring. Attach the probe to the patient with the light source to the fingernail. Line up the light source with the detector, so the source and the detector are in-line. Secure the probe and cable with microfoam tape, being careful not to over-tighten the tape. (See [Figure 9.4.](#))

**Figure 9.6. Adult and Pediatric Universal “Y” probe.**



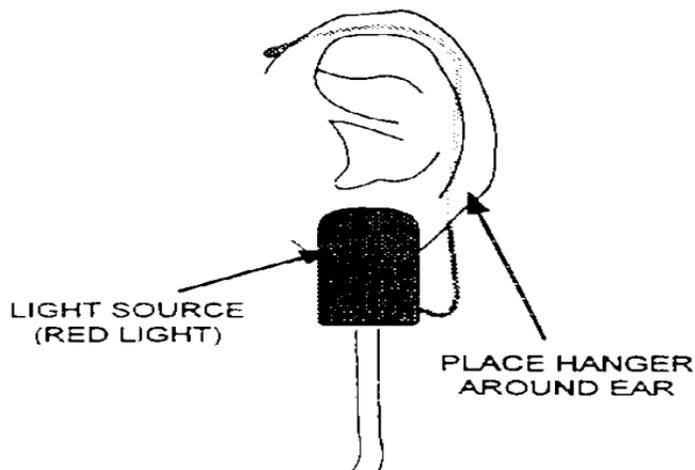
**NOTE:** For the best results, secure the probe cable independently from the probe, preferably around the base of the finger. Make sure that tape securing the cable does not restrict the blood flow.



9.3.8.4.4. The ear probe will be attached to a fleshy portion of the earlobe. Make sure the light source is on the outside of the ear, and the hanger is behind the ear. Place hanger around the

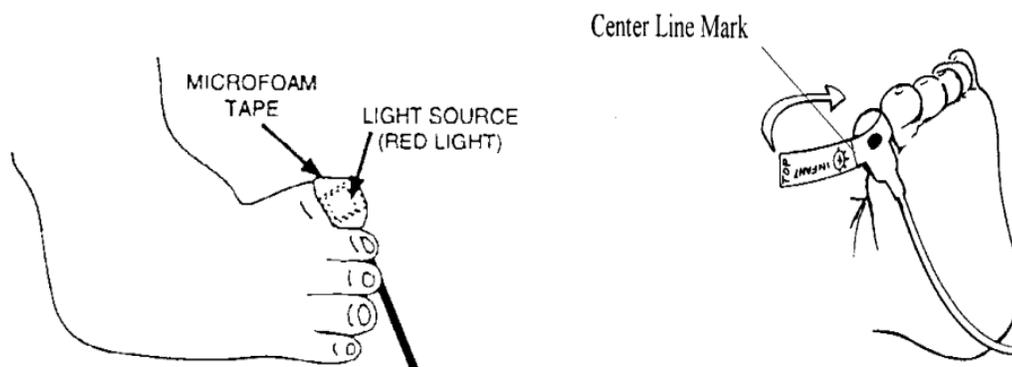
ear. Rub the earlobe with an alcohol prep for 1-2 minutes before attaching the ear probe. (See [Figure 9.5.](#))

**Figure 9.7. Ear Probe Adult and Pediatric**

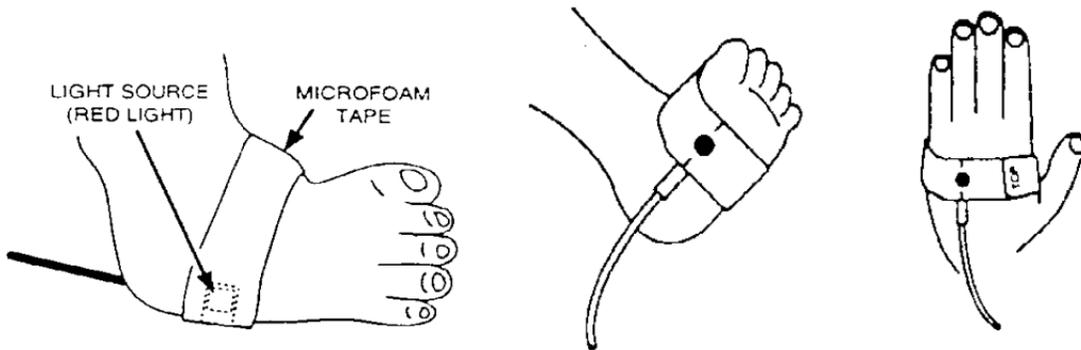


9.3.8.4.5. Attach the infant wrap probe with the light source to the toenail. Attach the probe with the light source on the outside or top of the foot to keep the director away from ambient light. Line up the light source and the detector, so the source and detector are in-line. Secure the probe with microfoam tape, being careful not to over-tighten the tape. (See [Figure 9.6.](#))

**Figure 9.8. Wrap Probe for Infant Toe.**



9.3.8.4.6. Attach the neonatal wrap to patient's foot or hand. The preferred site is the ball of the foot. Alternatively, the heel of the hand can be used. Route the cable towards the heel or wrist. Attach the probe with the light source on the outside or top of the foot or hand to keep the detector away from ambient light. Line-up the light source with the detector, so the source and detector are in-line. Secure the probe with microfoam tape, being careful not to over-tighten the tape. (See [Figure 9.7.](#))

**Figure 9.9. Probe for Neonate Hand and Foot**

**NOTE:** Attach probe using Microfoam tape, or equivalent by wrapping the tape or probe wrap over the probe assembly snugly, but not so tight as to restrict blood flow. For best results, secure cable independently from the probe, preferably around patient's ankle or lower leg. Make sure tape securing the cable does not restrict the blood flow.

#### 9.3.8.5. Securing the Unit.

##### 9.3.8.5.1. BCI Mounting Bracket.

**CAUTION:** The securing bracket may only be attached vertically with the bracket retaining pins down to prevent the monitor from falling out of the bracket. Horizontal or side mounting should not be attempted as the monitor could slide out of the bracket.

##### 9.3.8.5.2. Universal Mounting Bracket.

### 9.3.9. Disassembly and Storage.

9.3.9.1. Remove probe from Patient Interface Cable. Remove Patient Interface Cable from oximeter unit. The oximeter may be cleaned with a mild detergent and a damp cloth.

**CAUTION:** Do not use caustic or abrasive cleaning agents. Do not immerse or pour liquids on the Oximeter. Do not autoclave probes. No adjustments are necessary and opening the oximeter case is not recommended.

9.3.9.2. Clean the reusable probes with an isopropyl alcohol wipe. Allow enough time for the probe to dry thoroughly before reusing. They may also be sterilized as outlined in the BCI Instruction and Service Manual and local procedural guidance.

## Chapter 10

### RESPIRATORY USER'S GUIDE

#### 10.1. Chest Drainage Units.

**10.1.1. Purpose.** Chest drainage units provide drainage of the pleural cavity and suction control for patients with chest tubes.

**10.1.2. Description.** Water seal drainage units vary in specific design, but all are based on the same principle. A collection tube extends down into a collection chamber where its lower opening is covered by a layer of water. The water covering the tube acts as a one-way valve allowing drainage from the pleural cavity, but preventing back-flow into the plural cavity. Drainage may be either by "straight drainage" to gravity, or by "controlled suction".

**10.1.3. Pre-flight.** Inspect the drainage unit package for signs of damage. If the package is damaged, dispose of the item. If the drainage unit is pre-packaged with other supplies, ensure that the contents of the package have not expired.

#### 10.1.4. Set-up and Operation.

**NOTE:** Refer to the specific instructions accompanying each drainage unit for set-up and operation.

**WARNING:** A Heimlich Valve must always be installed between the thoracotomy tube and the drainage unit for flight. Always keep the chest drainage unit straight, level to the floor, and below the patient's chest.

10.1.4.1. Generalized instructions for set-up for drainage to gravity are:

10.1.4.1.1. Fill the water seal chamber to the specified level to provide the water seal.

10.1.4.1.2. Secure the drainage unit below the patient's chest.

10.1.4.1.3. Connect the drainage tube (usually the long tube) to the Heimlich Valve connected to the chest tube.

10.1.4.1.4. Leave the vent tube (short tube) open to air.

10.1.4.2. Generalized instructions for set-up for suction controlled drainage:

10.1.4.2.1. Fill the water seal chamber to the specified level.

10.1.4.2.2. Fill the suction control chamber to the level ordered by the physician.

10.1.4.2.3. Connect the suction tubing (usually the long tubing) to the Heimlich Valve connected to the chest tube.

10.1.4.2.4. Connect the suction tube (short tube) to the suction source and set the vacuum to produce gentle bubbling in the water in the suction control chamber.

10.1.4.3. If the water seal drainage is functioning properly, the water will rise and fall in the water seal chamber. Monitor the water seal and suction control levels closely and add water as necessary PRIOR to take-off and at cruising altitude. It is not normally necessary to adjust the water levels during ascent and descent.

10.1.4.4. Chest drainage units are single use items and are to be disposed of after use. On the ground after descent, slowly open the chest drainage unit and readjust the water levels in the water seal and suction control chambers. The Heimlich Valve will prevent air from entering the patient's chest cavity. On missions where the patient will be on more than one leg, remember that water from the water seal chamber will be pulled into the collection chamber on each descent. Monitor the collection chamber to ensure that it does not inadvertently fill after multiple descents. Be aware the collection chamber may not accurately display the amount of liquid drained from the patient.

## **10.2. Hand Operated Resuscitator - Manual Resuscitators (Adult/Child/Infant).**

**10.2.1. Purpose.** The Manual Resuscitators are used to administer artificial ventilation when natural inspirations are insufficient or have ceased.

**10.2.2. Description.** The Manual Resuscitator kit consist of oral airways, a bag valve-mask assembly, and an oxygen reservoir bag. There are three (3) sizes:

10.2.2.1. Adult - for patients over 66 lbs (30 kilograms [kg]).

10.2.2.2. Child - for patients between 15 lbs (7 kg) and 66 lbs (30 kg).

10.2.2.3. Infant - for patients under 15 lbs (7 kg).

10.2.2.4. The Adult unit consists of cuffed masks, a non-re breathing patient valve, a ventilation bag, an intake valve, an oxygen reservoir valve, and an oxygen reservoir bag.

10.2.2.5. The Child unit is similar to the Adult unit, but has smaller cuffed masks, a non-re-breathing patient valve with a pressure limiting device, and a smaller ventilation bag.

10.2.2.6. The Infant unit is similar to the Child unit, but has a one piece mask, a pressure limiting device, and smaller ventilation and oxygen reservoir bag than the Child unit.

10.2.2.7. Depending on the set-up and oxygen delivery provided to the unit, various oxygen concentrations may be delivered to patients:

10.2.2.7.1. 21% oxygen is delivered if no supplemental oxygen is supplied.

10.2.2.7.2. Up to 65% oxygen is delivered if supplemental oxygen is supplied.

10.2.2.7.3. Up to 100% oxygen is delivered if supplemental oxygen is supplied and an oxygen reservoir bag is used.

10.2.2.7.4. To attain the higher oxygen percentages delivered, supply oxygen at the "Flush" rate or at least 15 LPM.

**10.2.3. Pre-flight.** Ensure that the resuscitator bags are sealed, and that all masks and airways are present. DO NOT open the sealed bags to check operation of the resuscitators. They are operationally tested before being sealed in the bags.

**10.2.4. Operation.** Select the resuscitator based on patient size (Adult, Child, or Infant). Connect the oxygen reservoir bag to the oxygen reservoir valve, and that valve to the intake valve. Connect the oxygen tubing connected to the inlet nipple to a flow meter outlet and set the rate to "Flush" (maximum). Connect the appropriate sized mask to the manual resuscitator. Ensure a patent airway use an oral airway to help maintain it. Seal the mask over the patient's nose and mouth. Maintaining a seal,

compress the ventilation bag to ventilate the patient. Observe the chest for a rise and fall. Ventilate as required. Ensure a good seal is maintained between the mask and the patient's face.

**WARNING:** Ensure proper size reservoir bag is used with each ventilation bag. Ensure non-re-breathing valve, with pressure limiting device, is in place on child and infant units. If needed, the pressure limiting device can be overridden.

**NOTE:** The pressure limiting device restricts airway pressure to 35 centimeters (cm) H<sub>2</sub>O pressure. The oxygen reservoir bag must inflate with oxygen to be effective. If it does not, ensure oxygen is being delivered to the unit at an adequate rate.

### 10.3. Heimlich Valve.

**10.3.1. Purpose.** The heimlich valve prevents the flow of air or fluid from the chest drainage unit back into the patient's chest cavity.

**10.3.2. Description.** The heimlich valve consists of a hard, clear plastic tube that connects into the tubing inline between the patient's chest tube and the chest drainage unit. Inside the plastic tube is a flutter valve that allows only one-way flow of air and fluid through the tube. An arrow imprinted onto the side of the tube indicates the direction of the flow. The end of the valve that connects to the tubing from the patient's chest tube is colored blue, while the end that connects to the tubing to the chest drainage unit is clear.

**10.3.3. Pre-flight.** Inspect the heimlich valve and the sterile package for any signs of damage. If any signs of damage are present then, dispose of the entire package. Ensure that two (2) large Kelly clamps with latex tubing over the clamp jaws are available.

Figure 10.1. Heimlich Valve.



### 10.3.4. Set-up and Operation.

**WARNING:** The ends of the heimlich valve and all connections must remain sterile. Always ensure that a closed system is maintained.

10.3.4.1. Generalized instructions for connection of heimlich valve are:

10.3.4.1.1. Using the two Kelly clamps accompanying the valve, double clamp the chest catheter close to the patient's chest wall.

10.3.4.1.2. Attach the distal end of the catheter securely to the blue end of the heimlich valve.

10.3.4.1.3. Attach the distal end of the heimlich valve to the tubing connected to an approved closed chest drainage unit that is vented to allow air to escape during drainage.

10.3.4.1.4. Secure all connections with adhesive tape.

**NOTE:** The tubing should be taped firmly to the valve to prevent accidental disconnection. Use adhesive tape only. DO NOT use masking tape. Ensure the arrow on the heimlich valve points away from the patient's chest.

10.3.4.1.5. Remove both clamps from the chest catheter and store them near the patient.

**WARNING:** The clamps should be kept by the patient's side in case emergency clamping of the chest catheter becomes necessary.

10.3.4.2. The passage of fluids through the valve can be observed through the clear plastic of the valve. If the valve should become obstructed, use the sterile technique described in paragraph [10.3.4.1](#) to replace it. When the heimlich valve is installed properly, it is not necessary to clamp the chest catheter while transporting the patient. The heimlich valve will continue to function properly during a rapid decompression, protecting the patients pleural cavity. The heimlich valve is a single use item and should be disposed of immediately following use.

## Chapter 11

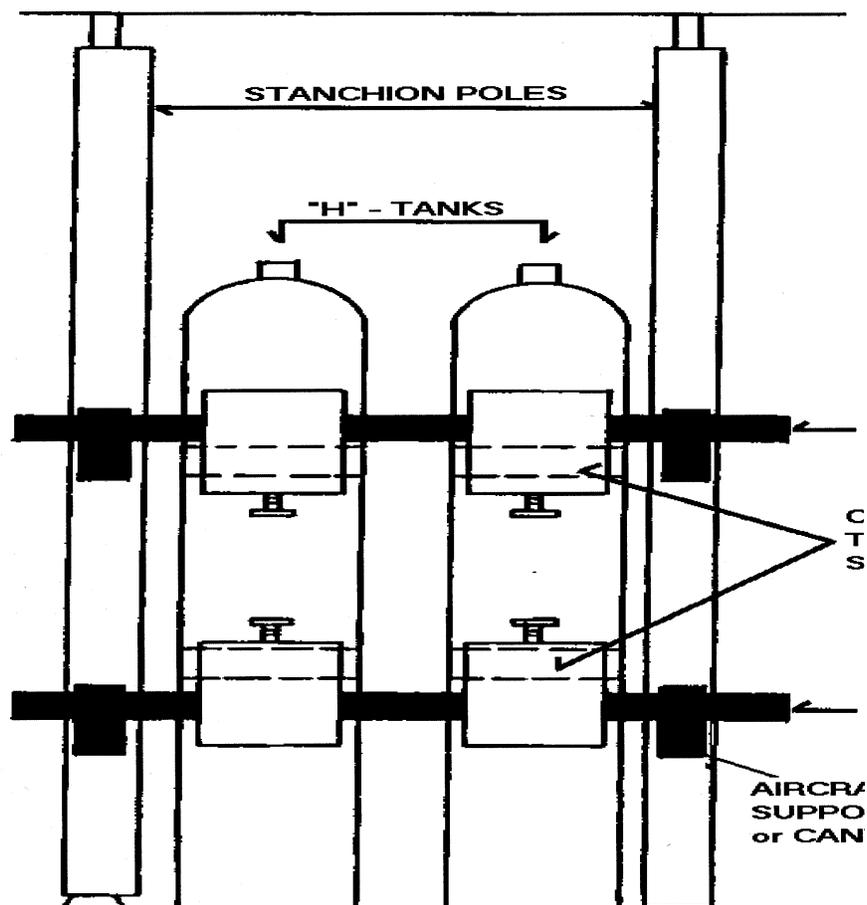
## SECURING USER'S GUIDE

## 11.1. H-Tank Bracket Set.

**11.1.1. Purpose.** The H-Tank bracket set is used to secure H-sized compressed gas cylinders on-board AE aircraft.

**11.1.2. Description.** The H-Tank bracket set consists of a pair of bars on which as many as two (2) sets of brackets may be clamped (**Figure 11.1**). H-Tanks are strapped to an upper and lower bracket by cargo tie-down straps, while supported on plywood shoring or a milk crate. The bars with brackets clamped to them are mounted to litter support brackets on C-130 and C-141 aircraft, or to cantilever arms on C-9A aircraft. The brackets and H-Tanks are placed between any two established litter tiers.

**Figure 11.1. H-Tank Brackets Mounted to Stanchion Poles.**



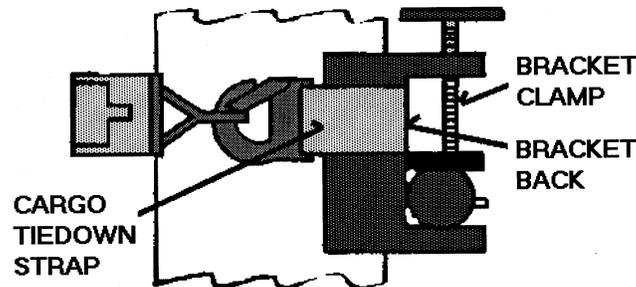
**11.1.3. Pre-flight.** Inspect the bracket set for signs of damage, and ensure the clamps are secure.

**11.1.4. Set-up.**

11.1.4.1. C-9A Aircraft. The C-9A requires at least a 3-30 configuration for the H-Tank bracket set. Place one set of cantilever arms about 18 inches from the floor and a second set about 36

inches above the floor. Place the H-Tank bracket sets into the cantilever arm clamps closest to the fuselage with the brackets facing the fuselage, and secure them in the cantilever arm clamps. Thread a cargo tie-down strap between the back of each bracket and bracket clamp that is to be used (Figure 11.2.). Place shoring on the floor below the bracket set.

**Figure 11.2. Cargo Tie Down Strap Securing Tank to Bracket.**



**CAUTION:** Use 3/4 inch plywood or a milk crate. A blanket IS NOT adequate for shoring. Place the H-Tank on the shoring, and against the brackets, and secure with the cargo tie-down straps around the brackets (Figure 11.2.). Ensure that the cargo tie-down strap ratchet mechanism is on the H-Tank surface and not on the bracket, as it may damage the bracket.

11.1.4.2. C-130 and C-141 Aircraft. Use litter support brackets on the stanchion poles instead of cantilever arms.

**WARNING:** Use one (1) cargo tie-down strap for each bracket, and ensure all straps are securely fastened to prevent movement of the H-Tanks.

**11.1.5. Disassembly.** Release the cargo tie-down straps and remove the H-Tanks from the bracket set. Release the litter stanchion brackets or cantilever arm clamps and remove the bracket sets.

## Chapter 12

### SUCTION USER'S GUIDE

#### 12.1. OHIO Intermittent Suction Unit (ISU).

**12.1.1. Purpose.** The OHIO Intermittent Suction Unit is designed to provide intermittent suction for gastrointestinal drainage or continuous suction for tracheal and oropharyngeal suctioning.

**12.1.2. Description.** The OHIO ISU is comprised of two (2) parts, a suction unit and a collection bottle.

12.1.2.1. The suction unit connects to a suction outlet on the C-9A aircraft by a nipple that plugs into the outlet. It has a vacuum gauge that has a range of 0 millimeters (mm) of Mercury (Hg) to 200 mm Hg. The gauge is also divided into LOW, MEDIUM, and HIGH ranges that correspond to 10 mm Hg to 60 mm Hg, 60 mm Hg to 100 mm Hg, and 100 mm Hg to 200 mm Hg respectively. Two (2) controls are also located on the suction unit. They are a Rotary Selector Switch with "OFF", "CONT", "INTER", and a Rotary Regulator Control.

12.1.2.2. The collection bottle mounts onto a wall bracket adjacent to the suction outlet. The straight stem on the top of the bottle connects by latex tubing to the nipple on the bottom of the suction unit. The curved stem on the bottle is for connection of a suction tubing and catheter.

12.1.2.3. When the OHIO ISU is used in the intermittent mode, both the ON and OFF cycle duration are independently adjustable. They are preset at the factory at 15 seconds ON and 8 seconds OFF. The ON cycle is longer than the OFF cycle to ensure the drainage will move away from the patient toward the collection bottle.

**12.1.3. Power Source.** The built in vacuum on the C-9A aircraft is used to provide the suction source for the OHIO ISU. A Master Vacuum Pump Switch is at the MCD station, and must be turned on for suction to be available.

**12.1.4. Pre-flight and Operation.** Inspect the OHIO ISU and collection bottle for damage, and ensure all components are present. Ensure that the OHIO ISU has a current inspection/calibration sticker. Turn the selector switch to the "OFF" position and insert the suction unit into a suction outlet. Ensure the Vacuum Pump Switch at the MCD station is switched on. Mount the collection bottle on the bracket adjacent to the suction outlet and connect the Bottle Outlet Stem to the OHIO ISU with latex tubing. Switch the selector knob to Continuous Suction (CONT), pinch the latex tubing and adjust the Regulator Knob till the gauge shows a vacuum of 200 mm Hg. Switch the selector knob to Intermittent Suction and verify that the unit cycles ON and OFF. Switch the selector switch to "OFF" until the unit is needed.

**NOTE:** Because patients are positioned below the suction unit, and a certain amount of suction is required to lift the aspirate from the patient to the collection bottle inlet, a correction must be made to compensate for that loss of suction. To compensate for the loss of suction and provide the desired suction at the patient, increase the gauge reading of suction by the values shown in [Table 12.1](#).

**12.1.5. Disassembly.** Switch the suction regulator knob to the "OFF" position. Remove the suction tubing and catheter, and the connecting latex tubing from the collection bottle and suction unit. Dispose of the tubing and collected aspirate in accordance with local policy. Clean the collection bottle and suction unit in accordance with local policy.

**Table 12.1. Ohio ISU Compensation Chart.**

HEIGHT OF BOTTLE ABOVE PATIENT (Inches)	INCREASE GAUGE READING APPROX. (mm Hg)
12	20
18	35
24	45
30	55
36	65
42	80

**12.2. Suction Apparatus Oropharyngeal - IMPACT MODEL 308M Portable Suction Unit.**

**12.2.1. Purpose.** The Impact Model 308M suction apparatus is a self-contained unit designed to provide continuous suction.

**12.2.2. Description.** The Impact Model 308M is housed in a high-density polyethylene case which is hinged and divided into lower and upper compartments. The lower compartment houses the vacuum pump, indicator lights, vacuum control valve, circuit breaker, power cord, vacuum gauge, power switch, collection canister, rinse bottle, and accessories. The top compartment functions as a cover for the unit. Latch-locks to close the unit, and a carrying handle are included on the case. Hook and pile straps attached to two pairs of "D" rings are used for securing the unit.

**12.2.3. Components.** The components of the Impact Model 308M and their function are as follows:

12.2.3.1. Circuit Breaker. This protects the pump motor from drawing excessive current.

12.2.3.2. Power Indicator Lamp. This illuminates during operation from internal batteries, external AC power, and external DC power.

12.2.3.3. Charge Indicator Lamp. This illuminates when the batteries are being charged by an external 115 VAC/50-400 Hz source.

12.2.3.4. Mode Selection Switch. The various modes are as follows:

12.2.3.4.1. Off/Charge - This turns the operating power "OFF" and allows batteries to recharge.

12.2.3.4.2. AC - This allows operations from a 115 VAC/50-400 Hz source.

12.2.3.4.3. 12 VDC - This allows operations from an external 12 VDC source.

12.2.3.4.4. Battery - This allows operation from the internal rechargeable battery.

12.2.3.5. Vacuum Gauge. This displays the vacuum developed in the patient suction circuit.

12.2.3.6. Vacuum Regulator Control. This allows regulation of the vacuum level from 0-550 mm Hg.

12.2.3.7. Bacterial Overflow Filter. This prevents bacteria and aspirate from being pulled into the pump.

12.2.3.8. Collection Canister. This is used to collect aspirate from the patient.

12.2.3.9. Rinse Bottle. Sterile water is stored in this bottle for use in rinsing catheters between suctioning passes in a suctioning episode.

12.2.3.10. AC Power Cord. Connects to 115 VAC/50-400 Hz power supply.

12.2.3.11. External 12V/DC Jack. This is where an external 12 VDC power source is plugged in. An Auto Power Cable is provided for this connection.

**NOTE:** The 12V/DC Auto Power Cable may be deleted from the components inventory.

**12.2.4. Power Sources.** The Impact Model 308M suction unit has power sources as follows:

12.2.4.1. 115 VAC/50-400 Hz is used to power the suction unit and to charge the internal battery when the unit is switched off.

12.2.4.2. Internal Rechargeable Battery. The internal battery is not designed as the primary power source and should be used only for emergencies and during transitory procedures. Approximate operating time on internal battery is 20 minutes. The battery requires 16 hours to fully recharge from a completely discharged condition. The batteries cannot be recharged from an external 12 VDC source.

12.2.4.3. Twelve (12) VDC external power is provided through an Auto Power Cable and is for ambulance use only.

**12.2.5. Pre-flight.**

12.2.5.1. Ensure the inspection sticker is current. Inspect the unit and components for signs of damage and serviceability.

12.2.5.2. Inventory the components and supplies as follows:

12.2.5.2.1. Six (6) foot long suction tubing (from collection canister).

12.2.5.2.2. Two (2) suction catheters (14 and 18 French).

12.2.5.2.3. Collection canister.

12.2.5.2.4. Two (2) bacterial/overflow filters (one installed, one extra).

12.2.5.2.5. One (1) rinse bottle.

12.2.5.2.6. Two (2) 24" long hook and pile attachment straps.

12.2.5.2.7. One (1) 12 VDC power cable (for ambulance use only, and if maintained in inventory).

**NOTE:** The manufacturer recommends the filter be in place but the pump will operate without it.

**CAUTION:** Ensure the bacterial/overflow filter is in place between the collection canister and the vacuum pump inlet. If the filter is discolored or contacts aspirate, air flow is impeded, or following 150 hours of cumulative use the filter should be replaced.

12.2.5.3. Ensure the Mode Selection Switch is off, then plug the AC line cord into a 115 VAC/50-400 Hz outlet. The Charge Indicator Light will illuminate. With the lid open, turn the Mode Selection Switch to the AC position. The Power Indicator Light will illuminate and the pump will start. Occlude the suction tubing and rotate the vacuum regulator knob to verify operation at various settings (clockwise rotation increases vacuum; counterclockwise rotation decreases vacuum).

Select the BATTERY position to ensure operation from the internal rechargeable battery. Turn the switch to the OFF position. Ensure that all hoses and fittings are available and properly connected.

**NOTE:** Suction cups are located on the bottom of the carrying case to aid in its security.

**WARNING:** Extra in-flight security of the impact suction unit may be necessary. Use litter straps if needed.

### 12.2.6. Operation.

12.2.6.1. Secure the Impact Suction Unit to equipment mounting brackets using the hook and pile attachment straps.

12.2.6.2. Thread the hook and pile straps under the brackets and place the suction unit on the brackets.

12.2.6.3. Place the ends of the straps through the "D-rings" on the carrying case, and secure them.

**NOTE:** Place the patient on oxygen for at least one (1) minute prior to suctioning. DO NOT suction a patient for longer than 10 seconds.

12.2.6.4. Open the lid and LEAVE OPEN while suction is in use. Secure the lid with a litter strap. Overheating of the motor may occur if the lid is not open during operation. Connect the Impact Suction to a 115 VAC/50-400 Hz power source, and select the AC position on the Mode Selection Switch.

**NOTE:** When a 115 VAC/50-400 Hz power source is not available, select the BATTERY position.

12.2.6.5. Select the vacuum setting by occluding the vacuum tubing and rotating the vacuum regulator knob till the desired vacuum setting is displayed on the gauge. Normal suction ranges for suctioning are as follows:

12.2.6.5.1. Adult -80 to -120 mm Hg.

12.2.6.5.2. Child -60 to -100 mm Hg.

12.2.6.5.3. Infant -5 to -60 mm Hg.

**NOTE:** Vibration will cause the vacuum gauge needle to fluctuate, especially at low vacuum levels.

12.2.6.6. Attach a sterile suction catheter to the suction tubing and suction the patient using proper technique. Monitor patient before and during suctioning. At the first sign of adverse reaction by the patient, discontinue suctioning and place patient on oxygen. Oxygenate patient after suctioning is complete. Empty the collection canister as necessary.

**CAUTION:** Monitor the collection canister during use to ensure it does not overflow.

12.2.6.7. Switch the Impact Suction Unit off when suctioning is completed.

**CAUTION:** Usage of the Impact Suction Unit should not exceed 27 minutes per hour. Usage in excess of this may cause overheating of the unit.

## 12.3. Suction Apparatus Oropharyngeal - IMPACT MODEL 326M Por table Suction Unit.

**12.3.1. Purpose.** The Impact 326M suction apparatus is a self-contained, multi-purpose, suction apparatus designed to provide continuous and intermittent suction for the removal of secretions from

the upper airway during oropharyngeal, nasopharyngeal and tracheal suctioning procedures; programmable gastrointestinal and abdominal wound drainage.

**12.3.2. Description.** The Impact 326M is housed within an injection molded case which includes a locking battery compartment door, a locking control panel door, carrying handle and mounting interface for securing bracket.

**12.3.3. Components.** The components and function of the Impact 326M consist of the following:

- 12.3.3.1. Circuit Breaker - Protects pump motor from drawing excessive current.
- 12.3.3.2. Vacuum Inlet Fitting - Vacuum source connection to collection canister(s).
- 12.3.3.3. External power Input Jack - Connection for external operating and battery recharging power: 115/230 VAC, 50-400 Hz, 12 VDC, and 11-30 VDC.
- 12.3.3.4. Dual-Scale Vacuum Gauge - Displays vacuum developed within the patient circuit.
- 12.3.3.5. "ON TIME" Suction Interval Control - Setting determines how long intermittent suction will last (adjustable from 5-40 seconds).
- 12.3.3.6. "OFF TIME" Suction Interval Control - Setting determines how long before the next intermittent cycle begins (adjustable from 5-40 seconds).
- 12.3.3.7. Battery Charge Indicator - Displays battery charge status. Green area portrays the charged zone, the red area portrays the discharged zone.
- 12.3.3.8. Charge Lamp - Indicates the presence of battery charging current from an external power source.
- 12.3.3.9. Power & Mode Selector Switch - Acts as a master power switch to start and stop operation. Turns power ON or OFF when the continuous "CONT" or intermittent "INT" suction mode is selected.
  - 12.3.3.9.1. CONT: Selects continuous suctioning, vacuum adjustable from 0 to 550 mmHg.
  - 12.3.3.9.2. INT: Selects intermittent suctioning, vacuum adjustable from 0 to 200 mmHg. Time interval combinations are selectable between 5 and 40 seconds ON, and 5 and 40 seconds OFF.
- 12.3.3.10. Vacuum Regulator Control - Limits the maximum deliverable vacuum level. Rotate clockwise to increase vacuum and counterclockwise to decrease vacuum. Adjusted and delivered vacuum levels will continuously display during operation on the dual-scale Vacuum Gauge.
- 12.3.3.11. External Power Lamp - Illuminates when unit is connected to external power.
- 12.3.3.12. Collection Canisters - Two 1200 cc disposable collection canisters and lids.

**NOTES:**

Disposable canisters include a built-in filter and do not require the use of additional disposable filters.

The Impact 326M is designed to operate from external power or internal rechargeable batteries.

**12.3.4. Power Sources.** The Impact 326M will simultaneously operate and recharge the internal battery from either 115/230 VAC, 50-400 Hz, 28 VDC power source and 12 VDC, for use in ambulances, using appropriate power cables.

**NOTE:** Internal battery operates for a minimum of two (2) hours. Recharging or internal battery will take a maximum of 16 hours.

### **12.3.5. Preflight.**

12.3.5.1. Ensure model label identifies unit as Model 326M and inspection sticker is current. Inspect the unit and components for signs of damage and serviceability.

12.3.5.2. Inventory components and supplies as follows:

12.3.5.2.1. One (1): AD/DC power supply (115/230 VAC, 50/60/400 hz.

12.3.5.2.2. One (1): Auto power cable assembly.

12.3.5.2.3. One (1): Sterile suction hose - Six (6) foot.

12.3.5.2.4. One (1): 3/8" Clear hose PVC - 12. Inches long.

12.3.5.2.5. One (1): 1/4" Clear hose PVC - 24 Inches long.

12.3.5.2.6. One (1): 3/8" Clear hose, PVC - 18 Inches long.

12.3.5.2.7. Two (2): Disposable collection canisters with lids.

12.3.5.2.8. One (1): 14 Fr. Catheter.

12.3.5.2.9. One (1): 18 Fr. Catheter.

12.3.5.2.10. One (1): Spare fuse.

12.3.5.2.11. Two (2): Universal canister attachment bracket.

12.3.5.2.12. One (1): Unit securing bracket.

12.3.5.3. Ensure all hoses and fittings are properly connected.

12.3.5.3.1. Accomplish following when using one disposable collection canister:

12.3.5.3.1.1. Secure disposable collection canister in universal canister bracket and attach to side of 326M.

12.3.5.3.1.2. Connect one end of the 12 Inch or 18 Inch clear 3/8" PVC hose to the "Vacuum Inlet" and the other end to the "Vacuum" port on the disposable collection canister.

12.3.5.3.1.3. Connect the six (6) foot sterile suction hose to the "Patient" port on the disposable collection canister.

12.3.5.3.1.4. Ensure "Tandem" port is capped on the disposable collection canister.

12.3.5.3.2. Accomplish following when using two disposable collection canisters:

12.3.5.3.2.1. Secure collection canisters in universal canister brackets and attach to each side of 326M.

12.3.5.3.2.2. Connect one end of the 12 Inch or 18 Inch clear 3/8" PVC hose to the "Vacuum Inlet" and the other end to the "Vacuum" port to the first disposable collection canister.

12.3.5.3.2.3. Cap "Patient" port on the first disposable collection canister.

12.3.5.3.2.4. Connect the 1/4" Clear hose PVC to the "Tandem" port on both disposable collection canister.

12.3.5.3.2.5. Connect the six (6) foot sterile suction hose to the "Patient" port on the second disposable collection canister.

12.3.5.3.2.6. Ensure "Vacuum" port to second bottle is capped.

12.3.5.4. Ensure the Power & Mode Selector switch is off, then plug the AC line power cord to an external power source. Charge Lamp should illuminate.

12.3.5.5. Turn Power & Mode Selector switch to the appropriate position to verify Continuous and Intermittent operation with external power and internal battery power. Occlude suction hose and adjust Vacuum Regulator Control clockwise to the maximum desired vacuum. Test Vacuum Regulator Control for correct operation at various vacuum settings.

12.3.5.6. Verify collection canister/s is/are properly secured.

12.3.5.7. Turn unit off.

### **12.3.6. Operation.**

12.3.6.1. Secure Impact 326M using securing bracket.

**NOTE:** Extra in-flight security of the impact suction unit may be necessary. Use litter straps as required.

12.3.6.2. Ensure all hoses are correctly attached and secured per [12.3.5.3.1.](#) or [12.3.5.3.2.](#) as required.

12.3.6.3. Ensure the Power & Mode Selector switch is off, then plug the AC line power cord to an external power source. Verify Charge Lamp illuminates.

12.3.6.4. Select the vacuum setting by occluding the vacuum tubing and rotating the vacuum regulator knob till the desired vacuum setting is displayed on the gauge.

12.3.6.5. Attach drainage device or sterile catheter for suctioning to suction tubing and follow established guidelines IAW AFI 41-307. Monitor patient before and during suctioning for any sign of adverse reactions. Discontinue suctioning and place patient on oxygen. Oxygenate patient after suctioning is complete.

**NOTE:** Monitor the collection canisters during use to ensure they do not overflow.

12.3.6.6. Turn Impact 326M off when suctioning is complete.

**12.3.7. Disassembly.** Remove all hoses and catheter. Dispose of the hoses and collected aspirate in accordance with local policy. Clean 326M in accordance with manufacture guidelines.

## Chapter 13

### VENTILATORS USER'S GUIDE

#### 13.1. Bear 33.

**13.1.1. Purpose.** The Bear 33 adult volume ventilator provides or assists patients with ventilation when the patients respiratory efforts are absent or inadequate.

**13.1.2. Description.** The Bear 33 is a volume ventilator. Three (3) modes of ventilation are available: control, assist control, and synchronized intermittent mandatory ventilation (SIMV). The ventilator is permanently mounted on top of the oxygen accumulator with a humidifier on a litter mounting sled. A protective carrying case is provided for transportation of the ventilator assembly.

#### 13.1.3. Power Source.

13.1.3.1. The Bear 33 ventilator requires a 115 VAC/60 Hz external power source. An internal battery provides 12 VDC power for operation during emergencies and movement from one external power source to another. The humidifier requires a 115 VAC/60 Hz external power source; no battery back-up is available.

13.1.3.1.1. A "GREEN" indicator, located on the left side of the control panel, displays "WALL AC" when 115 VAC/60 Hz is powering the ventilator. A "YELLOW" indicator, located on the left side of the control panel, displays "INT BATT" when the internal battery is powering the ventilator.

13.1.3.1.2. A "GREEN" indicator light will illuminate when the ventilator is turned "ON".

**NOTE:** The ventilator will automatically select the highest level power source available.

13.1.3.1.3. A "YELLOW" PWR CHANGE indicator, located on the right side of the control panel, will illuminate when an automatic power change to a lower priority power source has occurred.

**NOTE:** Will require a frequency converter to operate the ventilator and humidifier on aircraft that do not have 115 VAC/60Hz capability.

13.1.3.2. The CHARGING indicator, located on the left side of the unit, will illuminate "GREEN" when the unit is plugged into an active AC power source, indicating the battery is charging.

13.1.3.3. The internal battery charge meter, located on the left side below control panel, indicates the approximate percentage of internal battery charge is available. When the indicator is to the far right of the "GREEN" area, approximately one (1) hour of power exists. The "RED" area indicates an unacceptable charge and may be accompanied by a "LOW BATT" alarm. When the indicator is in the "RED" area, plug the unit into an AC outlet immediately.

**WARNING:** A fully charged internal battery provides approximately one (1) hour of ventilator operating time. The patient should not be left unattended at any time when the internal battery is used. An alternative power source should be connected immediately.

**WARNING:** When the internal battery is being used and the "LO BATT" indicator, located on the right side of control panel, is flashing, it indicates operating time of the ventilator is limited

(approximately 15 minutes). A circuit breaker to protect the electronic circuitry and the motor drive from current overload is located directly above the UNLOCK switch. When the circuit breaker trips, its center button will pop out. To reset the circuit breaker, press in the button.

**WARNING:** Do not reset the circuit breaker more than once. If the circuit breaker trips after resetting, the ventilator should be turned off and the unit referred to MERC.

#### 13.1.4. Controls.

13.1.4.1. The panel UNLOCK button located on the bottom left side of unit, unlocks the controls to allow setting ventilator parameters. Panel will remain unlocked for 15 seconds from the last key stroke on any of the parameter buttons. After 15 seconds, the panel will automatically lock all buttons until UNLOCK is depressed again. A “YELLOW” UNLOCK indicator will be displayed on the left side of control panel when the control panel is unlocked.

13.1.4.2. The POWER OFF/ON button, located on the left side of control panel, controls power to the ventilator. Depress button to turn unit “ON”. Panel must be unlocked to turn unit “OFF”.

13.1.4.3. The MODE button, located on the left side of the control panel, selects one of three modes: CONTROL, ASSIST CONTROL, and SIMV.

13.1.4.4. The “TIDAL VOLUME” control, located center of the control panel, allows UP/DOWN buttons to change “TIDAL VOLUME” from 100cc to 2200cc.

13.1.4.5. The RATE control, located center of control panel, allows UP/DOWN buttons to change RATE from 2.0 to 40 breaths per minute (BPM).

13.1.4.6. The PEAK FLOW control, located center of control panel, allows UP/DOWN buttons to change PEAK FLOW from 20 LPM to 120 LPM.

13.1.4.7. The ASSIST SENS control, located center of control panel, allows UP/DOWN buttons to change ASSIST SENSITIVITY from -9 to 19 cm water (H<sub>2</sub>O).

**WARNING:** ASSIST SENSITIVITY must be set below patient baseline pressure in ASSIST CONTROL and SIMV modes to prevent autocycling.

13.1.4.8. The UP/DOWN arrow control buttons, located center of control panel, allows increase and decrease of the digital display setting for the TIDAL VOLUME, RATE, PEAK FLOW, ASSIST SENSITIVITY HIGH PRESSURE ALARM, and LOW PRESSURE ALARM.

13.1.4.9. The TEST button, located center of control panel, activates the digital display segments (except CHARGING), indicators, and audible alarms.

13.1.4.10. The HIGH PRESS ALARM AND LIGHT control, located in the center of the control panel, allows the UP/DOWN buttons to change settings from 10 to 80 cm H<sub>2</sub>O.

13.1.4.11. The LOW PRESS ALARM control, located in the center of the control panel, allows the UP/DOWN buttons to change settings from 3 to 70 cm H<sub>2</sub>O.

13.1.4.12. The ALARM SILENCE button, located on right side of control panel, silences all audible alarms, except for VENT INOP, for 60 seconds.

**WARNING:** The “VENT INOP” indicator shows that a ventilator inoperative condition exists. Remove ventilator from the patient and provide back-up support. VENT INOP can only be silenced by turning the ventilator “OFF” or correcting the inoperative condition.

**WARNING:** The patient should never be left unattended when the ALARM SILENCE button is depressed to allow timely detection of alarm conditions.

13.1.4.13. The VISUAL RESET button clears visual indication of a corrected alarm condition.

**13.1.5. Oxygen Accumulator.** Components on the oxygen accumulator are the inlet fitting and the outlet fitting which are both to the right end of the oxygen accumulator. An inlet fitting is located on the lower right of the ventilator below an outlet fitting to the patient, a fitting labeled "Prox. Tee" and a fitting labeled "Balloon." An audible alarm emitter are in the central portion of the lower part of the ventilator.

**13.1.6. Displays.** From left to right:

13.1.6.1. Digital displays on liquid crystal display (LCD) panels, to the right of mode and power displays, show the ventilator operational parameters. LCD panels on the right side of the control panel display alarm conditions.

13.1.6.2. Below the digital displays are battery condition indicators.

13.1.6.3. The PRESSURE gauge is located to the right of the digital displays.

**13.1.7. Alarms.**

13.1.7.1. The alarm display panel is to the right of the pressure gauge.

13.1.7.2. The HIGH and LOW pressure alarms of the ventilator operate with a two (2) stage alarm system. Detecting an alarm condition, the visual display illuminates and flashes. If the condition is present on the next breathing cycle, the audible alarm will sound; if the condition is absent on the next cycle, the visual display turns off and the audible alarm is not activated. If the audible alarm is activated it will silence when the condition is corrected, however, the visual display will remain on until canceled by the visual reset switch.

13.1.7.3. The VENTILATOR inoperative alarm is a simultaneous visual and audible alarm that cannot be silenced or reset. The ventilator must be turned off and returned to MERC.

13.1.7.4. The APNEA alarm will activate visually and audibly anytime the interval between breaths exceeds 20 seconds. The audible alarm cancels at the next breath, but the visual indicator must be manually reset.

13.1.7.5. The POWER SOURCE CHANGED alarm occurs when the ventilator switches from external power to internal battery power. There is both visual and audible indication, which is canceled by the visual reset switch.

13.1.7.6. A complete POWER failure alarm occurs when all power sources fail. The ventilator's built-in capacitor will power the audible alarm until it's power is depleted (a minimum of one [1] minute).

**13.1.8. The Humidifier.** The Humidifier consists of a control module, and a jar with cover assembly. It has a water temperature knob that controls all electrical power to the control module and adjusts the water temperature.

13.1.8.1. The lights and description:

**13.1.8.1.1. Wait** - A white indicator illuminates when the water temperature has not reached the temperature corresponding to the water temperature control setting.

**13.1.8.1.2. Normal** - A green indicator illuminates continuously during normal operation. It indicates that the water temperature in the humidifier jar is within seven (7) degrees Fahrenheit (°F) of the water temperature control setting.

**13.1.8.1.3. Add Water** - An amber indicator illuminates when the water level in the jar is too low for normal operation.

**13.1.8.1.4. Inoperative** - A red indicator illuminates when the heater assembly is not properly connected to the control module, or some failure has occurred inside the heater assembly (in base of jar) or control module. Electrical power is discontinued to the heater assembly. The indicator is reset by turning the water temperature control to the off position and resetting it to the desired temperature. If the inoperative condition persists, the lamp will illuminate again within eight (8) seconds.

13.1.8.2. The cover and jar assembly mounts on the control module and contains the water used to humidify the breathing gas supplied to the patient. The jar contains up to 420 ml of water with 300 ml usable. The cover has an inlet port and an outlet port to bring dry gas into the humidifier, and to allow humidified air to exit to the patient. A filler cap fits into the center of the cover, and allows for refilling of the humidifier jar.

13.1.8.3. The cover attaches to the jar by a clockwise twisting motion. The jar secures to the top of the control module where the electrical contacts from the control module connect with those of the heater assembly in the jar. To secure the jar to the module, rotate the lock ring on the module fully clockwise. Position the jar so the full/add legend is facing to the right while facing the indicator/control surface (front) of the module. Place the jar into the recess on top of the module and rotate it in a clockwise direction. The jar will fall into place, making contact between the heater and module contacts. When the jar is seated snugly, rotate the lock ring fully counter clockwise, to lock the jar to the module.

**CAUTION:** Always secure the cover and jar assembly with the jar lock ring to avoid accidental dislodging. Do not allow water to enter the heater assembly electrical connections on the control module. Electric malfunction may occur.

**13.1.9. Accessories.** The following items are utilized with the ventilator and its breathing circuit, and must accompany the ventilator:

13.1.9.1. Oxygen Accumulator Tube - Connects the oxygen accumulator outlet to the ventilator inlet, and passes oxygen enriched air to the ventilator.

13.1.9.2. Test Lung - Used during the pre-flight to verify ventilator function.

13.1.9.3. Positive End Expiratory Pressure (PEEP) Valve and PEEP Valve Connector - The PEEP valve attaches, using the PEEP valve connector, to the outlet port on the exhalation valve, and controls positive end expiratory pressure from 0 cm H<sub>2</sub>O to 20 cm H<sub>2</sub>O. The valve and connector are non-disposable, and should not be discarded.

13.1.9.4. In-Line Bacterial Filter - Used to remove bacteria and particulate matter from the patient air. Placed in-line in the inspiratory tube. If the humidifier/heater is used, the filter is placed between the ventilator and the humidifier/heater.

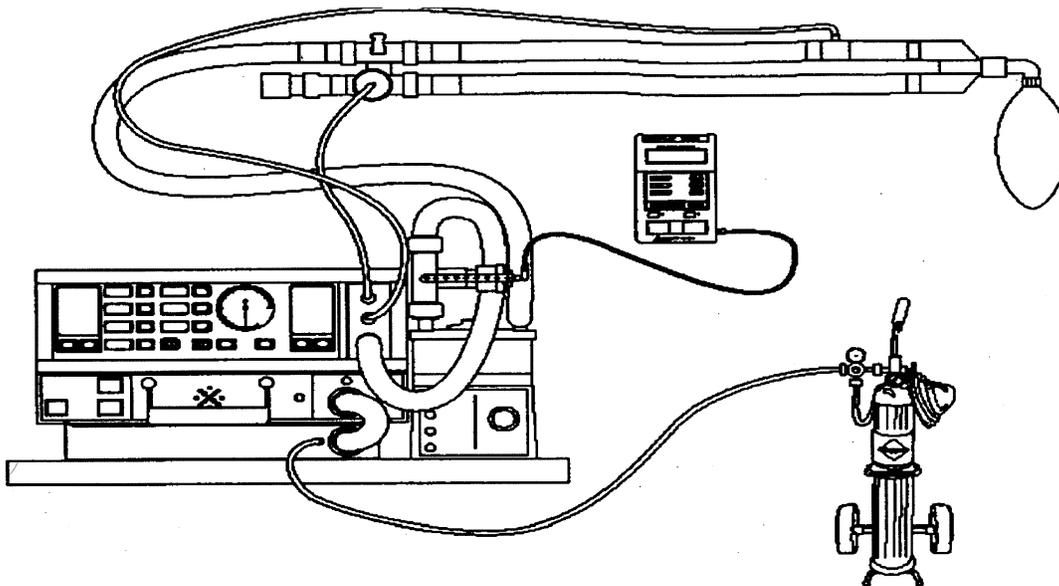
13.1.9.5. In-Line Thermometer - Placed in-line in the inspiratory tube at the patient manifold, monitors the inspired gas temperature.

13.1.9.6. Oxygen Monitor - Placed in-line in the 18 inch humidifier circuit between the ventilator output and humidifier inlet port, monitors oxygen concentration when concentrations greater than that of ambient air is ordered.

### 13.1.10. The Patient Breathing Circuit.

13.1.10.1. Consists of large bore patient tubing that brings breaths (inspiratory tubing) to the patient manifold and removes exhaled air (expiratory tubing) from the manifold to the exhalation valve. A 3/16 inch internal diameter (ID) tube is used to relay airway pressures from the patient manifold to the ventilator, and a 1/8" ID tube is used to connect the exhalation valve to the ventilator. A large bore tube is connected to the outlet of the exhalation valve, and has a retaining clip, to which the 1/8" ID tube and 3/16" ID tube are attached and clipped. (See [Figure 13.1. Breathing Circuit](#))

**Figure 13.1. Breathing Circuit.**



13.1.10.2. The breathing circuit requires some changes to function with the ventilator. First, remove the clip with the 1/8" ID tube and 3/16" ID tube from the large bore tubing attached to the exhalation valve, and clip it to the inspiratory tubing. Remove the large bore tubing from the exhalation valve outlet and cut a section of tubing approximately 18 inches from the end of the tube with a single lumen connector. Discard the remaining tube with the dual lumen connector. Connect the 18 inch tube to the outlet marked "Patient" on the right side of the ventilator. Connect the other end of the tube to an oxygen monitor "T" adapter and sensor. Connect "T" adapter to the inlet port of the in-line bacterial filter, and connect the outlet port of the filter to the inlet port of the humidifier. Connect the free end of the inhalation tube to the outlet port of the humidifier. Connect the 3/16" ID tube (larger of the small tubes) to the barb fitting marked " Prox Tee" on the ventilator, and the 1/8" ID tube to the barb fitting marked "Balloon" on the ventilator.

13.1.10.3. Disconnect the inspiratory tube at the patient manifold and install an in-line thermometer between the inspiratory tube and the manifold. Remove the cap on the elbow connector on the manifold, and connect the free end of the 3/16" ID tube to the connector. Uncap and connect

a 500cc test lung to the patient connector port on the patient manifold. Connect the PEEP valve to the exhalation valve using the PEEP valve connector, and set the PEEP to 0 cm H<sub>2</sub>O.

13.1.10.4. Connect the outlet of the oxygen accumulator to the inlet of the ventilator, at the lower right of the ventilator, with the nine (9) inch oxygen accumulator tube. This allows an oxygen enriched air flow from the oxygen accumulator into the ventilator.

**WARNING:** High inspired gas temperatures may cause physical damage to the patient. To avoid discomfort or possible injury, always monitor the inspired gas temperature and verify that it has stabilized before using the humidifier with a patient. The accumulator used for delivery of oxygen to the patient is not a calibrated device and requires the use of an oxygen analyzer.

**13.1.11. Pre-flight.** Accomplish the pre-flight on the aircraft prior to take off.

**CAUTION:** When performing a pre-flight check on the Bear 33 ventilator/humidifier remove the jar to avoid blowing the fuse, as stated in the maintenance manual.

13.1.11.1. Ensure currency of the inspection/calibration decal of the ventilator, and that all component parts are in serviceable condition. Ensure an oxygen monitor, PEEP valve, two (2) sets of ventilator tubing, a 500 cc test lung, nine (9) inch oxygen accumulator tube, inline filter, in-line thermometer, transport carrying case, a manual resuscitator, and sufficient sterile distilled water are present. Secure the ventilator on the mounting sled to a litter utilizing the J-bolts on the sled. The ventilator and mounting sled will not move when properly secured to the litter. Secure the litter into a space in a litter tier. Connect a flow meter with a nipple adapter to the oxygen source, and connect the flow meter nipple adapter to the oxygen accumulator inlet fitting. Set up a breathing circuit on the ventilator with a test lung connected to the patient manifold. Switch the ventilator on and depress the test switch. Ensure that all indicators illuminate and that the audible alarm sounds.

13.1.11.2. The LCD displays should be:

13.1.11.2.1. Tidal Volume = 8880

13.1.11.2.2. High Pressure Alarm = 88

13.1.11.2.3. Rate = 8.8

13.1.11.2.4. Low Pressure Alarm = 88

13.1.11.2.5. Peak Flow = 188

13.1.11.2.6. Inspiratory Time = 8.88

13.1.11.2.7. Assist Sensitivity = A-88

13.1.11.3. Set the ventilator parameter setting according to [Table 13.1.](#)

**Table 13.1. Ventilator Parameter Settings.**

<b>Item:</b>	<b>Setting:</b>
Mode	Control
Rate	10 Breaths per minute (BPM)
Assist Sensitivity	-2
Tidal Volume	500 ml.

Peak Flow	20 Liters per minute (LPM)
High Pressure Alarm	80 cm H <sub>2</sub> O
Low Pressure Alarm	8 cm H <sub>2</sub> O
PEEP	0 cm H <sub>2</sub> O

13.1.11.4. Squeeze and hold the test lung, and ensure the high pressure visual alarm illuminates, and that the audible alarm sounds.

**NOTE:** If the high pressure alarm does not activate, check the ventilator tubing for leaks.

13.1.11.5. Depress the alarm silence switch and ensure the audible alarm switches off. Release the test lung and allow the ventilator to cycle twice, then depress the visual reset switch to cancel the high pressure LED display. Remove the test lung from the manifold and ensure the low pressure visual alarm illuminated and the audible alarm sounds. Depress the alarm silence switch, place the test lung back on the manifold, allow the ventilator to cycle twice and depress the visual reset switch to cancel the low pressure display. Set the rate to 2.0 BPM, the mode to assist control and ensure that after 20 seconds the APNEA indicator illuminates, and the audible alarm sounds. Depress the alarm silence switch then the visual reset switch to cancel the alarm and display. Set the rate to 10 BPM and the mode to control.

13.1.11.6. Unplug the power cord from the power source and ensure that the internal battery indicator illuminates, the power change display illuminates, and the audible alarm sounds. Depress the alarm silence switch then the visual reset switch. Plug the power cord back into the external power source. Ensure the wall AC and charging indicators illuminate, and switch the ventilator off.

13.1.11.7. Plug humidifier into an approved power supply and switch it on. Ensure all four (4) indicator lights illuminate for one (1) second to verify function of the visual indicators. Switch the humidifier off.

**CAUTION:** Do not switch humidifier power on with an empty jar in place. This action will result in circuit failure requiring service by MERC personnel.

### 13.1.12. Operation.

13.1.12.1. Place the litter with the ventilator lower than the patient's litter. Ensure the patient breathing circuit is set-up and connected to the ventilator and humidifier.

**WARNING:** Ensure the ventilator tubing is draped so that condensation does not drain towards the patient. Frequently drain condensation from the ventilator tubes to avoid possible tube occlusion and discomfort to the patient.

13.1.12.2. Prior to switching the ventilator on:

13.1.12.2.1. Ensure the patient breathing circuit is connected to the humidifier.

13.1.12.2.2. Remove the humidifier filling cap, and fill the humidifier to the full line with sterile distilled water.

13.1.12.2.3. Replace the filling cap, and ensure it is securely in place.

13.1.12.2.4. Plug the humidifier power cord into an approved power source and switch the humidifier "ON".

13.1.12.2.5. Ensure all four (4) indicator lamps illuminate for a second, and set the water temperature control between "2" and "3". This setting will give an approximate temperature range of 88°F to 92°F. The wait light will remain illuminated until the humidifier reaches the set temperature then it will extinguish and the normal light will illuminate.

13.1.12.2.6. Monitor the in-line thermometer to determine the breathing gas temperature when the ventilator is switched on. The humidifier may take between 8 minutes and 30 minutes to reach the desired temperature. The colder the ambient temperature and water temperature, the longer it will take to reach the set operating temperature.

13.1.12.2.7. A full humidifier will operate for 6 to 8 hours before the water level reaches the add water line. Before water can be added to the humidifier, the patient must be disconnected from the ventilator and manually ventilated. The humidifier must be disconnected from the ventilator before adding water. If an attempt is made to add water while the Bear 33 is cycling, the water will be pushed back out the filler port. If water needs to be added, use small quantities so the water in the humidifier will not be cooled to a low temperature requiring an extended warming period.

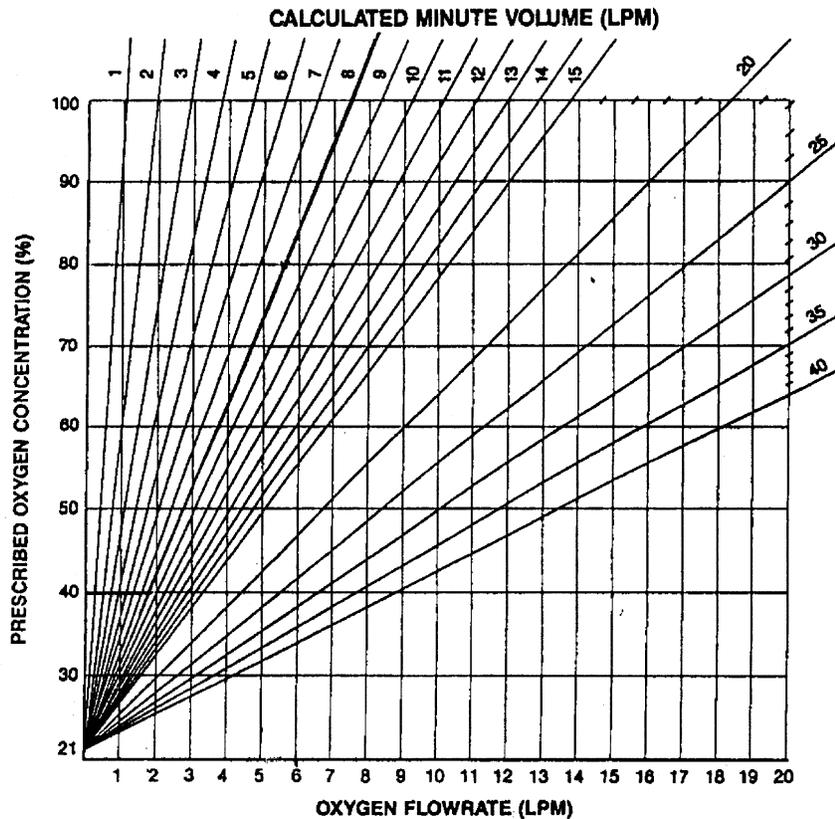
**CAUTION:** When the ventilator/humidifier is transported with a patient, ensure the unit remains level to avoid water spills from the humidifier into ventilator tubing. If water gets into the ventilator it will seriously damage the internal components. Never ship the unit with water in the humidifier jar.

**WARNING:** Do not overfill the humidifier jar. Overfilling may cause water to be pushed into the ventilator tubing. Do not allow the water level to fall below the refill line. This may cause the unit to overheat and the heater to shut down.

13.1.12.3. Switch the ventilator on, unlock the control panel, and set the mode, select sigh if desired, tidal volume, rate, peak flow, high pressure alarm, low pressure alarm, and assist sensitivity if in the assist control or SIMV mode as prescribed by doctors orders. The Bear 33 has an internal micro-processor that monitors the values of parameters set in the ventilator. It compares the value with the values of other parameters and signals the operator when the value being entered is at the maximum or minimum value compatible with the values of other parameters entered. This is indicated by the LED for the value being entered flashing. The Bear 33 micro-processor will not allow values that are not compatible with the others to be entered.

13.1.12.4. If a concentration of oxygen greater than room air is ordered for the patient, the minute volume for the patient must be calculated. Refer to the Bear 33 Volume Ventilator Oxygen Accumulator Chart ([Table 3.2.](#)). The result is used in conjunction with a chart to determine the approximate oxygen flowrate to the oxygen accumulator to achieve the desired concentration. Calculate the minute volume using the following formula:  $\text{Tidal Volume} \times \text{Rate} \times 0.001 = \text{Minute Volume}$  (Liters per minute)

Figure 13.2. Bear 33 Volume Ventilator Oxygen Accumulator Chart.



13.1.12.5. Where tidal volume is in cubic centimeters per breath (cc/B), rate is in BPMs, and 0.001 is liters per cubic centimeter (L/cc). **EXAMPLE:** Tidal Volume = 800 cc, Rate = 16 BPM,  $800 \times 16 \times 0.001 = 12.8$  LPM.

13.1.12.6. Use the resulting value with the Bear 33 volume ventilator oxygen accumulator chart to find the desired oxygen flowrate. Find the nearest calculated minute volume line (to the nearest whole number) at the top and top right of the chart (1 LPM-40 LPM). Find the oxygen concentration ordered on the left of the chart (21% - 100%). Locate the point where the diagonal line from the minute volume intersects with a horizontal line from the prescribed oxygen concentration. Vertically below the intersection point will be an approximate oxygen flowrate to provide the ordered oxygen concentration.

13.1.12.7. Set the oxygen flow meter to the approximate flowrate, operate the ventilator at the prescribed settings for two (2) minutes then use the oxygen monitor to verify the oxygen concentration. If adjustments are needed, change the oxygen flowrate slightly to achieve the required concentration. Re-check the oxygen concentration after changes in altitude, and adjust the oxygen flowrate if required.

**WARNING:** Changing the rate or tidal volume after the initial settings will change the minute volume and will require a change in the oxygen flowrate to maintain the oxygen concentration. The oxygen concentration must be monitored with an oxygen monitor.

13.1.12.8. If PEEP is ordered for the patient: Adjust the PEEP valve while observing the ventilator manometer to verify the amount of PEEP being set. Increase low pressure alarm value by an amount equal to the PEEP that has been set. **EXAMPLE:** If the low pressure alarm is set at 10 cc H<sub>2</sub>O, and 5 cc H<sub>2</sub>O PEEP is set, increase the low pressure alarm to 15 cc H<sub>2</sub>O.

13.1.12.9. In assist control and SIMV modes, adjust the assist sensitivity in the same manner as for the low pressure alarm setting. **EXAMPLE:** If assist sensitivity is set at -2 cc H<sub>2</sub>O, and PEEP is set at 5 cc H<sub>2</sub>O, increase the assist sensitivity to 3 cc H<sub>2</sub>O.

**WARNING:** The assist sensitivity control must be properly adjusted in the SIMV mode to insure accurate monitoring of spontaneous breaths. It is necessary to properly set the assist sensitivity control in the SIMV mode to synchronize patient effort with assisted and controlled breaths. Improper adjustment could lead to stacking controlled breaths on top of the patient's spontaneous breaths (if the sensitivity control is set higher than actual patient effort).

**WARNING:** Assist sensitivity must be set below patient baseline pressure in assist control and SIMV modes to prevent auto cycling.

**WARNING:** Use of PEEP may lead to increased work of breathing in some patients, resulting in rebreathing and carbon dioxide (CO<sub>2</sub>) retention. Evaluate the patient's ability to perform the work of breathing when PEEP is used. The PEEP valve generates an end expiratory pressure only, and it does not maintain Constant Positive Airway Pressure (CPAP) during a spontaneous breath.

**WARNING:** Position the PEEP valve so that it does not rub against the litter or any other items. If the control knob rubs against an item with enough force, the PEEP setting may change. Monitor the PEEP setting on the ventilator manometer periodically to ensure the required setting is maintained.

**13.1.13. Disassembly and Storage.** Remove the breathing circuit from the ventilator. Discard the circuit, but retain the PEEP valve, PEEP valve connector, nine (9) inch oxygen accumulator tube, and remove the oxygen monitor and in line thermometer components. Empty the humidifier jar, and place the ventilator/humidifier unit into the carrying case. Place the upper foam insert over the unit, and close and latch the case for transport.

## 13.2. Babybird Ventilator 5900.

**13.2.1. Purpose:** To sustain or assist respiration of neonatal or pediatric patients.

**13.2.2. Description:** The BABYBIRD is a pressure driven ventilator.

**13.2.3. Power source :** The BABYBIRD ventilator operates on compressed air and oxygen at a pressure of 50 PSI +/-5.

**WARNING:** Do not use with Therapeutic Oxygen Manifold System.

**WARNING:** When the air temperature is 40o F. or lower, the gel/lubricant on the valves inside the ventilator will stiffen, causing the ventilator not to work. If the temperature is going to be 40o F. or below, ensure to keep the BABYBIRD warm.

**NOTE:** The C-9A and oxygen regulators are set at 50 PSI +/-5 PSI. If there is a difference of 7 PSI between the BABYBIRD and the air/oxygen source, the BABYBIRD will not work. For example: If the BABYBIRD has been calibrated to operate at 45 PSI by MERC and the regulator has been calibrated to operate at 55 PSI, then the ventilator will not operate because there is a difference of more than 7 PSI

between the two. If the BABYBIRD is set to operate at 50 PSI and the regulator has been set to operate at 55 PSI, then the Babybird will operate because there is a less than 7 PSI difference.

#### **13.2.4. Components:**

13.2.4.1. Listed are the different components required for the save operation of the BABYBIRD Ventilator:

13.2.4.1.1. Ventilator.

13.2.4.1.2. Oxygen blender.

13.2.4.1.3. Breathing head assembly.

13.2.4.1.4. Approved Air Compressor (Airdyne 3500 Air Compressor) or a pre-determined quantity of H-size gaseous cylinders with at least 1800 PSI.

13.2.4.1.5. PSI "step-down" adjustable compressed air regulator (H size cylinders), if required.

13.2.4.1.6. "Step-down" adjustable oxygen regulator (C-141).

13.2.4.1.7. Two hoses attached to the BABYBIRD oxygen blender:

13.2.4.1.7.1. One green oxygen hose with Schrader adapter or threaded female coupling, as applicable.

13.2.4.1.7.2. One yellow air hose with threaded female coupling.

13.2.4.1.8. Infant Hand Operated Resuscitator - Manual Resuscitators with trach adapters.

13.2.4.1.9. Wrap-Around Heater

13.2.4.1.10. In-Line Temperature Sensor

13.2.4.1.11. ML bottle sterile distilled water

13.2.4.1.12. Cargo tie-down strap with two D-rings.

13.2.4.1.13. Litter strap.

13.2.4.1.14. BABYBIRD Litter Mount Sled (Optional)

**13.2.5. Pre-flight:** Accomplish the pre-flight on the aircraft prior to take off.

13.2.5.1. Ensure calibration sticker is current.

13.2.5.2. Attach hose (yellow) to the regulator on the compressed air cylinder/compressor.

13.2.5.3. Ensure breathing circuit system is complete and securely attached to BABYBIRD body unit.

13.2.5.4. Attach patient manifold to the FOR MECHANICAL TEST ONLY site, (lower socket on the right side of unit.)

**NOTE:** Turn all knobs carefully. If controls are turned too far, damage to the internal components of the Ventilator may occur.

13.2.5.5. Select midrange nebulization by rotating the NEBULIZATION knob clockwise until white arrow points to the "12 o'clock position".

13.2.5.6. Select midrange inspiratory time by rotating INSPIRATORY TIME knob fully counterclockwise to "OFF", then rotate clockwise "ON" or two turns to the "12 o'clock position".

13.2.5.7. Select midrange expiratory time by rotating EXPIRATORY TIME knob fully counterclockwise to "OFF", then rotate clockwise one or two turns to the "12 O'clock" position.

13.2.5.8. Select maximum inspiratory relief pressure by rotating INSPIRATORY RELIEF PRESSURE knob fully clockwise to the "OPEN" position.

13.2.5.9. Rotate EXPIRATORY FLOW GRADIENT knob fully counterclockwise to the "OFF" position.

13.2.5.10. Rotate INSPIRATORY TIME LIMIT knob fully clockwise till it stops, then counterclockwise to "3 SEC" mark.

13.2.5.11. Move CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) lever (red lever above air bag) to full left position.

13.2.5.12. Turn OXYGEN CONCENTRATION knob to "50%" (face of oxygen blender above BABYBIRD unit).

13.2.5.13. Turn "ON" compressed air. Alarm should sound. This tests oxygen inlet pressure alarm on blender, if oxygen hose is not connected to oxygen source.

13.2.5.14. Attach oxygen hose (GREEN) to oxygen source. Alarm should silence.

**NOTE:** When gas sources are initially pushed into the oxygen blender, the alarms will sound until gas pressures are equaled. If the alarm sounds continuously, push the RESET button on the lower right corner of the face of the ventilator. This resets the inspiratory time limit alarm to insure it is OFF.

**NOTE:** If alarm continues, check OPERATING PRESSURE gauge (top of body unit) for 45 to 55 PSI operating pressure. Check all connections for loose connections. Check gaseous source regulator.

13.2.5.15. Set flow rate at "10 LPM" by rotating FLOW knob clockwise or counterclockwise.

**NOTE:** Check LITER/MIN gauge, front left side of unit.

13.2.5.16. Rotate CONTROLLED IMV/SPONTANEOUS BREATHING control knob to controlled IMV. Unit should begin cycling.

13.2.5.17. Adjust PROXIMAL AIRWAY PRESSURE gauge (front right side of unit) to "ZERO" by adjusting EXPIRATORY FLOW GRADIENT knob (needle returns to zero).

13.2.5.18. Adjust INSPIRATORY RELIEF PRESSURE knob to adjust PROXIMAL AIRWAY PRESSURE gauge (front right side of unit) to read 20 cm H<sub>2</sub>O.

13.2.5.19. Adjust INSPIRATORY TIME and EXPIRATION TIME knobs to desired rate. To compute insp/exp times: divide 60 by the resp. rate = length of resp cycle. 1/3 of cycle is inspiration and 2/3 of cycle is expiration.

13.2.5.20. Adjust CPAP by sliding the CPAP lever (red lever above air bag) to the right to set PRESSURE GAUGE needle to 4 cm H<sub>2</sub>O above the 20 cm H<sub>2</sub>O. Reading will increase to 24 cm H<sub>2</sub>O. The needle should return to 4 cm H<sub>2</sub>O and hold without dropping to zero.

**NOTE:** If fluttering occurs, it may be necessary to lubricate the external surface of the short tower attached to the outflow valve diaphragm. The diaphragm is located inside the red lever assembly above

the air bag. This is accomplished by separating the two halves of the valve and remove the gray diaphragm. Holding the diaphragm with the short tower up, apply one drop of Visilube to the external area where the short tower meets the metal base. Spin the tower to spread the Visilube evenly. Reinstall the diaphragm and outflow valve into the proper position with the short tower up.

**NOTE:** If the fluttering continues, replace the diaphragm.

**NOTE:** Wash hands before accomplishing the following task.

13.2.5.21. Check the PRESSURE RELIEF VALVE (PRV) located in the alarm assembly (red cylinder opposite nebulizer bottle).

13.2.5.21.1. Remove the large bore expiratory tubing from the main manifold (below the PRV).

13.2.5.21.2. Occlude the tubing and observe the PROXIMAL AIRWAY PRESSURE (front right side of unit). Reading should be "30 cm water".

**WARNING:** The PRV should not be set higher than 5-10 cm H<sub>2</sub>O above the prescribed ventilator pressure.

13.2.5.21.3. If the desired pressure is higher than 30 cm H<sub>2</sub>O, adjust by Separating the end cap from the red alarm assembly exposing the adjusting nut to the PRV (the red alarm assembly will separate into two pieces, the cap containing the brass audible alarm and the main body which houses the PRV). Leave the main body attached to the unit (See Figure 6). Occluding the red EXPIRATORY tubing. Clamp, and observe the PROXIMAL AIRWAY PRESSURE gauge at the same time, turn the adjusting nut slowly counterclockwise to decrease the pressure limit (this increases the sensitivity of the valve). Adjust to "30 cm water" or the setting ordered by the physician. Replace the cap and again occlude the red tubing. Pressure should not go above the pressure limit set and the audible alarm should sound. If the pressure cannot be set and/or the alarm does not sound, replace the RV assembly and repeat preceding steps. If functioning correctly, reconnect red tubing.

13.2.5.21.4. Turn "OFF" compressed air. Alarm should sound. This tests the inlet air pressure alarm on the blender.

13.2.5.21.5. Disconnect oxygen hose from the oxygen source. Alarm should silence.

### 13.2.6. Operating Procedures.

13.2.6.1. Adjust settings per physician's order: (pressure, rate, LPM).

**NOTE:** The respiratory rate can be adjusted by turning the INSPIRATORY TIME LIMIT and EXPIRATORY TIME LIMIT knobs until the desired setting is obtained. Empty condensation traps whenever they are full. They are spring operated; therefore emptying won't interfere with the ventilator's operation.

13.2.6.2. Fill the 500 ml nebulizer with 500 ml of sterile distilled water and secure the nebulizer cover. Disconnect the large bore tubing coming off of the 500 ml nebulizer. Connect the In-Line Temperature Sensor to the 500 ml outlet port and connect the large bore tubing to the other end of the In-Line Temperature sensor. Place the UMID Wrap-Around Heater around the 500 ml nebulizer. Every 30 minutes check the In-Line Temperature Sensor and water level in the 500 ml nebulizer.

13.2.6.3. Adjust NEBULIZATION to desired level. Connect mechanical airway bifurcation to patient's indwelling airway catheter. Insure that condensation traps are secured, and level.

13.2.6.4. All further adjustments should be accomplished while constantly assessing chest movement and clinical signs.

### **13.2.7. Securing:**

13.2.7.1. With the BABYBIRD on its pole stand place the back of the BABY Bird against the stanchion pole.

13.2.7.2. Place the litter strap around the upper portion of the pole stand, around the stanchion pole, and secure the litter strap snug.

13.2.7.3. Place a D-ring on both sides at the base of the pole stand. Run the cargo tie-down strap around one of the base legs near one D-ring, then run the strap twice around a base leg by the other D-ring. Secure the strap to the D-rings and tighten securely.

### **13.2.8. Cleaning:**

13.2.8.1. Cleaning accomplished per unit's local protocol.

**CAUTION: DO NOT** use gas, dry heat, or steam sterilization. **DO NOT** immerse unit in water.

## **13.3. Uni-Vent "Eagle" Model 754M Ventilator by Impact.**

**13.3.1. Purpose.** The Uni-Vent 754M Ventilator provides or assists patients (adult, child, or infant) with ventilation when the patient's respiratory efforts are absent or inadequate.

**WARNING:** The Model 754 Ventilator is not recommended for use with neonate patients due to Tidal Volume Control being limited. Adjustment is available in 10ml increments over a range of 0-3000ml. The 0-10 ml setting being the minimum delivered tidal volume the clinician can work with. Additionally, adult breathing circuits are not recommended for use on small children or infants due to their compressibility and dead space. Disposable pediatric and infant breathing circuits are recommended in these cases or alternatively, Impact's Child/Infant Re-useable Patient Valve Kit (820-0754-04) may be used.

**13.3.2. Description.** The Uni-Vent 754M Ventilator is a portable (13 lb.), electronically controlled ventilator, and compressor, air/oxygen mixer. It is controlled by a microprocessor (CPU) which monitors and displays airway pressure, control settings, alarm parameters, gas sources, gas flows, gas blends, and power signals. ACV, SIMV, and CPAP modes are operable with or without PEEP or SIGH. ACV and SIMV are operable with or without PRESSURE PLATEAU. All modes are PEEP and altitude compensable to minimize your patients work of breathing and an automatic ventilatory backup assures continued mechanical support if the patient becomes apneic. An adjustable pressure limit control limits peak inspiratory pressures and high pressure alarm setpoint. The ventilator does not consume gas for operating power and may be operated without attachment of external gases. It is operable in any position: upright, on its side, or lying flat and has an operating temperature range of (-) 15 to (+) 120 degrees Fahrenheit.

Figure 13.3. Uni-Vent Model 754M Face Plate .



**13.3.3. Power Sources.** Model 754/754M Universal AC Power Supply and DC to DC Converter. Connects directly to AC outlets and is operable from 90-265 VAC, 50-400Hz (voltage and line frequency sensing is automatic) and draws 1 Ampere. DC operation range is 20-36 VDC (auto-sensing) and draws 5 Amperes. The converter also accepts external DC voltages, ranging from 16 to 30 volts via the secondary input leads provided (no plug attached at shipment). Attachment to a mating connector is required and polarity must be observed. The black input lead is positive; the white is negative. Do not attach the braided shield. In addition, a 12 VDC Power Cable is provided for attachment to an automotive power source, negative ground. Operating time on internal battery is 3-hours (maximum) using internal air compressor and 12-hours using external gas source. Recharging time ranges from 14-16 hours, depending on initial state of discharge.

**NOTE:** Two external fuse-holders are located on the top, left side of the Uni-Vent and each contains a 2AG, 10A fuse. The fuse closest to the battery compartment door affects external power operation and battery operation and the other fuse affects battery operation and charging. “EXT PWR” and battery icon “ON CHG” will not display if their respective fuse(s) is/are blown or missing. Return to MERC for servicing.

### 13.3.4. Components.

13.3.4.1. Uni-Vent 754M Ventilator, Compressor, Air/Oxygen Mixer.

- 13.3.4.2. Ventilator Circuit: Universal Portable Volume Ventilator Circuit (003764).
- 13.3.4.3. Compressed Air Hose (yellow), female, dual-end adapter.
- 13.3.4.4. Oxygen Hose (green), female, dual-end adapter.
- 13.3.4.5. Humi-Vent™ “artificial nose”, 250 – 1500cc.
- 13.3.4.6. DC power cord: 11-15 VDC.
- 13.3.4.7. AC power cord adapter: 90-265 VAC/47-400 Hz.
- 13.3.4.8. Securing straps (2).

### 13.3.5. Connections.

**Figure 13.4. Uni-Vent Model 754M top Connections**



13.3.5.1. Oxygen Inlet: Nominal 50 PSI input, oxygen, male-thread. Connects to output of oxygen cylinder pressure reducer, PTLOX, or on-board aircraft generated source. Use the green high-pressure hose (6 ft. long) for interconnection.

13.3.5.2. Air Inlet: Nominal 50 PSE input, air, male-thread. Connects to output of air cylinder pressure reducer, or electric compressor (oil-less and filtered). Use the 6 ft. yellow high-pressure hose for interconnection.

**CAUTION:** To protect the ventilator from dirt and condensate, use an Air Inlet Filter/Moisture Trap whenever external air is provided by an electric air compressor.

13.3.5.3. Gas Outlet: Low pressure, 22mm male tapered connection. Connects to disposable ventilator circuit.

13.3.5.4. Transducer: Low pressure, fits 3/16 in. tubing. Connects ventilator pressure transducer to disposable ventilator circuit transducer hose (green connector).

13.3.5.5. Exhalation Valve: Low pressure, fits ¼ in. tubing. Connects ventilator exhalation valve control port to disposable ventilator circuit exhalation valve (clear aluminum connector).

13.3.5.6. External Power Jack: Connects ventilator to Universal AC Power Supply or external 11-15 volt power source via 12 VDC Power Cable.

**NOTE:** The External Power Jack: includes pins containing signals for the Communications Port which provides remote interface and monitoring of the ventilator (see operation manual).

### 13.3.6. Interconnections.

13.3.6.1. For use with external oxygen, connect high-pressure green oxygen hose between OXY-GEN inlet port and a 50-PSI external oxygen source. Use only medical-grade oxygen.

13.3.6.2. For use with external air, connect a high-pressure yellow air hose between AIR inlet port and a 50-PSI external air source. Use only medical-grade compressed air.

13.3.6.3. Connect a disposable ventilator circuit to its respective gas outlet, transducer, and exhalation valve connectors on the Uni-Vent Connector Panel. Observe directions included with each disposable ventilator circuit.

13.3.6.4. Connect Universal AC Power Supply, or 12 VDC Power Cable, between EXTERNAL POWER JACK and external power source.

**CAUTION:** DO NOT block the Internal Compressor Air Filter port (upper-right side) and do not connect the ventilator circuit hose to this outlet.

**NOTE:** The Nylon Carrying Case does not interfere with air intake due to peripheral holes provided and therefore does not create a blockage.

### 13.3.7. Controls.

13.3.7.1. EXTERNAL AIR OFF/ON Pushbutton Switch: Permits the user to manually select external compressed air as your primary air source. If Air Pressure is greater than 40 PSI, operation will begin. If a lower pressure or no pressure is sensed, the LCD will display "OFF" (default value) and the internal compressor will operate.

13.3.7.2. SIGH OFF/ON Pushbutton Switch: Permits the Uni-Vent to operate with or without SIGH. When activated, the first ventilator generated breath will be a SIGH. Additional SIGH ventilation's are delivered once every 100 ventilation's or every 7 minutes, whichever comes first. Each SIGH does not exceed 3 seconds. SIGH becomes disabled in the CPAP mode, or when PRESSURE PLATEAU is "ON".

13.3.7.3. PEEP OFF/ON-SET Pushbutton Switch: Activates Uni-Vent's internal PEEP control. Pressing the pushbutton allows a PEEP value to be manually entered.

13.3.7.4. PRESSURE PLATEAU OFF/ON Pushbutton Switch: Permits ACV or SIMV operation with a pressure plateau. Pressing this pushbutton activates a PLATEAU value that is referenced 10 cmH<sub>2</sub>O below the HIGH PRESSURE

13.3.7.5. **HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control:** Used to select HIGH PRESSURE ALARM and PEAK INSPIRATORY PRESSURE RELIEF setpoint. It has an absolute range from 15 to 100 cmH<sub>2</sub>O.

13.3.7.6. **LOW PRESSURE ALARM Control:** Used to select the LOW PRESSURE ALARM setpoint. It has an absolute range from 0-50 cmH<sub>2</sub>O.

13.3.7.7. **VENTILATION RATE Control:** Determines the mechanical ventilation rate for ACV and SIMV operation. It is not operable in CPAP. Its range is from 1 to 150 breaths per minute (BPM). During APNEA, the RATE Control setting and its LCD display will change to 12 BPM.

13.3.7.8. **INSPIRATION TIME/I:E RATIO Control:** Sets the inspiratory duration of all ventilator-delivered breaths. It is adjustable in 0.1-second increments from 0.1 to 3.0 seconds maximum. Its usable range is limited by the VENTILATION RATE Control setting. Inverse I:E ratio (inspiratory is greater than expiratory time) is not permitted. INVERSE I:E will blink in this condition. Default I:E ratio of 1:2 is activated when this control is turned to its fully counterclockwise position.

13.3.7.9. **TIDAL VOLUME Control:** Allows gas to be delivered over a wide range. Maximum flow is equivalent to approximately 1000ml/sec (60 LPM). It may be obtained from any of the following gas sources. External Air (cylinder), External Compressed Air (compressor), Internal Air Compressor, External Oxygen and External Air Cylinder or Compressor, or Internal Air Compressor, or External Oxygen.

13.3.7.10. **AIR/OXYGEN MIXER Control:** Allows air, oxygen, or mixtures of air and oxygen to be delivered within a range of 21-100% FIO<sub>2</sub>. A 21 % FIO<sub>2</sub> is obtained from the following sources: External Air (cylinder), External Compressed Air (compressor), or Internal Air Compressor. FIO<sub>2</sub>'s up to 100% may be obtained by adding 100% External Oxygen to these sources.

13.3.7.11. **ALARM MUTE/CANCEL Pushbutton Switch:** Either mutes an audible alarm signal, or cancels a particular alarm function. OPERATING ALARM (30-Seconds), BATTERY Alarms (5-Minutes), EXTERNAL POWER Alarm (until internal battery depletes, then, a BATTERY LOW Alarm also activates for 5-Minutes).

13.3.7.11.1. **Muting:** This mutes the audible component of an Operating Alarm condition. Alarm muting is reset when the current alarm condition no longer applies or the mute-period is reached (alarm will resound). A new alarm condition overrides an already "muted" alarm.

13.3.7.11.2. **Canceling:** Cancels the audible component of an Advisory Alarm condition. During APNEA alarm condition, it will cancel both the audible and visual APNEA alarms and the controlled ventilations that are automatically invoked at the onset of apnea. Cancellation of an APNEA alarm allows Uni-Vent to resume operation at the preset ACV, SIMV or CPAP settings.

13.3.7.12. **MANUAL BREATH/TRIGGER Pushbutton Switch:** Pressing this in normal operation delivers one MANUAL BREATH. Each time a MANUAL BREATH is triggered, an audible beep is heard. MANUAL TRIGGER functions as a backup when the primary system fails. While depressed, the MANUAL TRIGGER delivers a continuous gas flow at 30 liters per minute (LPM), with peak inspiratory pressure not exceeding 40 cmH<sub>2</sub>O.

13.3.7.13. **MODE Selector Switch (ON-A/C-SIMV-CPAP-CAL):** Causes the microprocessor to perform a "SELF-CHECK" before initiating operating in the selected mode.

### 13.3.8. Visual Status Indicators.

13.3.8.1. MODE Indicator, displays respectively: ASSIST, SIMV, CPAP, or CAL.

13.3.8.2.  $V_{\min}$  Indicator: Displays Minute Volume (in liters) in the ACV mode, blanks during SIMV, CPAP, and CAL or when a PLATEAU VOLUME or SYSTEM FAILURE Alarm goes off.

13.3.8.3. INSPIRATION/EXHALATION Indicator: Displayed in phase of mechanical and/or spontaneous breaths in each operating mode, blanks during CAL.

13.3.8.4. POWER INFORMATION CENTER: Occupies a two-line area in the LCD's lower left section. It is displayed when the MODE SELECTOR SWITCH is in any position except OFF and the CPU validates a usable source of power during the power check portion of SELF-CHECK and displays various messages.

13.3.8.4.1. Line 1: EXT PWR ON; denotes an external power source, EXT PWR LOW denotes a low external power source and is blank with no power connected.

13.3.8.4.2. Line 2: Battery icon OK; denotes battery power source > 30 min. remaining, Battery icon LOW denotes battery power source < 30 min. remaining and is blank when no battery is sensed.

**NOTE:** The POWER INFORMATION CENTER is capable of detecting open/blown or missing fuses during or prior to external power operation and during or prior to internal battery operation. If the AC or DC power source is interrupted by one of these conditions, the alternative power source will power the unit if available (i.e. battery charged or AC plug connected to power).

13.3.8.5. PEAK AIRWAY PRESSURE Indicator: Displays the PEAK AIRWAY PRESSURE of the previous breath.

13.3.8.6. MEAN AIRWAY PRESSURE Indicator: Displays the MEAN AIRWAY PRESSURE.

13.3.8.7. DIGITAL BAR GRAPH Indicator: Provides continuous display of airway pressure. Its absolute range is -10 to +100 cm H<sub>2</sub>O.

13.3.8.8. HIGH and LOW AIRWAY PRESSURE ALARM Setpoint Indicators: Appear as small horizontal lines to the right of the DIGITAL BAR GRAPH. Displays are found above their respective controls and reposition whenever an alarm control is adjusted.

13.3.8.9.  $P_{aw}$  Indicator: Represents a continuous and updating display of airway pressure.

13.3.8.10. CHARGE Indicator: Green CHARGE Indicator LED illuminates whenever sufficient battery recharging current is flowing.

### 13.3.9. Alarm Indicators.

13.3.9.1. Operating Alarms:

13.3.9.1.1. BATTERY LOW/FAIL Alarm: Indicates when a low battery condition is sensed.

13.3.9.1.2. EXTERNAL POWER LOW Alarm: Indicates when external power is less than 10.9 VDC.

13.3.9.1.3. LOW PRESSURE Alarm: Indicates when PIP fails to exceed the LOW PRESSURE ALARM setpoint for two consecutive breath's and causes the LCD setpoint indicator to blink.

13.3.9.1.4. **DISCONNECT ALARM:** Indicates when a disconnect is sensed in the patient circuit.

13.3.9.1.5. **HIGH PRESSURE ALARM:** Indicates when PIP exceeds the HIGH PRESSURE ALARM setpoint for four consecutive breaths, or 2-seconds continuously, and causes the LCD setpoint indicator to blink.

13.3.9.1.6. **APNEA ALARM:**

13.3.9.1.6.1. **ACV AND SIMV:** Indicates when approximately 19-seconds have elapsed and no pressure deflections have been sensed.

13.3.9.1.6.2. **CPAP:** Indicates when no spontaneous breathing is detected for 10-seconds.

13.3.9.1.7. **HIGH PEEP Alarm:** Indicates when the inspiratory cycle begins before end expiratory pressure plateaus.

13.3.9.1.8. **O2 LOW/FAIL Alarm:** Indicates when low pressure is sensed from an external oxygen supply.

13.3.9.1.9. **EXT AIR LOW/FAIL Alarm:** Indicates when low pressure is sensed from an external source of compressed air.

13.3.9.1.10. **FIO2 Alarm:** Indicates when the oxygen component or the air component of the AIR/OXYGEN MIXER is unable to meet its proportion of the gas mixture.

13.3.9.1.11. **PRESSRE ALARM SETTINGS Alarm:** Indicates when the HIGH PRESSURE ALARM and LOW PRESSURE ALARM setpoints are reversed.

13.3.9.1.12. **V<sub>T</sub> Alarm:** Indicates when delivered tidal volume does not equal set tidal volume.

13.3.9.1.13. **COMP ALARM:** Indicates when the internal compressor output does not produce its intended contribution to tidal volume.

13.3.9.2. Non-operating Alarms:

13.3.9.2.1. **INVERSE I:E Alarm:** Indicates when inspiratory time becomes longer than expiratory time.

13.3.9.2.2. **TRANSDUCER CALIBRATION ABORT Alarm:** Indicates when the TRANSDUCER CALIBRATION process is stopped prematurely.

13.3.9.2.3. **SYSTEM FAILURE Alarm LED:** Illuminates when CPU is forced to shutdown operation or a CPU failure has occurred. This alarm is usually related to a hardware problem and will cause the LCD to blank.

13.3.9.2.4. **VENTILATOR FAIL ALARM:** Indicates when any one of seven ventilator failure causing conditions occurs.

13.3.9.3. Advisory Alarms:

13.3.9.3.1. **INSPIRATORY TIME TRUNCATED TO 3-SEC Alarm:** Indicates when control settings would cause inspiration time to exceed 3-seconds.

13.3.9.3.2. **PLATEAU VOLUME Alarm:** Indicates when delivered PRESSURE PLATEAU tidal volume is less than set tidal volume by more than 5%.

13.3.9.3.3.  $V_T$  SETTINGS Alarm: Indicates whenever the sum of the flows of the selected gases would exceed a flow rate of 60 liters per minute (LPM).

13.3.9.3.4. PREVENTATIVE MAINTENANCE Alarm: Indicates after 2000 hours of cumulative use, or 12 months, whichever comes first.

13.3.9.3.5. EXTENDED NON-USE/STORAGE Alarm: Indicates at power-up after 6 months of continuous non-use/storage has occurred.

13.3.9.3.6. EXTERNAL POWER FAILURE Alarm: Indicates whenever external power ails, or is disconnected during external power operation.

13.3.9.3.7. TOTAL FLOW BACKUP Alarm: Indicates when the backup flow sensor detects the sum of the flows (O<sub>2</sub>, Air, and internal compressor) exceeding set flows by +/- 50% for 5 consecutive breaths.

### 13.3.10. Preflight.

13.3.10.1. Ensure currency of the inspection/calibration decal on unit and that all component parts are complete and in serviceable condition (i.e. cleanliness, cracks, dints, missing parts or anything that could lead to a system failure).

13.3.10.2. Examine high- pressure hoses for cracks, wear, discoloration, damaged threads and/or connectors.

13.3.10.3. Examine the Compression Inlet for damage. Ensure the filter is in place on the top right side of the Uni-Vent and in good condition.

#### NOTES:

Filter may be removed with tweezers or similar tool and examined for dirt, lint, or general wear.

**CAUTION:** Do not block the inlet or attempt to operate the internal compressor without filter in place. Do not attempt to clean this filter, replace if necessary.

13.3.10.4. Visually observe the GAS OUT to Patient Outlet. Ensure the Antiasphyxia Valve is seated and not missing in order to prevent a pressure loss and resulting ventilator failure.

**NOTE:** If the GAS OUT to Patient Outlet is blocked, the pressure of the next mechanical ventilation may displace the Antiasphyxia Valve resulting in a malfunction (i.e. loss of pressure). The valve can be quickly resealed by pushing its “flapper” inward using the rounded tip of a retracted pen or small hemostat.

13.3.10.5. Turn Uni-Vent on.

13.3.10.6. Verify successful completion of SELF-CHECK.

**NOTE:** Uni-Vent undergoes a self-checking process every time its MODE Selector Switch is turned from “OFF” to ACV, SIMV, or CPAP; or from CAL to ACV, SIMV, or CPAP. Operation begins immediately following successful SELF-CHECK.

13.3.10.7. If Uni-Vent fails SELF-CHECK, a VENTILATOR FAIL Alarm will occur. Return the MODE Selector Switch to its OFF position and then repeat this procedure. If SELF-CHECK fails again, DO NOT ATTEMPT PATIENT USE.

13.3.10.8. Confirm AUTOMATIC TRANSDUCER CALIBRATION: The Uni-Vents’ pressure transducer automatically compensates to altitude pressure changes up to 25,000 ft. The TRANS-

DUCER CALIBRATION process calibrates Uni-Vent's internal pressure transducer to atmospheric pressure. This calibration process is performed automatically, with initiation of self-check, and repeats every 5 min. thereafter.

**WARNING:** SELF-CHECK will automatically alert personnel if the pressure transducer calibration "zero" baseline exceeds +/- 1 cm H<sub>2</sub>O from its last calibration. A TRANSDUCER CALIBRATION Alarm will be activated during the SELF-CHECK and will be visually displayed on the LCD. If only the pressure transducer calibration portion of SELF-CHECK fails, DO NOT ATTEMPT PATIENT USE.

**WARNING:** SELF-CHECK and TRANSDUCER CALIBRATION must be performed with the disposable ventilator circuit disconnected from the patient. This insures that the TRANSDUCER connection is open to ambient atmosphere. Ignoring this requirement would allow the procedure to sense any residual airway pressure in the patient circuit (a false reading). The residual pressure becomes the new calibration reference, which will increase your patient's work-of-breathing by the residual amount.

**NOTE:** A TRANSDUCER CALIBRATION ABORT Alarm will occur if the MODE Selector Switch is turned to an operating mode position before CAL is complete. The CAL procedure must be restarted by turning the MODE Selector Switch to any position other than CAL, and then returning it to CAL, and repeating the process described in [13.3.10.8](#).

13.3.10.9. Verify operating power selections: A/C, SIMV, or CPAP.

13.3.10.10. Perform MANUAL CALIBRATION: Set MODE Selector Switch to CAL. The AMC will display: "Calibration...Please Wait"; then MODE=CAL. Calibration will take approximately 3 seconds. When finished, the AMC display will change to: MODE=CAL OK.

13.3.10.11. When using external power source (from Universal AC Power Supply, or 12 VDC Power Cable) insure that the Power Information Center (PIC) Display verifies presence of external power: "EXT PWR ON" (PIC Line 1); charge indicator illuminates: "ON CHARGE" (PIC Line 2); and fuses are not blown or missing.

**NOTE:** A fully charged battery will cause CHARGE LED to turn off and battery icon "OK" (PIC Line 2) appears.

13.3.10.12. Check for positive indexing and operation of all switches and controls.

13.3.10.13. Disconnect external power source and verify internal battery operation.

13.3.10.14. Employ the system.

### **13.3.11. General Operating Instructions.**

13.3.11.1. Only the five primary controls, common to most applications, are marked. They are numbered in order of use, in a 5-step sequence on the front panel.

13.3.11.1.1. #1: Select operating mode; ACV, SIMV, OR CPAP.

13.3.11.1.2. #2: Set INSPIRATION TIME.

13.3.11.1.3. #3: Set VENTILATION RATE.

**NOTE:** If your protocol calls for use only at the 1:2 RATIO preset, Step #2 can be bypassed and the INSPIRATION TIME-I:E RATIO is turned to the full counter clockwise position.

13.3.11.1.4. #4: Set TIDAL VOLUME.

13.3.11.1.5. #5: Set the AIR/OXYGEN MIXER for an FIO<sub>2</sub> between 21 and 100% O<sub>2</sub>.

**NOTE:** If your protocol involves use without external oxygen, or with 100% O<sub>2</sub>, the AIR/OXYGEN MIXER control remains either fully counterclockwise or fully clockwise and Step #5 can be bypassed.

### **13.3.12. Condensed Operating Instructions.**

13.3.12.1. The following list is on the back of the Uni-vent.

13.3.12.2. Insure that all hoses and connections are secure.

13.3.12.3. Verify battery charge and/or presence of external power.

13.3.12.4. Allow SELF-CHECK process to complete.

13.3.12.5. Perform TRANSDUCER CALIBRATION if necessary.

13.3.12.6. Mute DISCONNECT Alarm during setup procedures as required.

13.3.12.7. Set RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, and AIR/OXYGEN MIXER Control settings.

13.3.12.8. Set SIGH, PEEP, PRESSURE PLATEAU, LOW and HIGHPRESSURE ALARM Switches/Controls as required.

13.3.12.9. Connect Disposable Ventilator Circuit to patient.

13.3.12.10. Resolve all active Operating Alarms; acknowledge all Advisory Alarms.

**WARNING:** DO NOT leave patient unattended until desired operation is verified.

### **13.3.13. Expanded Operating Instructions.**

**WARNING:** Functions that are dependent upon accurate pressure readings should only be used in conjunction with a protected airway (i.e. adequate seal). This will prevent “leaks” from distorting pressure signals. DO NOT use pressure dependent functions with an unprotected airway. This applies primarily to use with uncuffed endotracheal tubes, uncuffed tracheostomy tubes, and resuscitation masks where the face-to-mask seal is frequently compromised.

13.3.13.1. ASSIST-CONTROL VENTILATION (ACV): Configured to deliver a minimum ventilatory rate, preset inspiratory time and preset tidal volume. Patient-initiated breaths are assisted and controlled ventilations are delivered when patient’s effort falls below the ventilator’s minimum settings.

13.3.13.1.1. Turn MODE Selector Switch to A/C. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required.

13.3.13.1.2. Adjust VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER LOW, and HIGH AIRWAY PRESSURE ALARM Control Settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM’s are not used, set their respective controls to 0 to 100.

13.3.13.1.3. Attach disposable ventilator circuit to patient’s endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and can-

cel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel

13.3.13.1.4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD.

13.3.13.1.5. Press SIGH Pushbutton Switch if ACV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7 minutes, whichever occurs first. Each SIGH ventilation equals 150% of the INSPIRATION TIME setting, which increases delivered volume by 50%. As a safety precaution, Uni-Vent does not allow the inspiratory portion of a SIGH breath to exceed 3 seconds.

13.3.13.1.6. Press PLATEAU Pushbutton Switch if ACV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H<sub>2</sub>O below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF control setting.

### 13.3.13.2. SYNCHRONIZED INTERMITTENT MANDATORY

VENTILATION (SIMV): Permits patients to breathe spontaneously while periodically receiving ventilator-generated assisted breaths.

13.3.13.2.1. Turn MODE Selector Switch to SIMV. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required.

13.3.13.2.2. Adjust the VENTILATION RATE (SIMV RATE), INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE Alarms as required (if pressure controls are not used, set their respective controls to 0 and 100).

13.3.13.2.3. Attach disposable ventilator circuit to patient's endotracheal or tracheostomy tube if PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD.

13.3.13.2.4. Press SIGH Pushbutton Switch if SIMV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7 minutes, whichever comes first. Each SIGH ventilation equals 150% of the INSPIRATION TIME setting, which increases delivered volume by 50%. As a safety precaution,

Uni-Vent™ does not allow a SIGH breath to exceed 3 seconds.

13.3.13.2.5. Press PLATEAU Pushbutton Switch if SIMV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiration cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H<sub>2</sub>O below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting.

13.3.13.3. CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP): Similar to SIMV with PEEP, except the mandatory rate is "zero". There are no assisted ventilations and the patient breathes spontaneously with PEEP. PRESSURE PLATEAU and SIGH are disabled.

13.3.13.4. POSITIVE END EXPIRATORY PRESSURE (PEEP): Provides a means of converting the transducer calibration pressure reference from atmospheric pressure to atmospheric pressure + PEEP pressure. PEEP may be used during ACV, SIMV or CPAP operation.

**WARNING:** A separate PEEP valve is not required and must not be added to the closed patient circuit.

13.3.13.4.1. Manually enter a PEEP Value using the PEEP OFF/ON-SET pushbutton switch. Each time the switch is pressed, the value of PEEP will increase by 1 cm H<sub>2</sub>O. The maximum PEEP value is 20 cm H<sub>2</sub>O.

13.3.13.5. PRESSURE PLATEAU: Sets a plateau value that when reached, causes gas flow to be cycled ON and OFF to maintain the plateau until the inspiratory cycle is completed. Only operable in the ACV and SIMV operating modes.

13.3.13.5.1. Press PRESSURE PLATEAU OFF/ON Pushbutton Switch and the PLATEAU Value is automatically referenced 10cm H<sub>2</sub>O below HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control Point.

**NOTE:** If pressure rises above set Control Point, a valve vents the excess pressure; and if a leak is detected, additional gas flow automatically maintains the PLATEAU.

13.3.13.6. BACKUP VENTILATOR: Provides a limited degree of operation should a CPU Failure occur. A SYSTEM FAILURE Alarm will indicate an unsafe operating condition in the primary ventilator and a separate backup ventilator circuit begins operation with the following operating characteristics:

13.3.13.6.1. Rate: 12 breaths per minute.

13.3.13.6.2. I:E Ratio: 1:2.

13.3.13.6.3. Flow Rate: 30 liters per minute for duration of Inspiratory Time or until Peak Inspiratory Pressure threshold is reached.

13.3.13.6.4. Peak Inspiratory Pressure Relief: 40 cm H<sub>2</sub>O.

13.3.13.6.5. Gas Source Prioritization: External Air, if available, or Internal Compressor, if operable; or External Oxygen, if available.

13.3.13.6.6. Audible System Failure Alarm Mute/Cancel: Pressing ALARM MUTE/CANCEL pushbutton switch cancels audible alarm.

13.3.13.6.7. Manual Trigger Override: Yes, followed by a 6-second reset period before automatic ventilation resumes.

#### **13.3.14. Disassembly and Storage.**

13.3.14.1. Disconnect accessories and discard disposable items.

13.3.14.2. Clean Uni-Vent and its accessories.

**CAUTION:** Never allow grease or oil to enter the system or coat its components.

13.3.14.2.1. Housing and pressure-hose connections may be cleaned with a damp, soapy cloth and thoroughly dried with a lint-free cloth.

**CAUTION:** Do not clean with abrasives or chlorinated hydrocarbon cleansers.

13.3.14.2.2. Inspect Uni-Vent and accessories for wear and damage; refer to pre-flight as necessary.

13.3.14.2.3. Store the Uni-Vent per unit SOP.

**13.4. Forms Prescribed.** Standard Form (SF) 380, Reporting and Processing Medical Material **Complaint/Quality** Improvement Report, and Air Force Technical Order (AFTO) Form 350, Repairable Item Processing Tag.

PAUL K. CARLTON, JR., Lt General, USAF, MC  
Surgeon General

**Attachment 1****GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 21-101, *Maintenance Management of Aircraft*

AFI 41-301, *Worldwide Aeromedical Evacuation System*

AFI 41-302, *Aeromedical Evacuation Operations and Management*

AFI 41-316, *Aeromedical Evacuation Inflight Kit--Packaging Guide*

AFDIR 41-317, *Compendium of Aeromedical Evacuation Terminology*

AFM 161-30, Volume 1, *Solid Rocket/Propellants*

AFM 161-30, Volume 2, *Liquid Propellants*

TA 887, *Strategic and Tactical Aeromedical Evacuation (AE) In-Flight Kits*

T.O. 15X-2-8-1, *Liquid Oxygen Converter Type CRU-87/U*

AL/CF-TR-1995-0171, *Status Report On Medical Materiel Items Tested and Evaluated For Use In The USAF Aeromedical Evacuation System.*

***Abbreviations and Acronyms***

**AC**—alternating current

**AECM**—Aeromedical Evacuation Crew Member

**AFDIR**—Air Force Directory

**AFH**—Air Force Handbook

**AFI**—Air Force Instruction

**AFM**—Air Force Manual

**AFPAM**—Air Force Pamphlet

**AFTO**—Air Force Technical Order

**AE**—Aeromedical Evacuation

**AET**—Aeromedical Evacuation Technician

**ALSS**—Airborne Life Support System

**APU**—Auxiliary Power Unit

**BPM**—Breaths per minute

**BSS**—Battery Support System

**cc**—Cubic centimeters

**cc/B**—Cubic centimeters per breathe

**cm**—centimeters

**CO**—**2**carbon dioxide

**CPAP**—Constant Positive Airway Pressure

**DC**—Direct current

**ECAS**—Electrical Cord Assembly Set

**ECG**—Electro Cardiogram

**ECMO**—Eltracorporeal Membrane Oxygenation

**EMIS**—Emergency and Military Infusion System

**E.O.A.**—Esophageal Obturator Airway

**FE**—Flight Examiner

**FI**—Flight Instructor

**gm**—gram

**Hg**—Mercury

**Hz**—Hertz

**H**—**2O**Water

**ID**—Internal diameter

**IV**—Intravenous

**kg**—kilograms

**KVO**—Keep Vein Open

**lbs**—pounds

**LCD**—Liquid Crystal Display

**LED**—Light Emitting Diodes

**LPM**—Liters per minute

**L/cc**—Liters per cubic centimeter

**MAJCOM**—Major Command

**MCD**—Medical Crew Director

**MERC**—Medical Equipment Repair Center

**ml**—Milli-liters

**ml/hr**—Milliliter per hour

**mm**—Millimeters

**MTP**—Medical Technology Products

**NATO**—North Atlantic Treaty Organization

**NSN**—National stock number

**NTS**—Neonatal Transport System

**O**—2oxygen

**OEHL**—Occupational and Environmental Health Laboratory

**OWL**—Overweight Patient Litter (OWL)

**PEEP**—Positive End Expiratory Pressure

**psi**—Pounds per square inch

**PTLOX**—Patient Therapeutic Liquid Oxygen

**RON**—remain over night

**SF**—Standard Form

**SIMV**—Synchronized Intermittent Mandatory Ventilation

**TA**—Table of Allowances

**TMO**—Traffic Management Office

**T.O.**—Technical Order

**TOMS**—Therapeutic Oxygen Manifold Distribution System

**USAARL**—US Army Aeromedical Research Laboratory

**USAF**—United States Air Force

**VAC**—Volts Alternating Current

**VDC**—Volts Direct Current

**WRM**—War Reserve Materiel

**Attachment 2****EQUIPMENT AMPERAGE REQUIREMENTS**

**A2.1.** Always check the amp rating of the electrical outlet you are using before you plug in any equipment. Electrical outlets are labeled with their amp rating. The C-130 is rated for 40 amps on the right side and 20 amps on the left side using 115 VAC/400 Hz at 20 amps per outlet. The C-141 is rated for 60 amps on the right side and 60 amps on the left side using the 115 VAC/400 Hz outlets at 20 amps per outlet.

**A2.2.** All electrical equipment, when initially turned on, will triple its amperage load for a microsecond. To preclude "popping" electrical circuit breakers, only turn ON one piece of medical equipment at a time.

**Table A2.1. Equipment Amperage Requirements.**

<b>ITEM</b>	<b>NORMAL AMP LOAD</b>	<b>POWER REQUIREMENT</b>	<b>WTS</b>
ALSS Model 20H Incubator	3.0 amps	115 VAC/50-60Hz	82 lbs
ALSS Model 185 Incubator	3.0 amps	110 VAC/50-400 Hz	80 lbs
Airdyne Air Compressor	8.5 amps	120 VAC/50-60 Hz	90 lbs
AVI Guardian Volumetric Sys 100	0.15 amps	115 VAC/60 Hz	8.5 lbs
Avionic Elec Freq Converter	1.0 amps (Provides 34 amps)	115-200 BAC/400 Hz	79 lbs
Baxter AS 2F Autosyringe	0.03 amps	115 VAC/60 Hz	
Bear 33 Adult Ventilator	1.0 amps	115 VAC/50-60 Hz	32 lbs
Bear Humidifier, Adult	1.0 amps	115 VAC/50-60 Hz	6.75 lbs
CAS Med Sys Neo B/P Monitor 901	0.13 amp	120 VAC/60 Hz	10 lbs
Corometrics Neo Monitor MVP-10	0.17 amp	120 VAC/60 Hz	2.0 lbs
ECMO System (Total Components)		115 VAC/60 Hz	200.0 lbs
IMED 928 Infusion Pump	1.2 amps	120 VAC/50-60 Hz	12.25 lbs
IMED 960 Infusion Pump	0.5 amps	120 VAC/50-60 Hz	12.25 lbs
Impact 308M Suction Pump	3.0 amps	120 VAC/50-400 Hz	13.0 lbs
Impact 326M Suction Pump	1.0 amp	115-230 VAC/50-400 Hz	12.0 lbs
IVAC Medsystem III	0.6 amps (Maximum)	110-120 VAC/60 Hz	3.6 lbs
Laerdal Suction Unit LSU	0.6 amps	110 VAC/60 Hz	
Life Pak 10 Battery Support	1.0 amps	120 VAC/50-400 Hz	20.0 lbs
Life Pak 10 Defibrillator/Monitor	Battery	Battery	20.0 lbs
Life Pak 10 AC Aux Power Supply		120 VAC/60 Hz	3.5 lbs
MD3 Cardiac Monitor	3.0 amps	120 VAC/50-400 Hz	46.0 lbs
MRL 360 SL	0.4 amps	110 VAC/60 Hz	8.0 lbs
MRL 450SL-AF Cardiac Monitor	0.25 amps	120 VAC/50-400 Hz	37.4 lbs
MTP Infusion Pump	0.03 amps	110-115 VAC/50-400 Hz	4.0 lbs
Nellcor Pulse Oximeter N-200	0.3 amps	110 VAC/60 Hz	
Nonin 8600 Pulse Oximeter	0.02 amps	120 VAC/60 Hz	2.0 lbs

ITEM	NORMAL AMP LOAD	POWER REQUIREMENT	WTS
ProPaq Monitor 106	0.2 amps	120 VAC/60 Hz	15.1 lbs
ProPaq Monitor 106EL	0.7 amps	110 VAC/60 Hz	15.0 lbs
Unitron Elec. Freq. Converter	Provides 30 amps	200 VAC/400 Hz	145.0 lbs
Pulse Oximeter BCI 1040A	0.15 amps	115 VAC/60-400 Hz	2.0 lbs
Wrap Around Heater	1.25 amps	115 VAC/60-400 Hz	1.5 lbs

**A2.3.** Medical equipment is made to operate from 95-120 VAC/50-60 Hz. Plugging medical equipment labeled for 110,115, 117, or 120 VAC/50-60 Hz into an outlet labeled for 110-115 VAC/50-60 Hz will not affect the operation of that piece of medical equipment.

**Attachment 3****IC 2000-1 TO AFI 41-309, AEROMEDICAL EVACUATION EQUIPMENT STANDARDS**

10 DECEMBER 2000

***SUMMARY OF REVISIONS***

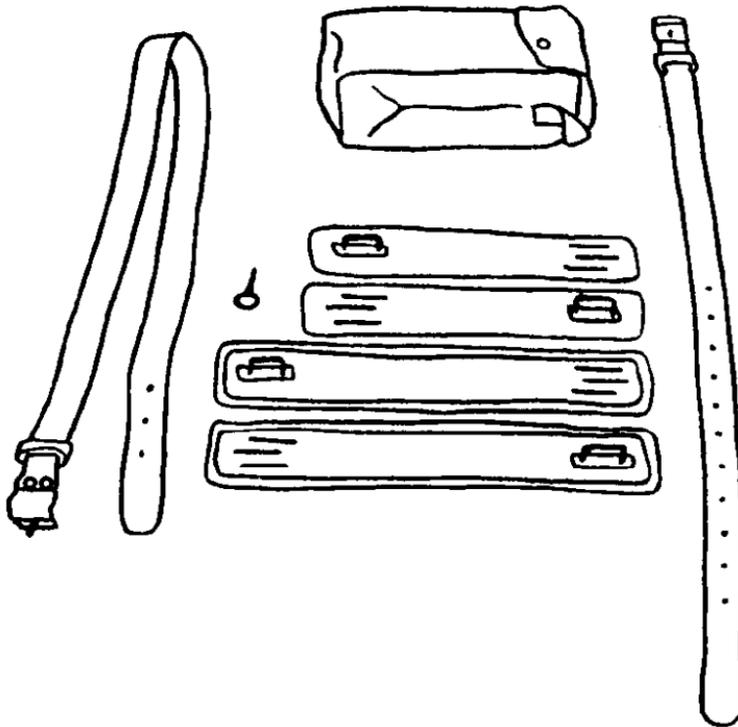
This revision incorporates Interim Change IC 2000-1. This change incorporates additional equipment. Review the added equipment items prior to operational use. A “[” indicates revised material since the last edition.

**7.8. Leather Restraint Set.**

7.8.1. **Purpose.** Restraint sets provide physical restraint of patients who are mentally compromised and who are at risk of injuring themselves or others.

7.8.2. **Description.** The restraint sets are comprised of two ankle cuffs, two wrist cuffs, one short and one long leather strap, one restraint key, and a carrying case. Figure 7.6. shows the cuffs, straps and key. The cuffs and straps are made of leather and have metal attachments for connecting straps to cuffs, and for locking straps.

7.8.2.1. Cuffs are made with a metal loop at one end, and three adjustment slots at the other end. The straps are made of leather and are made to fit through the metal loops of the cuffs.

**Figure 7.6. Leather Restraint Set****LEATHER RESTRAINT SET**

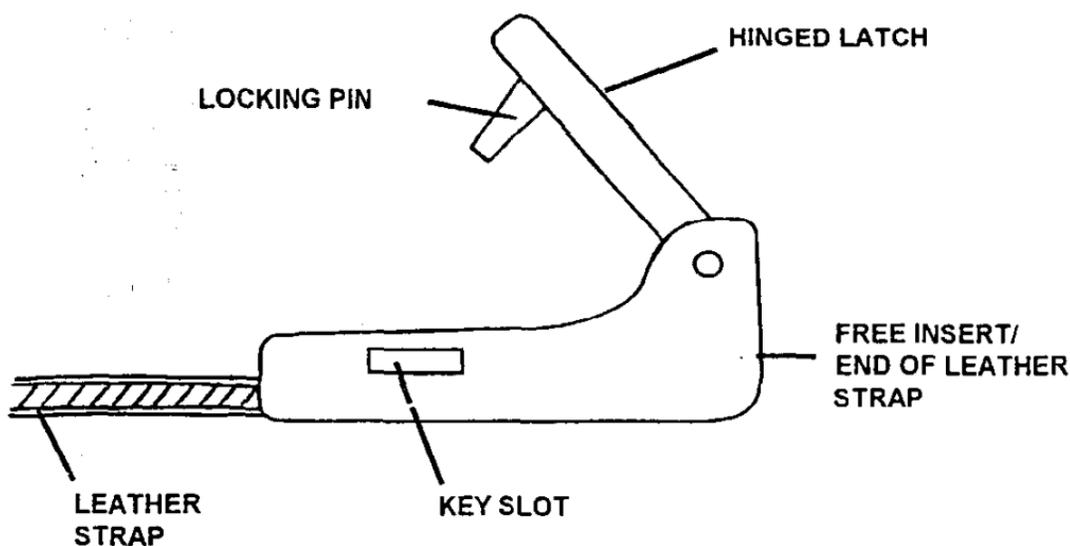
7.8.3. **Pre-Flight.** Inspect the components for any damage. Ensure that all components are present and that the restraint lock key is not bent.

7.8.4. **Operation.** Place a wrist cuff around each wrist with the metal loop on the inner side of the patient's wrist, and slide one of the three slots over the metal loop to produce a snug fit around the wrist. Use padding as necessary to prevent skin irritation and to provide a snug fit. Thread the long strap through the metal loop on the wrist cuff by the aisle, starting on the side closer to the elbow. Extend the strap across the patient's body and thread it through the metal loop on the other wrist cuff from the hand side. Pass the strap behind the patient and slide the end through the metal locking devise (**Figure 7.7.**) Do not secure the strap to the litter.

**WARNING 1:** Restraints are placed on patients who pose a threat of injury to themselves or others. Care must be exercised during placement of the restraints to protect all persons involved. Use at least two persons to apply the restraints.

**WARNING 2:** The restraints are never used to secure the patient to the litter.

**Figure 7.7. Locking Device on Leather Straps**



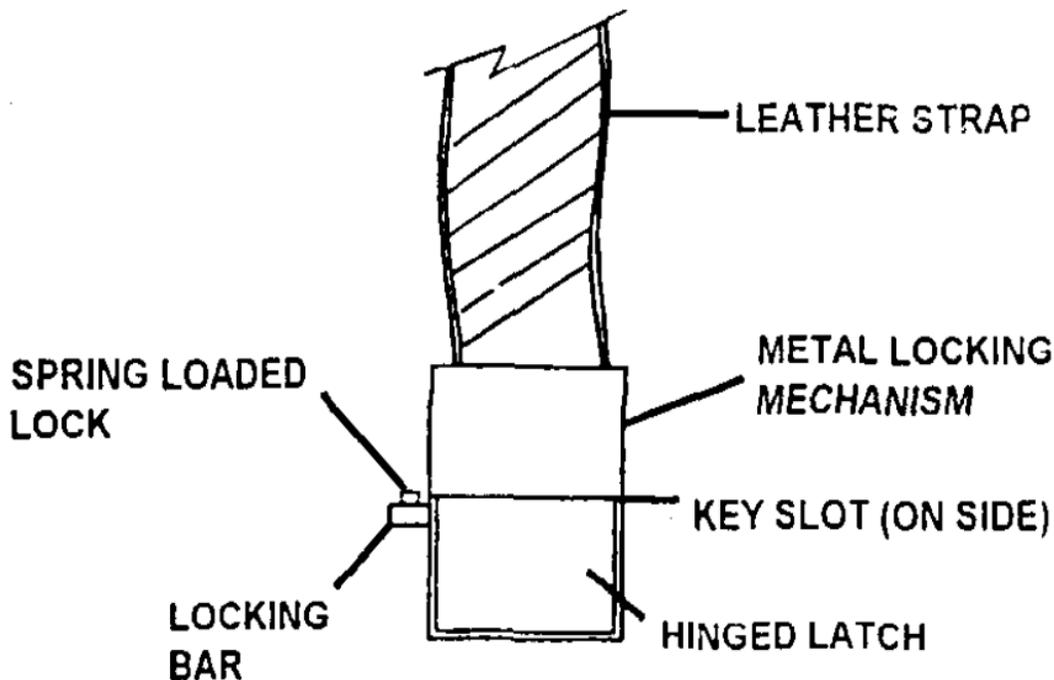
**LOCKING DEVICE ON LEATHER STRAPS**

**NOTE:**

Place locking devise toward the aisle.

7.8.4.1. Adjust the strap so the patient is able to touch his or her face, then lock the strap in place. The locking mechanism (**Figure 7.8.**) is locked by pushing in the spring loaded latch and sliding in the locking bar after the hinged latch has been rotated into the closed position.

**Figure 7.8. Locking Device on Restraint Straps**



7.8.4.2. The ankle restraints are placed in a similar manner with the cuffs placed around the ankles with the metal loop positioned to the inner portion of the leg. The short strap is threaded through both loops and adjusted to allow a reasonable walking step to be taken, then locked.

7.8.4.3. The locking devices are opened by sliding the restraint key into the key slot, on the metal locking device. To release the spring loaded lock, push the locking bar out to the open position, lift the hinged latch, and slide the strap to loosen or tighten it as necessary.

7.8.4.4. Since the cuffs are snug on the wrists and ankles, check circulation to all extremities at least hourly. Check security of the locking devices at least hourly as well, and ensure the cuffs remain snug.

7.8.5. **Summary.** Restraints are used to physically restrain patients who are a threat to themselves and/or others. The restraint set provides for restraint of arms and legs while allowing some movement of limbs to the patient.

### **9.3. BCI 3303 PulseOximeter User's Guide.**

**9.3.1. Purpose.** Continuously monitors arterial hemoglobin oxygen saturation, pulse rate, and pulse strength on neonate through adult patients by non-invasive means.

**9.3.2. Description.** The BCI 3303 Oximeter determines arterial hemoglobin saturation (SpO<sub>2</sub>), pulse rate and pulse strength by measuring wavelengths of red and infrared light passing through body tissue to a photodetector. The oximeter has three operating modes: Clinician Mode, Home-Use Mode, and Sleep Study Mode. Trend data is collected in all modes and may be down loaded to a printer. In the Clinician Mode (standard patient monitoring), SpO<sub>2</sub> and pulse rate is indicated by LED display. Pulse strength is indicated by an eight-segment LED bar graph with adjustable brightness. The SpO<sub>2</sub> and pulse rate LED display features adjustable high and low alarm limits, with adjustable alarm volume (including off). A

“beep” sounds with each pulse beat and has adjustable volume (including off). The pitch of the “pulse-beep” corresponds to increasing or decreasing SpO<sub>2</sub> values. The oximeter's accuracy is  $\pm 2\%$  at 70-100% SpO<sub>2</sub> and  $\pm 3\%$  at 50-69% SpO<sub>2</sub>. It will operate accurately over an ambient temperature range of 32 to 104 F (0 to 40 C).

**Figure 9.3. BCI 3303 PulseOx With Connections**



**9.3.3. Power Source.** 105 VAC to 125 VAC/60Hz and a four (4) cell rechargeable NiMH (Nickel Metal Hydride) battery pack. Battery pack will operate for minimum of 24 hours from a fully charged NiMH battery. Requires 6 hours to charge a fully depleted battery. If portable operation is not necessary, continuous charging is recommended to assure a fully charged battery.

**NOTE:** When BATT flashes, you must immediately charge the monitor's battery. Otherwise, the monitor turns itself off in approximately 30 minutes. Neither continuous charging or complete discharge will degrade battery capacity or battery life. The oximeter may be charged in flight and is fully charged when the charging light turns off. The AC power supply unit/cord will not connect to the C-9 wall outlets or

Electrical Cable Assembly Set (ECAS) due to adapter design. AC power unit/cord will only fit and may only be plugged into the Avionic or Unitron Electrical Frequency Converter for in-flight charging (converter is required on aircraft that do not have 115 VAC/60Hz capability).

**WARNING:** The BCI 3303 Oximeter has been approved for use in the AE environment while operating on internal battery only. Do not connect the AC power supply to the monitor for patient use in the aircraft. Power surges or spikes will cause the monitor to display inaccurate readings.

#### **9.3.4. Components.**

9.3.4.1. Oximeter, Pulse – BCI 3303.

9.3.4.2. Probe, Adult (>45 Kg) - 3044: Probe, Adult (reusable); 3043: Universal “Y” (reusable); 3078: Probe Ear (reusable).

9.3.4.3. Probe, Pediatric (15-45 Kg) – 3044: Probe, Adult (reusable); 3043: Universal “Y” (reusable); 3078: Probe Ear (reusable).

9.3.4.4. Probe, Infant (3-15 Kg) – 3043: Universal “Y” (reusable); 3025: Probe, Wrap, Infant (reusable).

9.3.4.5. Probe, Neonate (<3 Kg) – 3026: Probe, Wrap, Neonate (reusable).

9.3.4.6. 3311: Cable, Oximetry, 5 ft.

9.3.4.7. 8210: Battery Charger (105 to 125 VAC/60 Hz).

9.3.4.8. 3354: Pole Mount (BCI or Universal).

9.3.4.9. 3353: Protective Rubber Boot with Carrying Strap and Mounting Slide.

9.3.4.10. 3359: Analog Output Adapter.

9.3.4.11. Case.

Figure 9.4. Pulse Ox Front Panel Indicators



### 9.3.5. Front Panel Indicators.

9.3.5.1. Probe/Printer Connector. The probe connects here, or an oximeter cable can be connected between the monitor and the probe. The printer is also connected here.

9.3.5.2. SpO2 Numeric display. A number shows the patient's SpO2 value in percent. Dashes (---) mean the monitor is not able to calculate the pulse rate value.

9.3.5.3. Pulse Rate Numeric Display. A number shows the patient's pulse rate value in beats per minute. Dashes (---) mean the monitor is not able to calculate the pulse rate value.

9.3.5.4. Power Supply Connector. The AC power supply connector is located on the lower right side.

9.3.5.5. Pulse Strength Bar Graph. The pulse strength bar graph "sweeps" with the patient's pulse beat. The height of the bar graph tells the strength of the patient's pulse.

9.3.5.6. Probe Light. SENSOR flashes on and off when the probe is not connected to the monitor, the probe is not attached to the patient, or the probe is not properly attached to the patient.

**WARNING:** While SENSOR is flashing, the monitor cannot measure the patient's SpO2 or pulse rate. You must immediately check the patient's condition. After you have checked the patient's condition, you must correct the probe alert.

9.3.5.7. BATT Light. BATT flashes on and off when approximately 30 minutes of battery use remains. The monitor will continue to work until the battery becomes very weak. When the battery becomes very weak the monitor will automatically turn itself off.

**WARNING:** When the BATT flashes, you must immediately charge the monitors battery. Otherwise, the monitor turns itself off about 30 minutes after the BATT begins to flash.

9.3.5.8. POWER Light. The POWER light is green when the power supply is attached.

9.3.5.9. CHARGING Light. The CHARGING light is yellow when the battery is fast charging.

9.3.5.10. Alarm Silenced Light. The alarm silenced light flashes on and off when the alarm and alert tones are silenced for two minutes (press alarm silence). The alarm silenced light remains on when the alarm and alert tones are silenced indefinitely (press and hold alarm silence for a few seconds) until canceled, or until the monitor is turned off.

9.3.5.11. On Key. Pressing on turns on the monitor.

9.3.5.12. Off/Stby Key. Pressing the Off/Stby turns off the monitor.

9.3.5.13. I.D./Clear Key. While the probe is connected to the monitor: Pressing the I.D./Clear increases the patient number by one; the patient number is briefly displayed in the SpO2 digits. Pressing and holding the I.D./Clear for about six seconds clears all the trend data and resets the patient number to one.

9.3.5.13.1. While the probe is not connected to the monitor: Pressing I.D./CLEAR cause the monitor to enter the trend view mode (two bar graph segments flash to indicate the view trend mode). During the view trend mode, the valid measurement for each patient number can be shown by pressing the up/down arrow keys. The display shows Pn (n = patient number) then the number corresponding to that patient number. If, after 20 seconds, no keys are pressed, the monitor exits the trend view mode.

9.3.5.14. Up/Down Arrow Keys. Up/Down arrow keys are used to adjust the following settings: brightness of the display; alarm limits; trend view patient numbers; SpO2 and pulse rate averaging.

9.3.5.15. Alarm Silence Key. Momentarily pressing the alarm silence key silences the alarm tone for two minutes. Pressing and holding the alarm silence key for about three seconds silences the alarm tone indefinitely until it is canceled or the monitor is turned off.

9.3.5.16. Alarm Sel Key. Pressing the ALARM SEL cycles through each of the alarm limits for the setting.

9.3.5.17. Alarm Vol Key. Pressing the ALARM VOL key changes the alarm volume from soft to loud or loud to soft.

9.3.5.18. Pulse Vol Key. Pressing the PULSE VOL key change the pulse “beep” volume.

**NOTE:** The pulse volume is stored after the monitor is turned off.

9.3.5.19. AC Power Supply. AC power supply connection is located on the lower right side of the unit.

9.3.5.20. Probe/Printer Connector. Probe/printer connection is located on the top right side of the unit.

### **9.3.6. Patient Alarms.**

9.3.6.1. High SpO2 Alarm. An audible alarm and the SpO2 display will flash when saturation percentage is at or above settings.

9.3.6.2. Low SpO2 Alarm. An audible alarm and the SpO2 display will flash when saturation percentage is at or below settings.

9.3.6.3. High Pulse Rate. An audible alarm and the pulse display will flash when pulse rate is at or above settings.

9.3.6.4. Low Pulse Rate. An audible alarm and the pulse display will flash when pulse rate is at or below settings.

**NOTE:** Refer to BCI Instruction and Service Manual for additional information and proper operation.

### **9.3.7. Pre-Flight.**

9.3.7.1. Ensure currency of the inspection/calibration decal on unit and that all component parts are complete and in serviceable condition.

**NOTE:** The AC power supply cord will not fit the ECAS pigtails or C-9A wall outlets except in the Special Care Area.

9.3.7.2. Connect the AC power supply to the monitor.

9.3.7.3. Ensure the POWER and CHARGING lights have illuminated.

9.3.7.4. Visually inspect the probe and oximeter cable for cracks, kinks, and fraying.

9.3.7.5. Connect the probe to the oximeter cable then connect the oximeter cable to the monitor.

9.3.7.6. Turn on the monitor.

9.3.7.7. Place probe on finger.

9.3.7.8. Measure the SpO<sub>2</sub>, pulse rate, and pulse strength bar graph.

9.3.7.9. Adjust the brightness of the LED display and change the pulse beep volume.

9.3.7.10. Turn off the alarm and the alert tones for two minutes.

9.3.7.11. Turn on the alarm and alert tones.

9.3.7.12. View the alarm limits.

9.3.7.13. Remove the probe from finger and ensure the PROBE/SENSOR alert illuminates.

9.3.7.14. Check the BATT attention.

9.3.7.15. Turn monitor off.

### **9.3.8. Operating Instructions.**

9.3.8.1. Press ON key and observe cycling of pulse bar graph light, software revision number, patient number and Clinician Mode (SpO<sub>2</sub> and bpm) is displayed.

**NOTE:** Should the oximeter inadvertently be placed in Home-Use or Sleep Study Mode, it may be returned to Clinician Mode as follows: Home-Use Mode-turn monitor off, press and hold the PULSE VOL key, then press the ON key, when H stops flashing and Pn lights steady, release the key. Sleep Study Mode-turn monitor off, press and hold the ALARM SILENCE key, then press the ON key, when SLP stops flashing and Pn lights steady, release the key.

**NOTE:** Assigning patient numbers: the BCI 3303 monitor remembers all the trend data for up to 99 patients for a 24-hour period (advance by pressing I.D./Clear for successive patients). The monitor needs to be manually cleared of previous patient numbers at the beginning of the mission if trend data is to be collected (press and hold I.D. Clear until P1 appears). Otherwise, the monitor may turn on and used as is.

9.3.8.2. Set Patient Alarms (High/Low SpO<sub>2</sub>% & High/Low Pulse Rate) as required.

9.3.8.3. Connect the cable and probe.

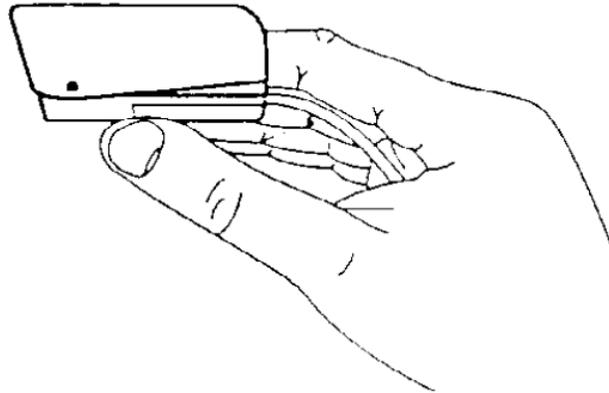
9.3.8.4. Secure appropriate probe to patient. (See [Figure 9.3.](#) for adult and [Figure 9.4.](#) for pediatric).

**WARNING:** Change sensor site and check skin integrity, circulatory status and correct alignment at least every four hours. When attaching probes with Microfoam tape or other approved adhesive tape, do not stretch tape too tightly due to possible circulation impairment, skin breakdown and blisters.

9.3.8.4.1. The finger clip probe (reusable) Model 3044 is designed for spot check monitoring of pediatric and adult patients or continuous monitoring less than 30 minutes where patient movement is not expected and the patient's finger is large enough for the probe to be attached securely.

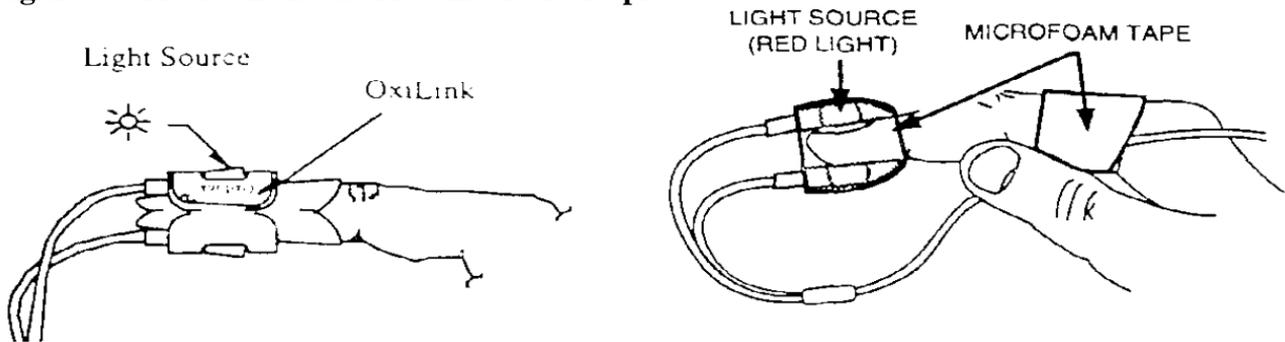
9.3.8.4.2. Insert finger (preferably left or right index finger) completely into the finger probe (See [Figure 9.3.](#)). The thumb is specifically not recommended for use with the finger clip probe.

**Figure 9.5. Probe For Adult or Pediatric Finger.**

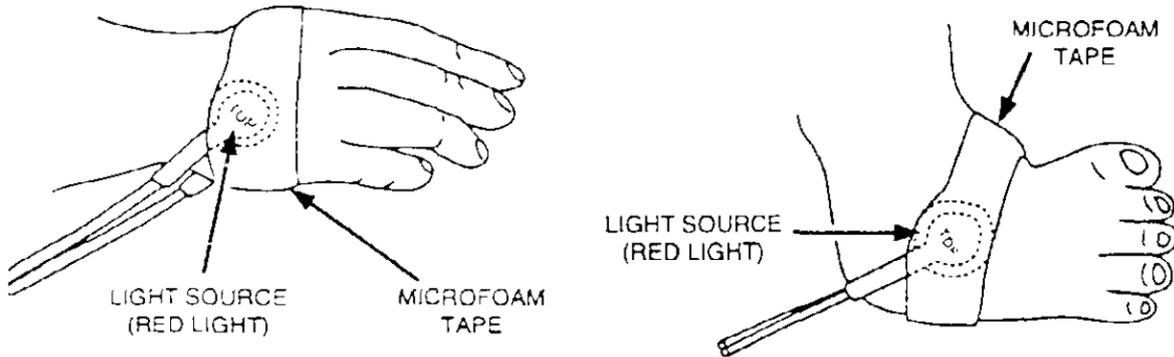


9.3.8.4.3. The Universal Y probe may be positioned on the Adult or Pediatric Finger, Infant Hand, or Infant foot and is designed for continuous monitoring. Attach the probe to the patient with the light source to the fingernail. Line up the light source with the detector, so the source and the detector are in-line. Secure the probe and cable with microfoam tape, being careful not to over-tighten the tape. (See Figure 9.6.).

**Figure 9.6. Adult and Pediatric Universal “Y” probe.**

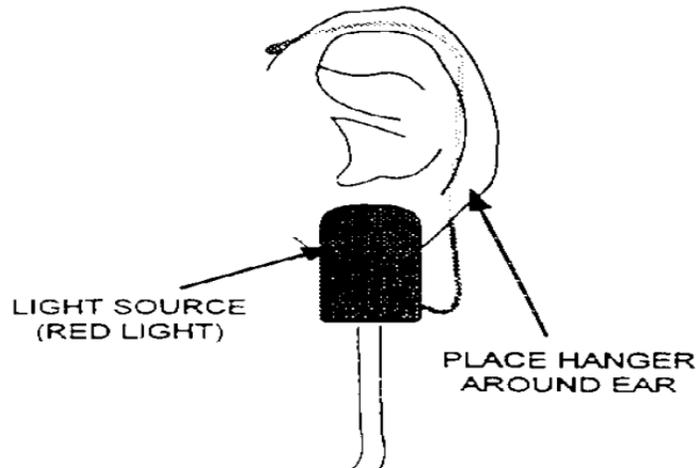


**NOTE:** For the best results, secure the probe cable independently from the probe, preferably around the base of the finger. Make sure that tape securing the cable does not restrict the blood flow.



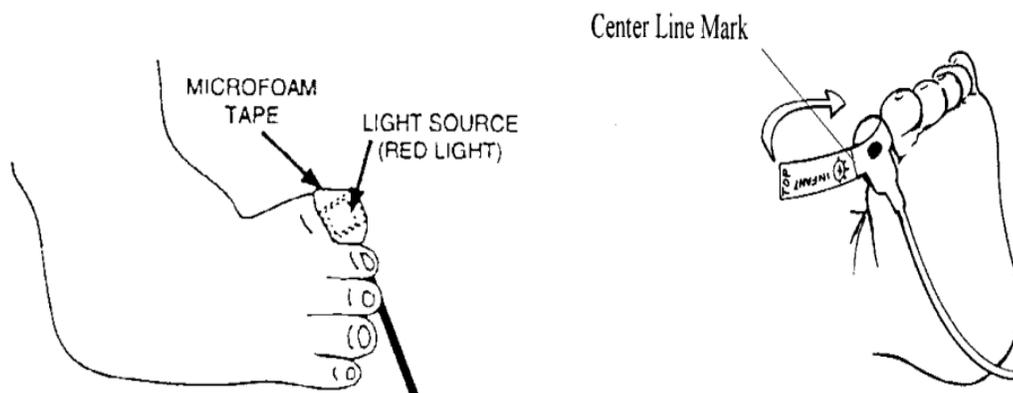
9.3.8.4.4. The ear probe will be attached to a fleshy portion of the earlobe. Make sure the light source is on the outside of the ear, and the hanger is behind the ear. Place hanger around the ear. Rub the earlobe with an alcohol prep for 1-2 minutes before attaching the ear probe. (See [Figure 9.5.](#))

**Figure 9.7. Ear Probe Adult and Pediatric**



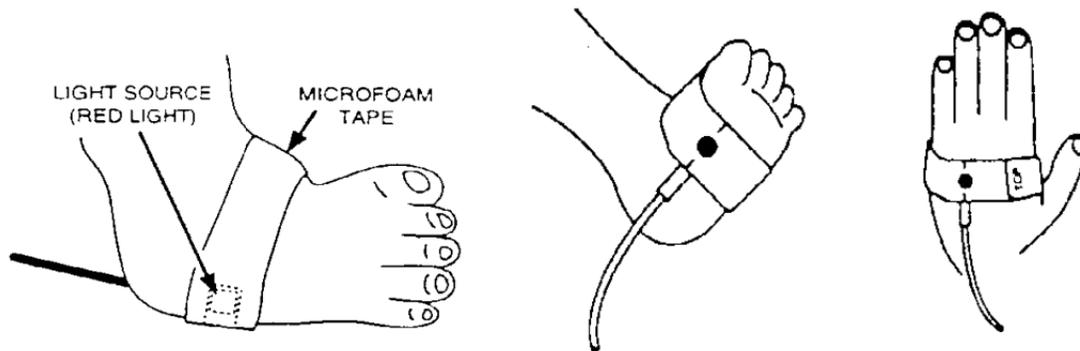
9.3.8.4.5. Attach the infant wrap probe with the light source to the toenail. Attach the probe with the light source on the outside or top of the foot to keep the director away from ambient light. Line up the light source and the detector, so the source and detector are in-line. Secure the probe with microfoam tape, being careful not to over-tighten the tape. (See [Figure 9.6.](#))

**Figure 9.8. Wrap Probe for Infant Toe.**



9.3.8.4.3. Attach the neonatal wrap to patient's foot or hand. The preferred site is the ball of the foot. Alternatively, the heel of the hand can be used. Route the cable towards the heel or wrist. Attach the probe with the light source on the outside or top of the foot or hand to keep the detector away from ambient light. Line-up the light source with the detector, so the source and detector are in-line. Secure the probe with microfoam tape, being careful not to over-tighten the tape. (See [Figure 9.7.](#))

**Figure 9.9. Probe for Neonate Hand and Foot**



**NOTE:** Attach probe using Microfoam tape, or equivalent by wrapping the tape or probe wrap over the probe assembly snugly, but not so tight as to restrict blood flow. For best results, secure cable independently from the probe, preferably around patient's ankle or lower leg. Make sure tape securing the cable does not restrict the blood flow.

9.3.8.5. Securing the Unit.

9.3.8.5.1. BCI Mounting Bracket.

**CAUTION:** The securing bracket may only be attached vertically with the bracket retaining pins down to prevent the monitor from falling out of the bracket. Horizontal or side mounting should not be attempted as the monitor could slide out of the bracket.

9.3.8.5.2. Universal Mounting Bracket.

**9.3.9. Disassembly and Storage.**

9.3.9.1. Remove probe from Patient Interface Cable. Remove Patient Interface Cable from oximeter unit. The oximeter may be cleaned with a mild detergent and a damp cloth.

**CAUTION:** Do not use caustic or abrasive cleaning agents. Do not immerse or pour liquids on the Oximeter. Do not autoclave probes. No adjustments are necessary and opening the oximeter case is not recommended.

9.3.9.2. Clean the reusable probes with an isopropyl alcohol wipe. Allow enough time for the probe to dry thoroughly before reusing. They may also be sterilized as outlined in the BCI Instruction and Service Manual and local procedural guidance.

**10.3. Heimlich Valve.**

**10.3.1. Purpose.** The heimlich valve prevents the flow of air or fluid from the chest drainage unit back into the patient's chest cavity.

**10.3.2. Description.** The heimlich valve consists of a hard, clear plastic tube that connects into the tubing inline between the patient's chest tube and the chest drainage unit. Inside the plastic tube is a flutter valve that allows only one-way flow of air and fluid through the tube. An arrow imprinted onto the side of the tube indicates the direction of the flow. The end of the valve that connects to the tubing from the patient's chest tube is colored blue, while the end that connects to the tubing to the chest drainage unit is clear.

**10.3.3. Pre-flight.** Inspect the heimlich valve and the sterile package for any signs of damage. If any signs of damage are present then, dispose of the entire package. Ensure that two (2) large Kelly clamps with latex tubing over the clamp jaws are available.

**Figure 10.1. Heimlich Valve.****10.3.4. Set-up and Operation.**

**WARNING:** The ends of the heimlich valve and all connections must remain sterile. Always ensure that a closed system is maintained.

10.3.4.1. Generalized instructions for connection of heimlich valve are:

10.3.4.1.1. Using the two kelly clamps accompanying the valve, double clamp the chest catheter close to the patient's chest wall.

10.3.4.1.2. Attach the distal end of the catheter securely to the blue end of the heimlich valve.

10.3.4.1.3. Attach the distal end of the heimlich valve to the tubing connected to an approved closed chest drainage unit that is vented to allow air to escape during drainage.

10.3.4.1.4. Secure all connections with adhesive tape.

**NOTE:** The tubing should be taped firmly to the valve to prevent accidental disconnection. Use adhesive tape only. DO NOT use masking tape. Ensure the arrow on the heimlich valve points away from the patient's chest.

10.3.4.1.5. Remove both clamps from the chest catheter and store them near the patient.

**WARNING:** The clamps should be kept by the patient's side in case emergency clamping of the chest catheter becomes necessary.

10.3.4.2. The passage of fluids through the valve can be observed through the clear plastic of the valve. If the valve should become obstructed, use the sterile technique described in paragraph [10.3.4.1](#) to replace it. When the heimlich valve is installed properly, it is not necessary to clamp the chest catheter while transporting the patient. The heimlich valve will continue to function properly during a rapid decompression, protecting the patients pleural cavity. The heimlich valve is a single use item and should be disposed of immediately following use.

**13.3. Uni-Vent "Eagle" Model 754M Ventilator by Impact.**

13.3.1. **Purpose.** The Uni-Vent 754M Ventilator provides or assists patients (adult, child, or infant) with ventilation when the patient's respiratory efforts are absent or inadequate.

**WARNING:** The Model 754 Ventilator is not recommended for use with neonate patients due to Tidal Volume Control being limited. Adjustment is available in 10ml increments over a range of 0-3000ml. The 0-10 ml setting being the minimum delivered tidal volume the clinician can work with. Additionally, adult breathing circuits are not recommended for use on small children or infants due to their compressibility and dead space. Disposable pediatric and infant breathing circuits are recommended in these cases or alternatively, Impact's Child/Infant Re-useable Patient Valve Kit (820-0754-04) may be used.

13.3.2. **Description.** The Uni-Vent 754M Ventilator is a portable (13 lb.), electronically controlled ventilator, and compressor, air/oxygen mixer. It is controlled by a microprocessor (CPU) which monitors and displays airway pressure, control settings, alarm parameters, gas sources, gas flows, gas blends, and power signals. ACV, SIMV, and CPAP modes are operable with or without PEEP or SIGH. ACV and

SIMV are operable with or without PRESSURE PLATEAU. All modes are PEEP and altitude compensable to minimize your patients work of breathing and an automatic ventilatory backup assures continued mechanical support if the patient becomes apneic. An adjustable pressure limit control limits peak inspiratory pressures and high pressure alarm setpoint. The ventilator does not consume gas for operating power and may be operated without attachment of external gases. It is operable in any position: upright, on its side, or lying flat and has an operating temperature range of (-) 15 to (+) 120 degrees Fahrenheit.

**Figure 13.3. Uni-Vent Model 754M Face Plate**



**13.3.3. Power Sources.** Model 754/754M Universal AC Power Supply and DC to DC Converter. Connects directly to AC outlets and is operable from 90-265 VAC, 50-400Hz (voltage and line frequency sensing is automatic) and draws 1 Ampere. DC operation range is 20-36 VDC (auto-sensing) and draws 5 Amperes. The converter also accepts external DC voltages, ranging from 16 to 30 volts via the secondary input leads provided (no plug attached at shipment). Attachment to a mating connector is required and polarity must be observed. The black input lead is positive; the white is negative. Do not attach the braided shield. In addition, a 12 VDC Power Cable is provided for attachment to an automotive power source, negative ground. Operating time on internal battery is 3-hours (maximum) using internal air compressor and 12-hours using external gas source. Recharging time ranges from 14-16 hours, depending on initial state of discharge.

**NOTE:** Two external fuse-holders are located on the top, left side of the Uni-Vent and each contains a 2AG, 10A fuse. The fuse closest to the battery compartment door affects external power operation and

battery operation and the other fuse affects battery operation and charging. “EXT PWR” and battery icon “ON CHG” will not display if their respective fuse(s) is/are blown or missing. Return to MERC for servicing.

#### 13.3.4. Components.

13.3.4.1. Uni-Vent 754M Ventilator, Compressor, Air/Oxygen Mixer.

13.3.4.2. Ventilator Circuit: Universal Portable Volume Ventilator Circuit (003764).

13.3.4.3. Compressed Air Hose (yellow), female, dual-end adapter.

13.3.4.4. Oxygen Hose (green), female, dual-end adapter.

13.3.4.5. Humi-Vent™ “artificial nose”, 250 – 1500cc.

13.3.4.6. DC power cord: 11-15 VDC.

13.3.4.7. AC power cord adapter: 90-265 VAC/47-400 Hz.

13.3.4.8. Securing straps (2).

13.3.4.9. Nylon Carrying Case.

#### 13.3.5. Connections.

**Figure 13.4. Uni-Vent Model 754M top Connections**



13.3.5.1. Oxygen Inlet: Nominal 50 PSI input, oxygen, male-thread. Connects to output of oxygen cylinder pressure reducer, PTLOX, or on-board aircraft generated source. Use the green high-pressure hose (6 ft. long) for interconnection.

13.3.5.2. Air Inlet: Nominal 50 PSE input, air, male-thread. Connects to output of air cylinder pressure reducer, or electric compressor (oil-less and filtered). Use the 6 ft. yellow high-pressure hose for interconnection.

**CAUTION:** To protect the ventilator from dirt and condensate, use an Air Inlet Filter/Moisture Trap whenever external air is provided by an electric air compressor.

13.3.5.3. Gas Outlet: Low pressure, 22mm male tapered connection. Connects to disposable ventilator circuit.

13.3.5.4. Transducer: Low pressure, fits 3/16 in. tubing. Connects ventilator pressure transducer to disposable ventilator circuit transducer hose (green connector).

13.3.5.5. Exhalation Valve: Low pressure, fits 1/4 in. tubing. Connects ventilator exhalation valve control port to disposable ventilator circuit exhalation valve (clear aluminum connector).

13.3.5.6. External Power Jack: Connects ventilator to Universal AC Power Supply or external 11-15 volt power source via 12 VDC Power Cable.

**NOTE:** The External Power Jack includes pins containing signals for the Communications Port which provides remote interface and monitoring of the ventilator (see operation manual).

### 13.3.6. **Interconnections.**

13.3.6.1. For use with external oxygen, connect high-pressure green oxygen hose between OXYGEN inlet port and a 50-PSI external oxygen source. Use only medical-grade oxygen.

13.3.6.2. For use with external air, connect a high-pressure yellow air hose between AIR inlet port and a 50-PSI external air source. Use only medical-grade compressed air.

13.3.6.3. Connect a disposable ventilator circuit to its respective gas outlet, transducer, and exhalation valve connectors on the Uni-Vent Connector Panel. Observe directions included with each disposable ventilator circuit.

13.3.6.4. Connect Universal AC Power Supply, or 12 VDC Power Cable, between EXTERNAL POWER JACK and external power source.

**CAUTION:** DO NOT block the Internal Compressor Air Filter port (upper-right side) and do not connect the ventilator circuit hose to this outlet.

**NOTE:** The Nylon Carrying Case does not interfere with air intake due to peripheral holes provided and therefore does not create a blockage.

### 13.3.7. **Controls.**

13.3.7.1. EXTERNAL AIR OFF/ON Pushbutton Switch: Permits the user to manually select external compressed air as your primary air source. If Air Pressure is greater than 40 PSI, operation will begin. If a lower pressure or no pressure is sensed, the LCD will display "OFF" (default value) and the internal compressor will operate.

13.3.7.2. SIGH OFF/ON Pushbutton Switch: Permits the Uni-Vent to operate with or without SIGH. When activated, the first ventilator generated breath will be a SIGH. Additional SIGH ventilation's are delivered once every 100 ventilation's or every 7 minutes, whichever comes first. Each SIGH does not exceed 3 seconds. SIGH becomes disabled in the CPAP mode, or when PRESSURE PLATEAU is "ON".

13.3.7.3. PEEP OFF/ON-SET Pushbutton Switch: Activates Uni-Vent's internal PEEP control. Pressing the pushbutton allows a PEEP value to be manually entered.

13.3.7.4. PRESSURE PLATEAU OFF/ON Pushbutton Switch: Permits ACV or SIMV operation with a pressure plateau. Pressing this pushbutton activates a PLATEAU value that is referenced 10 cmH<sub>2</sub>O below the HIGH PRESSURE

13.3.7.5. HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control: Used to select HIGH PRESSURE ALARM and PEAK INSPIRATORY PRESSURE RELIEF setpoint. It has an absolute range from 15 to 100 cmH<sub>2</sub>O.

13.3.7.6. LOW PRESSURE ALARM Control: Used to select the LOW PRESSURE ALARM setpoint. It has an absolute range from 0-50 cmH<sub>2</sub>O.

13.3.7.7. VENTILATION RATE Control: Determines the mechanical ventilation rate for ACV and SIMV operation. It is not operable in CPAP. Its range is from 1 to 150 breaths per minute (BPM). During APNEA, the RATE Control setting and its LCD display will change to 12 BPM.

3.3.7.8. **INSPIRATION TIME/I:E RATIO Control:** Sets the inspiratory duration of all ventilator-delivered breaths. It is adjustable in 0.1-second increments from 0.1 to 3.0 seconds maximum. Its usable range is limited by the VENTILATION RATE Control setting. Inverse I:E ratio (inspiratory is greater than expiratory time) is not permitted. INVERSE I:E will blink in this condition. Default I:E ratio of 1:2 is activated when this control is turned to its fully counterclockwise position.

13.3.7.9. **TIDAL VOLUME Control:** Allows gas to be delivered over a wide range. Maximum flow is equivalent to approximately 1000ml/sec (60 LPM). It may be obtained from any of the following gas sources. External Air (cylinder), External Compressed Air (compressor), Internal Air Compressor, External Oxygen and External Air Cylinder or Compressor, or Internal Air Compressor, or External Oxygen.

13.3.7.10. **AIR/OXYGEN MIXER Control:** Allows air, oxygen, or mixtures of air and oxygen to be delivered within a range of 21-100% FIO<sub>2</sub>. A 21 % FIO<sub>2</sub> is obtained from the following sources: External Air (cylinder), External Compressed Air (compressor), or Internal Air Compressor. FIO<sub>2</sub>'s up to 100% may be obtained by adding 100% External Oxygen to these sources.

13.3.7.11. **ALARM MUTE/CANCEL Pushbutton Switch:** Either mutes an audible alarm signal, or cancels a particular alarm function. OPERATING ALARM (30-Seconds), BATTERY Alarms (5-Minutes), EXTERNAL POWER Alarm (until internal battery depletes, then, a BATTERY LOW Alarm also activates for 5-Minutes).

13.3.7.11.1. **Muting:** This mutes the audible component of an Operating Alarm condition. Alarm muting is reset when the current alarm condition no longer applies or the mute-period is reached (alarm will resound). A new alarm condition overrides an already "muted" alarm.

13.3.7.11.2. **Canceling:** Cancels the audible component of an Advisory Alarm condition. During APNEA alarm condition, it will cancel both the audible and visual APNEA alarms and the controlled ventilations that are automatically invoked at the onset of apnea. Cancellation of an APNEA alarm allows Uni-Vent to resume operation at the preset ACV, SIMV or CPAP settings.

13.3.7.12. **MANUAL BREATH/TRIGGER Pushbutton Switch:** Pressing this in normal operation delivers one MANUAL BREATH. Each time a MANUAL BREATH is triggered, an audible beep is heard. MANUAL TRIGGER functions as a backup when the primary system fails. While depressed, the MANUAL TRIGGER delivers a continuous gas flow at 30 liters per minute (LPM), with peak inspiratory pressure not exceeding 40 cmH<sub>2</sub>O.

13.3.7.13. **MODE Selector Switch (ON-A/C-SIMV-CPAP-CAL):** Causes the microprocessor to perform a "SELF-CHECK" before initiating operating in the selected mode.

### 13.3.8. **Visual Status Indicators.**

13.3.8.1. **MODE Indicator,** displays respectively: ASSIST, SIMV, CPAP, or CAL.

13.3.8.2. **V<sub>min</sub> Indicator:** Displays Minute Volume (in liters) in the ACV mode, blanks during SIMV, CPAP, and CAL or when a PLATEAU VOLUME or SYSTEM FAILURE Alarm goes off.

13.3.8.3. **INSPIRATION/EXHALATION Indicator:** Displayed in phase of mechanical and/or spontaneous breaths in each operating mode, blanks during CAL.

13.3.8.4. **POWER INFORMATION CENTER:** Occupies a two-line area in the LCD's lower left section. It is displayed when the MODE SELECTOR SWITCH is in any position except OFF and the CPU validates a usable source of power during the power check portion of SELF-CHECK and displays various messages.

13.3.8.4.1. **Line 1:** EXT PWR ON; denotes an external power source, EXT PWR LOW denotes a low external power source and is blank with no power connected.

13.3.8.4.2. **Line 2:** Battery icon OK; denotes battery power source > 30 min. remaining, Battery icon LOW denotes battery power source < 30 min. remaining and is blank when no battery is sensed.

**NOTE:** The POWER INFORMATION CENTER is capable of detecting open/blown or missing fuses during or prior to external power operation and during or prior to internal battery operation. If the AC or DC power source is interrupted by one of these conditions, the alternative power source will power the unit if available (i.e. battery charged or AC plug connected to power).

13.3.8.5. PEAK AIRWAY PRESSURE Indicator: Displays the PEAK AIRWAY PRESSURE of the previous breath.

13.3.8.6. MEAN AIRWAY PRESSURE Indicator: Displays the MEAN AIRWAY PRESSURE.

13.3.8.7. DIGITAL BAR GRAPH Indicator: Provides continuous display of airway pressure. Its absolute range is -10 to +100 cm H<sub>2</sub>O.

13.3.8.8. HIGH and LOW AIRWAY PRESSURE ALARM Setpoint Indicators: Appear as small horizontal lines to the right of the DIGITAL BAR GRAPH. Displays are found above their respective controls and reposition whenever an alarm control is adjusted.

13.3.8.9. P<sub>aw</sub> Indicator: Represents a continuous and updating display of airway pressure.

13.3.8.10. CHARGE Indicator: Green CHARGE Indicator LED illuminates whenever sufficient battery recharging current is flowing.

### 13.3.9. Alarm Indicators.

#### 13.3.9.1. Operating Alarms:

13.3.9.1.1. BATTERY LOW/FAIL Alarm: Indicates when a low battery condition is sensed.

13.3.9.1.2. EXTERNAL POWER LOW Alarm: Indicates when external power is less than 10.9 VDC.

13.3.9.1.3. LOW PRESSURE Alarm: Indicates when PIP fails to exceed the LOW PRESSURE ALARM setpoint for two consecutive breath's and causes the LCD setpoint indicator to blink.

13.3.9.1.4. DISCONNECT ALARM: Indicates when a disconnect is sensed in the patient circuit.

13.3.9.1.5. HIGH PRESSURE ALARM: Indicates when PIP exceeds the HIGH PRESSURE ALARM setpoint for four consecutive breaths, or 2-seconds continuously, and causes the LCD setpoint indicator to blink.

#### 13.3.9.1.6. APNEA ALARM:

13.3.9.1.6.1. ACV AND SIMV: Indicates when approximately 19-seconds have elapsed and no pressure deflections have been sensed.

13.3.9.1.6.2. CPAP: Indicates when no spontaneous breathing is detected for 10-seconds.

13.3.9.1.7. HIGH PEEP Alarm: Indicates when the inspiratory cycle begins before end expiratory pressure plateaus.

13.3.9.1.8. O<sub>2</sub> LOW/FAIL Alarm: Indicates when low pressure is sensed from an external oxygen supply.

13.3.9.1.9. EXT AIR LOW/FAIL Alarm: Indicates when low pressure is sensed from an external source of compressed air.

13.3.9.1.10. FIO<sub>2</sub> Alarm: Indicates when the oxygen component or the air component of the AIR/OXY-GEN MIXER is unable to meet its proportion of the gas mixture.

13.3.9.1.11. PRESSRE ALARM SETTINGS Alarm: Indicates when the HIGH PRESSURE ALARM and LOW PRESSURE ALARM setpoints are reversed.

13.3.9.1.12. V<sub>T</sub> Alarm: Indicates when delivered tidal volume does not equal set tidal volume.

13.3.9.1.13. COMP ALARM: Indicates when the internal compressor output does not produce its intended contribution to tidal volume.

#### 13.3.9.2. Non-operating Alarms:

13.3.9.2.1. INVERSE I:E Alarm: Indicates when inspiratory time becomes longer than expiratory time.

13.3.9.2.2. TRANSDUCER CALIBRATION ABORT Alarm: Indicates when the TRANSDUCER CALIBRATION process is stopped prematurely.

13.3.9.2.3. **SYSTEM FAILURE Alarm LED:** Illuminates when CPU is forced to shutdown operation or a CPU failure has occurred. This alarm is usually related to a hardware problem and will cause the LCD to blank.

13.3.9.2.4. **VENTILATOR FAIL ALARM:** Indicates when any one of seven ventilator failure causing conditions occurs.

13.3.9.3. Advisory Alarms:

13.3.9.3.1. **INSPIRATORY TIME TRUNCATED TO 3-SEC Alarm:** Indicates when control settings would cause inspiration time to exceed 3-seconds.

13.3.9.3.2. **PLATEAU VOLUME Alarm:** Indicates when delivered **PRESSURE PLATEAU** tidal volume is less than set tidal volume by more than 5%.

13.3.9.3.3. **V<sub>T</sub> SETTINGS Alarm:** Indicates whenever the sum of the flows of the selected gases would exceed a flow rate of 60 liters per minute (LPM).

13.3.9.3.4. **PREVENTATIVE MAINTENANCE Alarm:** Indicates after 2000 hours of cumulative use, or 12 months, whichever comes first.

13.3.9.3.5. **EXTENDED NON-USE/STORAGE Alarm:** Indicates at power-up after 6 months of continuous non-use/storage has occurred.

13.3.9.3.6. **EXTERNAL POWER FAILURE Alarm:** Indicates whenever external power ails, or is disconnected during external power operation.

13.3.9.3.7. **TOTAL FLOW BACKUP Alarm:** Indicates when the backup flow sensor detects the sum of the flows (O<sub>2</sub>, Air, and internal compressor) exceeding set flows by +/- 50% for 5 consecutive breaths.

13.3.10. **Preflight.**

13.3.10.1. Ensure currency of the inspection/calibration decal on unit and that all component parts are complete and in serviceable condition (i.e. cleanliness, cracks, dints, missing parts or anything that could lead to a system failure).

13.3.10.2. Examine high- pressure hoses for cracks, wear, discoloration, damaged threads and/or connectors.

13.3.10.3. Examine the Compression Inlet for damage. Ensure the filter is in place on the top right side of the Uni-Vent and in good condition.

**NOTE:** Filter may be removed with tweezers or similar tool and examined for dirt, lint, or general wear.

**CAUTION:** Do not block the inlet or attempt to operate the internal compressor without filter in place. Do not attempt to clean this filter, replace if necessary.

13.3.10.4. Visually observe the **GAS OUT** to Patient Outlet. Ensure the Antiasphyxia Valve is seated and not missing in order to prevent a pressure loss and resulting ventilator failure.

**NOTE:** If the **GAS OUT** to Patient Outlet is blocked, the pressure of the next mechanical ventilation may displace the Antiasphyxia Valve resulting in a malfunction (i.e. loss of pressure). The valve can be quickly reseated by pushing its "flapper" inward using the rounded tip of a retracted pen or small hemostat.

13.3.10.5. Turn Uni-Vent on.

13.3.10.6. Verify successful completion of **SELF-CHECK**.

**NOTE:** Uni-Vent undergoes a self-checking process every time its **MODE Selector Switch** is turned from "OFF" to **ACV**, **SIMV**, or **CPAP**; or from **CAL** to **ACV**, **SIMV**, or **CPAP**. Operation begins immediately following successful **SELF-CHECK**.

13.3.10.7. If Uni-Vent fails **SELF-CHECK**, a **VENTILATOR FAIL Alarm** will occur. Return the **MODE Selector Switch** to its **OFF** position and then repeat this procedure. If **SELF-CHECK** fails again, **DO NOT ATTEMPT PATIENT USE**.

13.3.10.8. Confirm **AUTOMATIC TRANSDUCER CALIBRATION:** The Uni-Vents' pressure transducer automatically compensates to altitude pressure changes up to 25,000 ft. The **TRANSDUCER CALIBRA-**

TION process calibrates Uni-Vent's internal pressure transducer to atmospheric pressure. This calibration process is performed automatically, with initiation of self-check, and repeats every 5 min. thereafter.

**WARNING:** SELF-CHECK will automatically alert personnel if the pressure transducer calibration "zero" baseline exceeds +/- 1 cm H<sub>2</sub>O from its last calibration. A TRANSDUCER CALIBRATION Alarm will be activated during the SELF-CHECK and will be visually displayed on the LCD. If only the pressure transducer calibration portion of SELF-CHECK fails, DO NOT ATTEMPT PATIENT USE.

**WARNING:** SELF-CHECK and TRANSDUCER CALIBRATION must be performed with the disposable ventilator circuit disconnected from the patient. This insures that the TRANSDUCER connection is open to ambient atmosphere. Ignoring this requirement would allow the procedure to sense any residual airway pressure in the patient circuit (a false reading). The residual pressure becomes the new calibration reference, which will increase your patient's work-of-breathing by the residual amount.

**NOTE:** A TRANSDUCER CALIBRATION ABORT Alarm will occur if the MODE Selector Switch is turned to an operating mode position before CAL is complete. The CAL procedure must be restarted by turning the MODE Selector Switch to any position other than CAL, and then returning it to CAL, and repeating the process described in [13.3.10.8](#).

13.3.10.9. Verify operating power selections: A/C, SIMV, or CPAP.

13.3.10.10. Perform MANUAL CALIBRATION: Set MODE Selector Switch to CAL. The AMC will display: "Calibration...Please Wait"; then MODE=CAL. Calibration will take approximately 3 seconds. When finished, the AMC display will change to: MODE=CAL OK.

13.3.10.11. When using external power source (from Universal AC Power Supply, or 12 VDC Power Cable) insure that the Power Information Center (PIC) Display verifies presence of external power: "EXT PWR ON" (PIC Line 1); charge indicator illuminates: "ON CHARGE" (PIC Line 2); and fuses are not blown or missing.

**NOTE:** A fully charged battery will cause CHARGE LED to turn off and battery icon "OK" (PIC Line 2) appears.

13.3.10.12. Check for positive indexing and operation of all switches and controls.

13.3.10.13. Disconnect external power source and verify internal battery operation.

13.3.10.14. Employ the system.

### 13.3.11. General Operating Instructions.

13.3.11.1. Only the five primary controls, common to most applications, are marked. They are numbered in order of use, in a 5-step sequence on the front panel.

13.3.11.1.1. #1: Select operating mode; ACV, SIMV, OR CPAP.

13.3.11.1.2. #2: Set INSPIRATION TIME.

13.3.11.1.3. #3: Set VENTILATION RATE.

**NOTE:** If your protocol calls for use only at the 1:2 RATIO preset, Step #2 can be bypassed and the INSPIRATION TIME-I:E RATIO is turned to the full counter clockwise position.

13.3.11.1.4. #4: Set TIDAL VOLUME.

13.3.11.1.5. #5: Set the AIR/OXYGEN MIXER for an FIO<sub>2</sub> between 21 and 100% O<sub>2</sub>.

**NOTE:** If your protocol involves use without external oxygen, or with 100% O<sub>2</sub>, the AIR/OXYGEN MIXER control remains either fully counterclockwise or fully clockwise and Step #5 can be bypassed.

### 13.3.12. Condensed Operating Instructions.

13.3.12.1. The following list is on the back of the Uni-vent.

13.3.12.2. Insure that all hoses and connections are secure.

13.3.12.3. Verify battery charge and/or presence of external power.

13.3.12.4. Allow SELF-CHECK process to complete.

13.3.12.5. Perform TRANSDUCER CALIBRATION if necessary.

13.3.12.6. Mute DISCONNECT Alarm during setup procedures as required.

13.3.12.7. Set RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, and AIR/OXYGEN MIXER Control settings.

13.3.12.8. Set SIGH, PEEP, PRESSURE PLATEAU, LOW and HIGHPRESSURE ALARM Switches/ Controls as required.

13.3.12.9. Connect Disposable Ventilator Circuit to patient.

13.3.12.10. Resolve all active Operating Alarms; acknowledge all Advisory Alarms.

**WARNING:** DO NOT leave patient unattended until desired operation is verified.

### 13.3.13. Expanded Operating Instructions.

**WARNING:** Functions that are dependent upon accurate pressure readings should only be used in conjunction with a protected airway (i.e. adequate seal). This will prevent “leaks” from distorting pressure signals. DO NOT use pressure dependent functions with an unprotected airway. This applies primarily to use with uncuffed endotracheal tubes, uncuffed tracheostomy tubes, and resuscitation masks where the face-to-mask seal is frequently compromised.

13.3.13.1. ASSIST-CONTROL VENTILATION (ACV): Configured to deliver a minimum ventilatory rate, preset inspiratory time and preset tidal volume. Patient-initiated breaths are assisted and controlled ventilations are delivered when patient’s effort falls below the ventilator’s minimum settings.

13.3.13.1.1. Turn MODE Selector Switch to A/C. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required.

13.3.13.1.2. Adjust VENTILATION RATE, INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER LOW, and HIGH AIRWAY PRESSURE ALARM Control Settings as required. If LOW and HIGH AIRWAY PRESSURE ALARM’s are not used, set their respective controls to 0 to 100.

13.3.13.1.3. Attach disposable ventilator circuit to patient’s endotracheal or tracheostomy tube. Spontaneous breathing should cause the ventilator to trigger an assisted breath and cancel the DISCONNECT Alarm. A ventilator-generated controlled breath will also cause the DISCONNECT Alarm to cancel

13.3.13.1.4. If PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD.

13.3.13.1.5. Press SIGH Pushbutton Switch if ACV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7 minutes, whichever occurs first. Each SIGH ventilation equals 150% of the INSPIRATION TIME setting, which increases delivered volume by 50%. As a safety precaution, Uni-Vent does not allow the inspiratory portion of a SIGH breath to exceed 3 seconds.

13.3.13.1.6. Press PLATEAU Pushbutton Switch if ACV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiratory cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H<sub>2</sub>O below the HIGH PRESSURE ALARM/ PEAK INSPIRATORY PRESSURE RELIEF control setting.

13.3.13.2. SYNCHRONIZED INTERMITTENT MANDATORY VENTILATION (SIMV): Permits patients to breathe spontaneously while periodically receiving ventilator-generated assisted breaths.

13.3.13.2.1. Turn MODE Selector Switch to SIMV. Allow SELF-CHECK tests to complete. Perform TRANSDUCER CALIBRATION if required.

13.3.13.2.2. Adjust the VENTILATION RATE (SIMV RATE), INSPIRATION TIME/I:E RATIO, TIDAL VOLUME, AIR/OXYGEN MIXER, LOW and HIGH AIRWAY PRESSURE Alarms as required (if pressure controls are not used, set their respective controls to 0 and 100).

13.3.13.2.3. Attach disposable ventilator circuit to patient’s endotracheal or tracheostomy tube if PEEP is required, repeatedly press PEEP Pushbutton Switch until desired setting appears in LCD.

13.3.13.2.4. Press SIGH Pushbutton Switch if SIMV operation with SIGH is required. SIGH ventilations are delivered once every 100 ventilations or 7 minutes, whichever comes first. Each SIGH ventilation equals 150% of the INSPIRATION TIME setting, which increases delivered volume by 50%. As a safety precaution,

Uni-Vent™ does not allow a SIGH breath to exceed 3 seconds.

13.3.13.2.5. Press PLATEAU Pushbutton Switch if SIMV operation with PRESSURE PLATEAU is required. SIGH is automatically disabled (OFF) when PLATEAU is selected. PRESSURE PLATEAU limits peak airway pressure to the PLATEAU level for the duration of an inspiration cycle. The PRESSURE PLATEAU value is automatically referenced 10 cm H<sub>2</sub>O below the HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control setting.

13.3.13.3. CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP): Similar to SIMV with PEEP, except the mandatory rate is “zero”. There are no assisted ventilations and the patient breathes spontaneously with PEEP. PRESSURE PLATEAU and SIGH are disabled.

13.3.13.4. POSITIVE END EXPIRATORY PRESSURE (PEEP): Provides a means of converting the transducer calibration pressure reference from atmospheric pressure to atmospheric pressure + PEEP pressure. PEEP may be used during ACV, SIMV or CPAP operation.

**WARNING:** A separate PEEP valve is not required and must not be added to the closed patient circuit.

13.3.13.4.1. Manually enter a PEEP Value using the PEEP OFF/ON-SET pushbutton switch. Each time the switch is pressed, the value of PEEP will increase by 1 cm H<sub>2</sub>O. The maximum PEEP value is 20 cm H<sub>2</sub>O.

13.3.13.5. PRESSURE PLATEAU: Sets a plateau value that when reached, causes gas flow to be cycled ON and OFF to maintain the plateau until the inspiratory cycle is completed. Only operable in the ACV and SIMV operating modes.

13.3.13.5.1. Press PRESSURE PLATEAU OFF/ON Pushbutton Switch and the PLATEAU Value is automatically referenced 10cm H<sub>2</sub>O below HIGH PRESSURE ALARM/PEAK INSPIRATORY PRESSURE RELIEF Control Point.

**NOTE:** If pressure rises above set Control Point, a valve vents the excess pressure; and if a leak is detected, additional gas flow automatically maintains the PLATEAU.

13.3.13.6. BACKUP VENTILATOR: Provides a limited degree of operation should a CPU Failure occur. A SYSTEM FAILURE Alarm will indicate an unsafe operating condition in the primary ventilator and a separate backup ventilator circuit begins operation with the following operating characteristics:

13.3.13.6.1. Rate: 12 breaths per minute.

13.3.13.6.2. I:E Ratio: 1:2.

13.3.13.6.3. Flow Rate: 30 liters per minute for duration of Inspiratory Time or until Peak Inspiratory Pressure threshold is reached.

13.3.13.6.4. Peak Inspiratory Pressure Relief: 40 cm H<sub>2</sub>O.

13.3.13.6.5. Gas Source Prioritization: External Air, if available, or Internal Compressor, if operable; or External Oxygen, if available.

13.3.13.6.6. Audible System Failure Alarm Mute/Cancel: Pressing ALARM MUTE/CANCEL pushbutton switch cancels audible alarm.

13.3.13.6.7. Manual Trigger Override: Yes, followed by a 6-second reset period before automatic ventilation resumes.

### 13.3.14. **Disassembly and Storage.**

13.3.14.1. Disconnect accessories and discard disposable items.

13.3.14.2. Clean Uni-Vent and its accessories.

**CAUTION:** Never allow grease or oil to enter the system or coat its components.

13.3.14.2.1. Housing and pressure-hose connections may be cleaned with a damp, soapy cloth and thoroughly dried with a lint-free cloth.

**CAUTION:** Do not clean with abrasives or chlorinated hydrocarbon cleansers.

13.3.14.2.2. Inspect Uni-Vent and accessories for wear and damage; refer to pre-flight as necessary.

13.3.14.2.3. Store the Uni-Vent per unit SOP.

**Attachment 4****IC2001-01 TO AFI 41-309, AEROMEDICAL EVACUATION EQUIPMENT STANDARDS****5 OCTOBER 2001*****SUMMARY OF REVISIONS***

The Propaq Encore 206EL, MiniOX 3000 Oxygen Monitor and Century Car Seat are new items in the inventory. Review the added equipment items in their entirety prior to operational use. Follow preflight guidance before use in-flight.

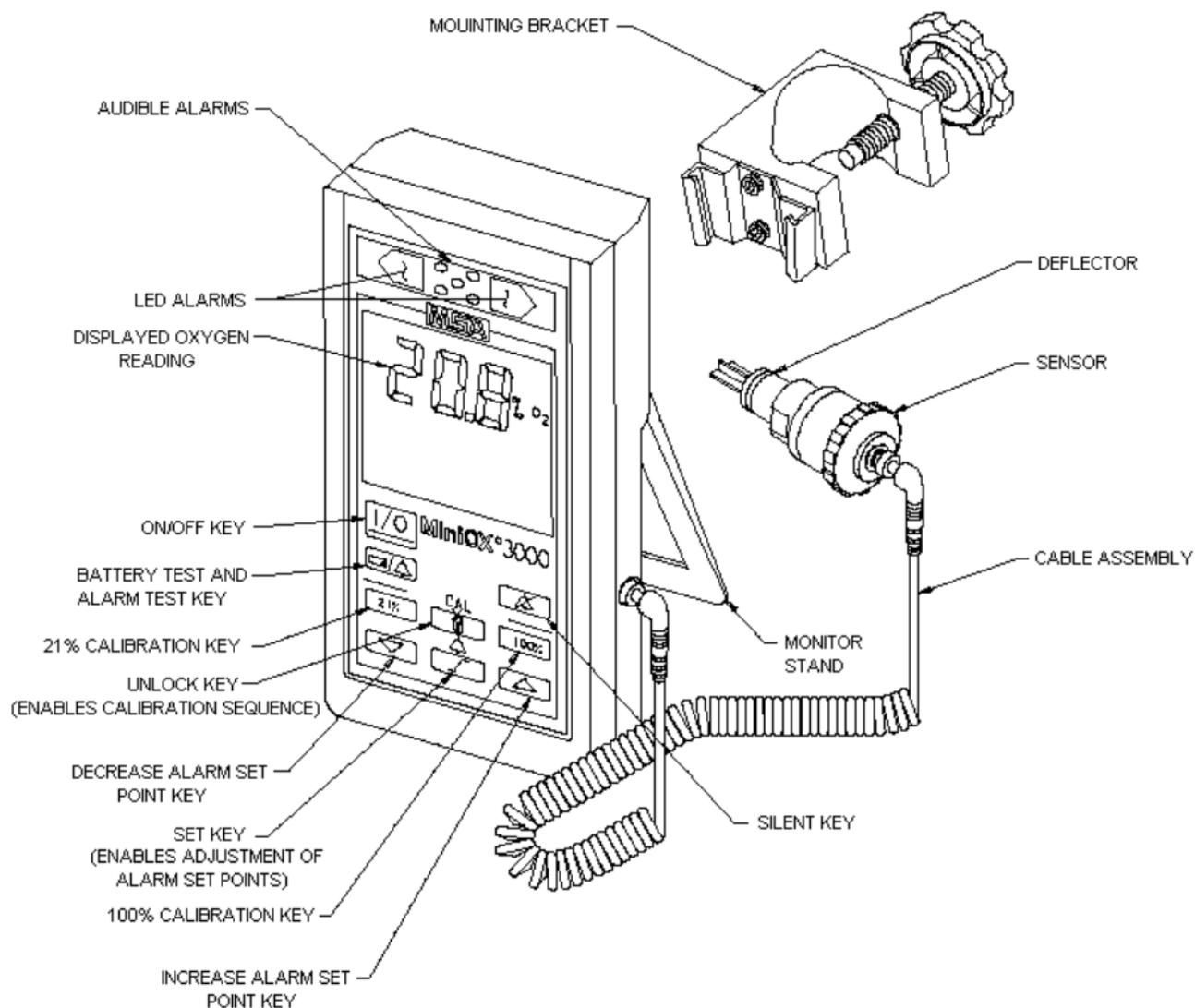
**3.7. Oxygen Analyzer - MiniOX 3000 Oxygen Monitor.**

3.7.1. Purpose. The MiniOX 3000 Oxygen Monitor provides continuous, direct monitoring of oxygen mixtures in a variety of applications, including: Respiratory therapy (e.g., respirators, ventilators, pediatric incubators), anesthesiology, and oxygen therapy (oxygen tents).

**3.7.2. Description.**

3.7.2.1. Battery-operated and microprocessor-controlled, the MiniOX 3000 Oxygen Monitor measures oxygen concentrations in the 0% to 100% range. The monitor's performance features ensure reliable and accurate oxygen measurement. These features include: calibration, high and low oxygen concentration alarms, low and depleted battery alarms, oxygen sensor indicator, automatic error detection, battery test, oxygen alarm test.

Figure 3.5. MiniOX 3000 and Accessories – Front View



3.7.2.2. The MiniOX 3000 consists of:

3.7.2.2.1. MiniOX 3000 monitor.

3.7.2.2.2. Oxygen Sensor and deflector.

3.7.2.2.3. 10-foot coiled cable.

3.7.2.2.4. Tee adapter.

3.7.2.2.5. Sensor retaining strap.

3.7.2.2.6. 9-volt alkaline battery.

3.7.2.2.7. Carrying case.

3.7.2.2.8. MiniOX 3000 Operation Manual.

3.7.2.3. The calibration function allows calibration of the device against room air (Defined as oxygen concentration of 20.8%) or 100% O<sub>2</sub>.

3.7.2.4. Audible and visual alarms alert the operator when monitor calibration is required. High and low oxygen concentration alarms may be set in the ranges of: 15% to 100% (high alarm) and 16% to 99% (low alarm) or the default high/low settings may be used (50% and 18%, respectively.)

3.7.2.5. The MiniOX 3000 Oxygen Monitor has audible and visual alarms that activate when oxygen concentrations exceed preset low or high alarm settings. Default settings are 18% and 50% respectively; however, the operator may select alarm levels between 15% and 100%.

3.7.2.5.1. When the MiniOX 3000 unit detects an oxygen concentration that exceeds the preset alarm limit: the red LED for that alarm flashes, an audible alarm activates, and the measured concentration appears in the display.

3.7.2.5.2. The operator can silence the audible alarm for three 30-second intervals for a total of 90 seconds; however, the visual alarm continues to flash. At the end of the silence period, the audible alarm reactivates if the alarm condition is not corrected.

**NOTE:** An audible and visual alarm accompanies any alarm condition.

**NOTE:** The audible alarm may not be heard in high noise environments. Visually monitor unit during flight.

3.7.2.6. The MiniOx 3000 features a two-stage alarm that warns of depleted and expired battery voltage.

3.7.2.6.1. The first alarm alerts the operator that the monitor has approximately six hours of operating time remaining; a warning message appears in the display, with an audible alarm that sounds at 30-second intervals.

3.7.2.6.2. If the operator does not replace the battery after this alarm, a second low battery alarm activates when the battery is no longer able to support monitoring. The monitor displays a warning message and activates an audible and visual alarm.

3.7.2.7. Audible and visual alarms activate when oxygen concentrations: fall below the preset (or default) low alarm setting or rise above the preset (or default) high alarm setting.

3.7.2.8. The MiniOX 3000 Oxygen Monitor: detects low and depleted battery conditions, activates audible and visual alarms for sensor disconnection or malfunction, and various internal operating errors.

3.7.2.9. The MiniOX 3000 Oxygen Monitor conducts self-checks: at power up (battery installation), at turn-on, and during operation.

3.7.2.10. The monitor has two operator-initiated test functions: the Alarm Test verifies the operation of the high and low oxygen level alarms, the Battery Test assesses the relative remaining battery life.

3.7.2.11. The MiniOX 3000 Oxygen Monitor consists of two components: the instrument and the oxygen sensor.

3.7.2.11.1 The front of the hand-held instrument features: a touch-sensitive keypad, a liquid crystal display (LCD) that shows: monitor status, continuous oxygen concentration, preset alarm levels, two red light emitting diodes (LEDs) that serve as visual alarms.

3.7.2.11.2. The back of the instrument case features: a bail bar to allow the instrument to “stand” on a horizontal surface during monitoring operations and a plastic wedge that slides into an optional bracket for mounting the instrument on a horizontal or vertical pole.

3.7.2.12. Connected to the instrument by a coiled cable, the galvanic oxygen sensor consists of a deflector assembly and a plastic housing containing two electrodes. A coiled cable connects the sensor to the instrument. Plugs at each end of the cable snap into jacks (one located in the sensor housing and one located in the instrument) and are held securely in place by twist collars.

**3.7.3. Power Source.** One standard 9-volt alkaline battery is housed in the back of the monitor.

#### **3.7.4. Pre-flight.**

**NOTE:** This will be done prior to scheduled takeoff and can be done in the Medical Equipment Section.

3.7.4.1. Check the calibration and inspection sticker for currency. Inspect the unit and its components for any signs of damage. Ensure all components are present (refer to 3.7.2.).

3.7.4.2. Attach the sensor to the coiled cable. Firmly press the connector until it snaps into place; tighten the twist collar. Insert the opposite end of the coiled cable into the jack on the side panel of the instrument; tighten the twist collar. Insert the gasket into the open end of the deflector, ensuring that the gasket is properly seated within the deflector. Gently screw the deflector onto the sensor.

**NOTE:** DO NOT handle the sensor while performing calibrations. Body heat can cause the sensor's thermistor to change disproportionately to the change in gas sample temperature at the sensing electrode. This may produce some error until thermal equilibrium is restored.

3.7.4.3. The MiniOX 3000, Monitor must be calibrated:

3.7.4.3.1. Daily, while in operation.

3.7.4.3.2. Each time the monitor is turned ON.

3.7.4.3.3. Following sensor disconnection/ reconnection.

3.7.4.3.4. When environmental conditions (temperature, pressure and humidity) change.

3.7.4.3.5. Before using the monitor at the final cruising cabin altitude.

3.7.4.4. To Calibrate in Room Air: Press I/O to turn ON the instrument. "CAL" flashes in the display. Press 21%. The following appears on the display: "CAL", "LOCKED", and "21% Cal.". Press UNLOCK key. The following will be displayed: "CAL", "21% CAL", and a 10-segment bar graph that "counts down" two seconds per bar for 20 seconds.

3.7.4.4.1. After 20 seconds, the calibration process is complete. The device: displays 20.8% +/- 2% O<sub>2</sub> (18.8% to 22.8%), proceeds to the monitoring mode, and displays the current oxygen concentration as %O<sub>2</sub>.

3.7.4.5. To Calibrate at 100 O<sub>2</sub>%:

3.7.4.5.1. Calibrate in room air (See 3.7.4.4. Calibrate in Room Air). Expose the sensor to 100% oxygen, via T-adaptor with O<sub>2</sub> at 4Lpm, and allow the readings to stabilize prior to initiating the calibration.

"CAL" flashes in the display. Press 100%. The following appears on the display: "CAL", "LOCKED" and "100% Cal.". Press UNLOCK. The following appears on the display: "CAL", "100% Cal", and a 10-segment bar graph that "counts down" two seconds per bar for 20 seconds.

3.7.4.5.2. After 20 seconds, the calibration process is complete; the device displays: 100% +0/-2% (98% to 100%) proceeds to the monitoring mode and displays the current oxygen concentration as %O<sub>2</sub>.

**NOTE:** When calibrating the monitor at altitude the cabin pressure must remain at a constant level for at least 2-3 minutes before calibration can be accomplished. If cabin altitude changes the MiniOx 3000 must be recalibrated at that pressure.

**NOTE:** The MiniOX 3000 Oxygen Monitor has a five-second "time out" following keypad functions. If you do not press UNLOCK within five seconds, the instrument returns to the flashing "CAL" mode.

**NOTE:** During calibration if "CAL ERR" flashes in the display, visual, audible alarms activate and then "CAL" flashes, turn OFF the instrument and repeat calibration procedure. When recalibrating, be sure to select the calibration value and use the corresponding calibration gas. If "CAL ERR" reoccurs, it may be necessary to replace the sensor.

**NOTE:** During operation if "CAL" appears on the display, you must recalibrate the monitor. If "CAL" displays following proper recalibration, it may be necessary to replace the sensor.

### 3.7.5. Operation.

3.7.5.1. Installing the sensor in a breathing circuit.

3.7.5.1.1. Needed components: MiniOX 3000, attached sensor (with deflector), Tee adapter, and retaining strap.

3.7.5.1.2. Install the tee adapter into the breathing circuit upstream from the humidifier. Make sure that the side port of the tee adapter is facing upward. Remove the coiled cable from the sensor. Firmly insert the sensor (with deflector) into the tee adaptor with the deflector pointing downward to prevent moisture from condensing onto the sensor membrane.

**NOTE:** Ensure that the sensor is placed upstream of the humidifier and the sensor is mounted pointing down to prevent moisture from draining onto the sensor membrane. If moisture is allowed onto the membrane it will result in a lower oxygen concentration reading and an increased response time.

**WARNING:** To ensure accurate operation, a tight fit must exist between the sensor and “T” adapter. The sensor must be mounted with the deflector pointing downward, upstream from a humidified source.

3.7.5.2. Setting the Alarms.

3.7.5.2.1. To set the Low Alarm: Press SET once. The following appears on the display: “AL” and up/down arrows. Using the arrow keys, scroll up or down to the desired Low Alarm set point (15% to 99%). The MiniOX 3000 Oxygen Monitor “locks” this value. After five seconds the monitor: beeps once, automatically proceeds to the Monitoring Mode.

**NOTE:** The Low Alarm CANNOT be disabled or set: below 15%, above 99%, or higher than or equal to the High Alarm setting.

3.7.5.2.2. To set the High Alarm: press SET twice. The following appears on the display: “AL” and up/down arrows. Using the arrows keys, scroll up or down to the desired High Alarm set point (16% to 100%). The MiniOX 3000 Oxygen Monitor “locks” this value. After five seconds, the monitor: beeps once and automatically proceeds to Monitoring Mode (Press SET once after selecting set point to manually proceed to Monitoring Mode).

**NOTE:** The High Alarm value: CANNOT be set equal to, or less than, the Low Alarm value; CAN be disabled by increasing the alarm set point beyond 100% until “—” display.

### 3.7.6. In-Flight Calibration.

3.7.6.1. The MiniOX 3000 must be recalibrated prior to use at cruising altitude if the monitor has been used on the ground or if the unit is initially being used in flight. To calibrate the unit in-flight used the standard procedures of calibrations to 21% and 100% ( see 3.7.4.4.- 3.7.4.5.).

**NOTE:** The sensor responds to partial pressure (not percentage) of oxygen. Changes in barometric pressure change the reading, even if the percent of oxygen in the sample remains constant. Therefore, to eliminate error due to pressure changes, the instrument must be calibrated at the pressure in which it is used.

**NOTE:** Accuracy of the unit during ascent and descent are potentially inaccurate. It will take several minutes at a stable cabin pressure to ensure accurate readings and calibration.

**WARNING:** DO NOT USE THE MiniOX III ALTITUDE POST-CALIBRATION CONVERSION CHART in AFI 41-309, Table 3.3. for this piece of equipment.

### 3.7.7. Disassembly and Storage.

3.7.7.1. Sensor Replacement.

3.7.7.1.1. Replace the sensor when room air reading is greater than 20.8% +/- 2% (18.8% to 22.8%) in Two-Point Linearity Check (See Manual), the MiniOX 3000 Oxygen Monitor will not calibrate, or “Sensor” and “OFF” display and audible and visual alarms persist when sensor and cable connections are correct and cable is viable.

3.7.7.1.2. To replace sensor: Verify that the monitor is turned OFF. The display should be blank. Disconnect the expired sensor from the coiled cable. Attach a new sensor to the coiled cable and firmly press the connector until the sensor snaps into place. Tighten the twist collar. Recalibrate the monitor.

**WARNING:** The sensor is a sealed unit containing potassium hydroxide. If the unit should develop a leak, discard it immediately. The sensor contains a caustic material and must be disposed of in accordance with Federal, State and Local regulations. Should contact occur with skin or clothing, rinse area immediately

with large quantities of water. In case of eye contact, immediately flush eyes with water for at least 15 minutes, holding eyes open. Contact a physician. Can be fatal if swallowed.

**NOTE:** The sensors are warranted by the manufacture for useful life of 12 months. The sensor life may be useful up to 18-24 months. This time starts at manufacturing. The manufacturing date appears on the side shaft of the sensor as a two-digit identifier. The first digit represents a month (A=JAN, B=FEB, C=MAR, D=APR, E=MAY, F=JUN, G=JUL, H=AUG, I=SEP, J=OCT, K=NOV, L=DEC). The second digit the year of manufacture ( 0=2000; 1=2001, 2=2002, 3=2003).

**NOTE:** When the MiniOX 3000 is unable to be calibrated, or gives erratic readings, the sensor must be replaced.

3.7.7.1.3. Storage of the unit: Disconnect the sensor and coiled cord, turn unit off. Replace parts to their respective spaces in the padded foam case.

3.7.7.1.4. Cleaning: The MiniOX 3000 monitor and sensor may be cleaned by wiping it with a mild detergent, ethanol, or *Cidex*. DO NOT STERILIZE.

**CAUTION:** Never autoclave, immerse, or expose the MiniOX 3000 Oxygen Monitor (including sensor) to high temperatures (>70C). Never expose the device to pressure, irradiation, vacuum, steam, or chemicals (other than alcohol or mild cleaning agents).

### **3.7.8. Battery Replacement.**

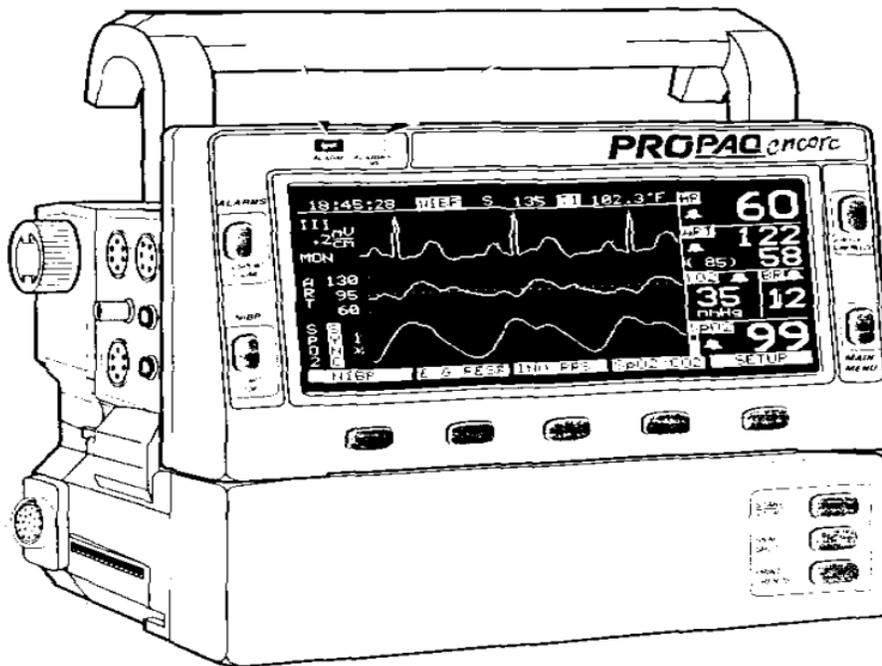
3.7.8.1. Verify that the monitor is turned OFF. The display should be blank. Pull out the support stand from the back of the case. Unscrew the two screws on the battery cover in back of the instrument and remove cover. Remove the battery from the case and unsnap the battery from the battery holder.

**NOTE:** To ensure proper start-up, wait at least 45 seconds before connecting the fresh battery to the battery connector. Snap the terminal of the new 9-volt battery into the battery holder. Install the battery cover and screw into place. Make sure that the battery cover is properly seated and flat on the back of the MiniOX 3000 Oxygen Monitor case. Recalibrate the monitor. Reset the low and high alarms, if desired.

**NOTE:** To maximize battery life, press I/O to turn OFF the MiniOX 3000 unit when not monitoring. In order to retain alarm settings, do not remove battery.

## **4.4. PROPAQ ENCORE 206EL.**

**Figure 4.1. The Propaq Encore 206 EL with Expansion Module – Front View.**



**4.4.1. Purpose:** The Propaq Encore monitors neonatal, pediatric and adult patient vital signs.

**NOTE:** Pediatric patients must meet minimum weight range of  $\leq 10$  Kg.

**4.4.2. Description:** The Propaq Encore, is durable, lightweight (13.5lbs), and portable patient monitor. Which has the capability to monitor blood pressure, body temperature, pulse oximetry (SpO<sub>2</sub>), expired carbon dioxide level (CO<sub>2</sub>), breath rate and heart rhythms (ECG) and is capable of non-invasive and invasive monitoring.

**4.4.3. Power Source:** 100-120 VAC/50-60 Hz (500mA), 12-28 VDC, or a battery pack. 3-Ampere fuse. The battery is at full capacity after eight (8) hours of recharging if the monitor is off. Typical monitoring time is about 3 hours when all patient channels are active and measurements are taken every 15 minutes and print strips are taken every 15 minutes, or 2 hours at 25° C. Battery voltage is displayed on the initial powerup screen and settings window.

**NOTE:** Flashing “LOW BATT” caution message means that you have 1.5 hours left.

**NOTE:** If the green Battery Charging lamp does not light when the AC adapter is connected, the fuse may be blown.

**4.4.4. Components:**

- 4.4.4.1. Propaq Encore Monitor with expansion module.
- 4.4.4.2. ECG cables.
- 4.4.4.3. Blood Pressure Cuffs, single-tube and connectors.
  - 4.4.4.3.1. Adult (standard)(23-33cm) (reusable).
  - 4.4.4.3.2. Adult (large)(31-40cm) (reusable).
  - 4.4.4.3.3. Adult (thigh)(38-50cm) (reusable).
  - 4.4.4.3.4. Small Adult/Child (17-25cm) (reusable).
  - 4.4.4.3.5. Child (12-19cm) 008-0291-12 (reusable).

4.4.4.3.6. Infant: 008-0291-06 (8-13cm) (reusable).

4.4.4.4. Adult/Pediatric NIBP hose.

4.4.4.5. Infant NIBP hose.

4.4.4.6. Temperature.

4.4.4.6.1. Skin probe.

4.4.4.6.2. Oral probe.

4.4.4.6.3. Rectal probe.

4.4.4.7. SpO2 Sensor:

4.4.4.7.1. Adult/Pediatric – Finger (reusable).

4.4.4.7.2. Pediatric/Infant – Toe (reusable).

4.4.4.7.3. Extension Cable, Oxygen Sensor.

4.4.4.8. CO2 Sensor.

4.4.4.9. Battery Charger (100-120 VAC/50-60 Hz).

4.4.4.10. Printer.

4.4.4.11. Protective Case.

#### **4.4.5. NOMENCLATURE:**

4.4.5.1. Front.

4.4.5.1.1. Alarm light.

4.4.5.1.1.1. A red light turns on when any alarm limit is violated.

4.4.5.1.2. Alarm(s) off light.

4.4.5.1.2.1. A yellow light turns on when any alarm limit is turned off.

4.4.5.1.3. Alarms suspend/resume button.

4.4.5.1.3.1. Stop the alarm tone.

**NOTE:** Suspending an alarm tone, suspends all alarm monitoring for 90 seconds or until the RESUME button is pressed.

4.4.5.1.4. NIBP start/stop button.

4.4.5.1.4.1. Starts and stops NIBP measurements. The Stop function will automatically vent the cuff.

4.4.5.1.5. Freeze/unfreeze button.

4.4.5.1.5.1. Freeze/Unfreeze: Freezes or “unfreezes” the waveforms. If only one or two waveforms are displayed and you press freeze, the frozen waveform(s) are shown along with an active waveform so you can continue to monitor the patient’s condition.

4.4.5.1.6. Main menu button.

4.4.5.1.6.1. Takes you back to the main menu.

4.4.5.1.7. Display window.

4.4.5.1.7.1. Either liquid crystal display (LCD) or electroluminescent (EL).

4.4.5.1.8. Buttons under the display window.

4.4.5.1.8.1. Changes functions according to the display window above each specific button.

4.4.5.2. Right side.

4.4.5.2.1. Monitor button.

4.4.5.2.1.1. Turns on/off.

4.4.5.2.2. Fuse.

4.4.5.2.2.1. 3 amp, slow blow fuse used to protect form power surges.

**NOTE:** Only replaced by a qualified service personal.

4.4.5.2.3. Power adapter (12-28v, 3mA)

4.4.5.2.3.1. 100-120VAC/ 50-60 Hz

4.4.5.2.4. Battery Charging Light. Green light indicates a power source is connected (AC or DC). Battery will continue to charge even though the monitor is turned off as long as an external power source is connected.

4.4.5.2.5. Defib synchro.

4.4.5.2.5.1. Connects and provides signal transmission to a LIFEPAK 5 or 6.

4.4.5.2.6. EKG x 1000.

4.4.5.2.6.1. Speaker.

4.4.5.3. Left side.

4.4.5.3.1. SpO2 Connector.

4.4.5.3.1.1. Nellcor SpO2 cable is connected.

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

4.4.5.3.2. INV, BP P1 Connector.

4.4.5.3.2.1. Measures arterial, pulmonary artery, central venous and intracranial pressures. Range is from -30 to 300mmHg.

4.4.5.3.3. ECG/EKG Connector.

4.4.5.3.3.1. Three lead electrodes.

4.4.5.3.4. NIBP PSNI Connector.

4.4.5.3.4.1. Single cuff hose is connected.

**WARNING:** Cuff pressures could injure neonates. Do not use on neonates.

4.4.5.3.5. Temperature Connectors.

4.4.5.3.5.1. Connect esophageal, rectal, needle and skin probes.

4.4.5.3.6. INV, BP P2 Connector.

4.4.5.3.6.1. Measures arterial, pulmonary artery, central venous and intracranial pressures. Range is from -30 to 300mmHg.

4.4.5.3.7. Printer.

#### **4.4.6. Alarm Tones:**

4.4.6.1. A steady, high-pitched alarm tone sounds whenever a limit is violated on most patient channels.

4.4.6.2. The tone for the SpO2 alarms is lower in frequency.

4.4.6.3. The tone for the Apnea alarm is one second on, one second off.

4.4.6.4. The alarm tone continues until:

4.4.6.4.1. The patient condition changes and no longer exceeds the limit.

4.4.6.4.2. You suspend the alarm tone by pressing the Suspend button.

4.4.6.4.3. You adjust the alarm limit so the vital sign does not exceed it.

**NOTE:** The life-threatening alarms cannot be turned off (i.e. the apnea alarm).

**WARNING:** Before you use on a new patient, always turn off for a few seconds. This clears the prior patient's trend values, alarm limit settings, and NIBP cuff inflation target.

#### **4.4.7. Alarm Status Window:**

4.4.7.1. Bells only appear when at least one limit is turned on and the vital sign parameter is being monitored.

4.4.7.2. The full bell shows you that all alarm limits are turned on.

4.4.7.3. The half bell indicates that at least one alarm limit is turned off.

4.4.7.4. The absence of a bell shows that no alarm limits are turned on.

4.4.8. Alarms Menu:

4.4.8.1. Located below the status window.

4.4.8.2. Lets you access other alarms functions to individually set alarm limits or automatically set them.

#### 4.4.9. Tone Volume:

4.4.9.1. Volume can be adjusted to one of three volumes.

4.4.9.2. To adjust, press Setup, then more, then Next (to select Alarm Tone), and then the Change button to change the setting.

4.4.9.3. To suspend the alarm tone temporarily using the Suspend button.

4.4.9.3.1. The tone is suspended for 90 seconds.

4.4.9.3.2. You can “unsuspend” by pressing the Resume button in the Alarms Menu or the Resume key to the left of the screen, except for the NIBP.

**WARNING:** Suspending an alarm suspends ALL alarm tones for 90 seconds or until the Resume button is pressed.

**NOTE:** If you want to turn all limits on or off, without changing their values, press ALL ALRM in the Alarms Menu. The alarm status window lets you know when all alarms are on or off by the displayed bells.

#### 4.4.10. Changing Individual Limits:

4.4.10.1. From the Main Menu, press Setup > Alarms.

4.4.10.2. Press Limits to display the alarm limits window and the Limits Menu.

4.4.10.3. Press Next Page to change to the desired alarm limit window.

4.4.10.4. Press the Next button to move the cursor.

4.4.10.5. Press Up or Down, or On/Off to set the limit to the desired limit value.

4.4.10.6. When the limit is set, select the next limit with the Next button. Or, to select another vital sign, press Next Page.

#### 4.4.11. Equipment alerts:

4.4.11.1. If an equipment alert condition is detected, a high-pitched alarm tone will sound for one second at five-second intervals. This alert tone will repeat until you respond to the equipment alert by pressing any button located at the bottom of the screen or until the equipment condition is corrected.

4.4.11.2. The equipment alert window will also appear on the display identifying the condition.

4.4.11.3. If the equipment condition also caused a patient alarm, you will need to first suspend the alarm tone by pressing Suspend, then take the required action.

#### 4.4.12. Preflight:

4.4.12.1. Ensure currency of inspection/calibration sticker decal on unit and that all component parts are complete and in serviceable condition.

4.4.12.2. While unplugged from external power, turn-on unit by depressing the ON/OFF button located on top right side of panel; the “Startup Screens” will appear in following order.

4.4.12.2.1. “Startup window” displays information about the Propaq Encore and the monitor runs a diagnostic test to ensure proper functioning. The internal battery indicator must be adequately charged to  $\geq 7.8\text{V}$  (Volts) during preflight check.

**Table 4.1. Battery Voltage Effects on Operation, based on full EL configuration.**

Battery Voltage	Monitor Functioning and Messages	Approximate Operating Time at 25° C
$\geq 7.8\text{V}$	Monitor which is fully functional and displaying no error messages	4.5 hrs
$< 7.8\text{V}$	Flashing LOW BATT message	1.5 hrs

Battery Voltage	Monitor Functioning and Messages	Approximate Operating Time at 25° C
< 7.6V	LOW BATT, NIBP DISABLED, PRINTER DISABLED Equipment alerts; NIBP and Printer are disabled. NOTE: If NIBP measurement or print-out is in progress it will continue until voltage falls below 7.3V.	45 mins
< 7.4V	VERY LOW BATT, NIBP DISABLED, PRINTER DISABLED Equipment Alerts	15 mins
< 7.3V	VERY LOW BATT, NIBP DISABLED, PRINTER DISABLED, CO2 HEATER DISABLED Equipment Alerts	5 mins
= 7.0V	Unit Shutdown	

4.4.12.2.2. A few seconds later, the top two lines of the screen are replaced with text indicating the current patient mode (Adult, pediatric, or neonatal).

**WARNING:** The factory default setting is Adult Mode.

**NOTE:** If the patient Mode is changed, alarms will change to default for that Mode.

4.4.12.3. Ensure the battery is properly charging. Plug in unit AC power cord, to three-prong male adapter end into the electrical port next to the green battery LED on the right side of the unit and lock in place.

4.4.12.3.1. Plug in the gray power cord into the “Universal Power Adapter” and the other end into approved 100-120VAC/50-60 Hz power source. Depress On switch located on Universal Power Adapter “Green battery LED charging light will illuminate on Monitor and Universal Power Adapter.

**NOTE:** Internal battery will recharge while plugged-in to FULL over 8-12 hours if monitor is On, and 6-8 hours with monitor Off.

4.4.12.4. Ensure following accessories are in the carrying case and that the case is in good repair:

4.4.12.4.1. Blood pressure cuffs: Adult standard, large, thigh, Small adult/Child, Child, Infant, and Adult/Pediatric NIBP hose, Infant NIBP hose.

4.4.12.4.2. ECG Cable 3 or 5 lead; 6ea Adult and Pediatric electrode pads (silver or silver chloride pads).

4.4.12.4.3. SpO2 Sensors: Adult/Pediatric, one Finger Clip-on type and Pediatric/Infant, Wrap around type and Sensor Extension Cable.

4.4.12.4.4. Temperature: Oral, Skin and Rectal probes.

4.4.12.4.5. Additional features may include an Expansion Module, with the following capabilities:

4.4.12.4.5.1. Printer; requires additional roll of paper.

4.4.12.4.5.2. Mainstream Capnography; requires CO2 sensor cable and airway adapters.

**NOTE:**

The CO2 adapters may be gas sterilized for reuse.

#### **4.4.13. Operating Instructions:**

4.4.13.1. Monitor Setup.

4.4.13.1.1. Statscale: automatically readjusts all waveform scales.

4.4.13.1.2. Alarms: allows access to the Alarm Menu.

4.4.13.1.3. Wave Sel: allows you to turn on and off desired waveforms or NIBP numerics for display.

4.4.13.1.4. Trends: allows access to the Trend settings and display.

4.4.13.1.5. More: this displays the next setup menu and a status window.

- 4.4.13.1.6. Next: selects the new setting in the status window.
- 4.4.13.1.7. Change: changes the currently selected display setting.
- 4.4.13.1.8. Printer: allows access to the Printer Menu.
- 4.4.13.2. Printer functions.
  - 4.4.13.2.1. Press Setup > More > Printer.
  - 4.4.13.2.2. Next: selects the next setting in the status window.
  - 4.4.13.2.3. Change: changes the currently selected display setting.
  - 4.4.13.2.4. PR Trend: prints all trends turned on in the Printer Trend Select Window.
  - 4.4.13.2.5. More: pressing the More buttons displays another menu and status window.
  - 4.4.13.2.6. Prev Menu: returns you to the previous menu.
  - 4.4.13.2.7. The front panel of the printer lets you control the basic printer functions.

#### **4.4.14. ECG Monitoring:**

**NOTE:** Monitor will automatically determine if only three lead wires are connected, and will automatically reduce the number of selectable leads to three (I, II, III).

**WARNING:** Use of ECG cables with loose or faulty detachable lead wires may cause erratic behavior of the ECG waveform, SpO<sub>2</sub>, C-Lock, and NIBP due to intermittent ECG lead wire connections.

- 4.4.14.1. Inspect the ECG cable for wear, breakage, or fraying. Replace the cable if it shows signs of any of these. Plug the ECG cable into the ECG connector on the Propaq's left side panel.
- 4.4.14.2. If the monitor is off, press the OFF/ON switch to turn it on.
- 4.4.14.3. Select the patient mode appropriate for the patient (adult, pediatric, neonatal).
- 4.4.14.4. Setting up the ECG channel:
  - 4.4.14.4.1. Press ECG to set the selections: ECG Size and ECG Lead.
  - 4.4.14.4.2. The More buttons displays the second ECG menu and a status window with selections for HR/PR Tone, Pacer Display, and ECG Bandwidth.

**NOTE:** If the patient has a pacemaker, you may want to turn on the Pacer indicator function. On the Pacer Display, vertical dashed lines indicate each time a pacemaker signal is detected when the Propaq Encore Pacer function is turned on. If the pacemaker contains sufficient energy, a "spike" will be produced. If the Pacer function is turned off, only the pacemaker spike is displayed.

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

#### **4.4.15. Noninvasive blood pressure (NIBP):**

**NOTE:** Neonatal Mode: use on infants up to about 44 weeks gestational age. Pediatric Mode: use on larger infants and small children up to about 9 years old. Adult Mode: full range of patient numerics and cuff pressures but limits the cuff sizes available to the standard child cuff and larger.

**WARNING:** Verify patient mode. Incorrect patient mode may result in inaccurate heart rates and inappropriate alarm settings.

**WARNING:** The following can adversely affect accurate measurement determination. Patients exhibiting cardiac arrhythmias, sudden changes in blood pressure, convulsions, shivering or other body motions. People or objects bumping against the cuff, vibration, very weak pulses due to conditions; such as shock, if selected cuff size is too small or a cuff is too loosely applied (high readings may occur).

**WARNING:** The Propaq Encore monitor does not have automated arrhythmia analysis. Therefore, some ventricular tachycardias and ventricular fibrillation may not be interpreted correctly and may display an inaccurate heart rate.

- 4.4.15.1. Press NIBP button to display the status window and menu.

4.4.15.2. Start/Stop: starts and stops NIBP measurements. Any time the monitor is taking a noninvasive pressure measurement, the Start button changes to stop so you can stop the measurement in progress. Pressing Stop will automatically vent the cuff.

4.4.15.3. Auto/Man: This button switches the mode between Automatic and Manual Mode. The Manual Mode is the default unless you change it by reprogramming your monitor. Measurements can be taken at intervals of 1,2,3,5,10,15,30, and 60 minutes. Press Start to initiate a measurement.

4.4.15.4. Interval: Selects the interval at which NIBP measurements are automatically taken. The interval you select, ranging from one minute to 60 minutes is shown on the display next to the word TIME.

4.4.15.5. Turbo cuff: automatically starts NIBP measurements and continues to take as many measurements as possible within five minutes.

**WARNING:** The patient's limb should be periodically observed to ensure that the circulation is not impaired for a prolonged period of time.

**WARNING:** The Propaq Encore should never be used to monitor NIBP on one patient while simultaneously monitoring ECG on another patient.

**WARNING:** If a noninvasive blood pressure measurement is suspect, repeat the measurement. If you are still uncertain about the reading, use another method.

**WARNING:** Do not attempt to conduct NIBP TEST when the cuff is attached to the patient.

**WARNING:** Always place the monitor in Neonatal Mode when using on a neonate. If monitor is in Pediatric Mode and the cuff is placed on neonate, maximum pressure can exceed 150 mmHg.

4.4.16. Pulse Oximetry (SpO<sub>2</sub>):

4.4.16.1. Setting up the monitor for SpO<sub>2</sub>:

4.4.16.1.1. SpO<sub>2</sub> connector is located on the left side of the Propaq. Turn the locking ring around the connector counterclockwise until it stops.

4.4.16.1.2. Plug the sensor into the SpO<sub>2</sub> sensor extension cable and plug the extension cable into the Propaq, or plug the sensor directly into the SpO<sub>2</sub> connector.

4.4.16.1.3. Lock the connector by turning the locking ring clockwise until it stops.

4.4.16.1.4. SEARCH is displayed in the SpO<sub>2</sub> numeric window while the channel tries to detect blood pulsing through the measurement site. Once the measurement has been established; the saturation value is displayed in the numeric window.

4.4.16.1.5. From the Main Menu, press SpO<sub>2</sub> and then Size to adjust the size of the waveform for best viewing.

4.4.16.1.6. Adjust the placement of the sensor until a good SpO<sub>2</sub> waveform is displayed.

4.4.16.1.7. Size: selects the SpO<sub>2</sub> waveform size (1X, 2x, 4X, and 8X).

4.4.16.1.8. More: displays the next SpO<sub>2</sub> menu.

4.4.16.1.9. Response: sets the time the Propaq Encore Pulse Ox takes to acquire the oxygen saturation value.

4.4.16.1.10. C-Lock: turns on and off the C-Lock function (use this function if you are monitoring ECG and SpO<sub>2</sub> and artifact is present).

**WARNING:** Incorrect application or use of a sensor can cause Tissue damage.

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

4.4.17. Temperature

4.4.17.1. Place probe on patient and plug into monitor.

4.4.17.2. To select the temperature in C\* or F\*, press SETUP, More, More, Services, Yes, More, More, Settings. Use the Next and Change buttons to select and set.

**NOTE:** Changing units does not clear trends.

4.4.17.3. Set the alarm limits.

4.4.17.4. Messages: “Probe not detected”, Probe has been disconnected. “Probe short”, verify the probe is properly inserted in the left side panel, if so, replace probe. “Calibration error, temp disabled”, Propaq, can not accurately measure the temperature.

4.4.18. CO2

4.4.18.1. Connect the mainstream CO2 sensor or side stream CO2 water trap.

**NOTE:** After you connect the sensor a waveform will be displayed without a value range briefly. It displays WARM UP or START UP for 20 seconds.

4.4.18.2. Press SpO2/CO2 to display the first CO2 menu.

4.4.18.3. Press Range until you see the desired waveform scale range on the screen.

4.4.18.3.1. Press mm/s to select either 3.13, 6.26 or 12.5mm/sec. The default setting is 6.25mm/sec.

4.4.18.3.2. Press More to view the CO2 status window.

4.4.18.3.3. If either O2 or NO2 is being administered, press Gas comp to set the proper gas compensation. If no other gas is being administered, set to off.

4.4.18.3.4. Press Response to select either normal, slow or fast.

4.4.18.3.4.1. Fast setting (15 seconds) is recommended where a sudden in ETCO2 is of concern, such as that induced by an air embolus in certain neurosurgical procedures.

4.4.18.3.4.2. Slow response (45 seconds) will decrease ETCO2 false alarms when breath values vary from one to the next.

4.4.18.3.4.3. Default setting is normal (30 seconds).

4.4.18.3.5. Set the alarm limits for ETCO2, INCO2 and breath rate.

**WARNING:** For patient safety, it is recommended that the breath rate alarm limits always be turned on and set properly.

4.4.18.3.6. Set the alarm limit for apnea delay- this is the maximum time allowed between two successive breaths before the alarm occurs.

4.4.18.3.7. Side stream Co2 Monitoring.

4.4.18.3.7.1. Connect water trap by Firmly inserting the side stream CO2 water trap into the connector on the left side.

4.4.18.3.8. Set up the CO2 channel and set alarm limits as described above.

4.4.18.3.9. Connect to a non-intubated patient by positioning the cannula on the patient then connect the sample line to the watertrap.

**WARNING:** Do not connect sample line or patient input to the exhaust port.

4.4.18.3.10. Connect to an intubated patient by connecting the gas sampling elbow and elbow connector into the patient’s breathing circuit. Connect the sample line to the elbow connector and the water trap.

**WARNING:** Do not connect sample line or patient input to the exhaust port.

#### **4.4.19. Displayed Messages.**

4.4.19.1. Altimeter failure- Range: Operating out side the ranges –2000 to 15000ft.

4.4.19.2. Altimeter failure- Rate: Ambient pressure is changing at a rate greater than 100mmHg/minute.

4.4.19.3. Degraded waveform, check adapter: Mainstream adapter is obstructed or the sensor has failed.

4.4.19.4. Lack of wave, Check adapter, and sensor: Either the airway adapter is obstructed or the CO2 sensor has failed.

4.4.19.5. Low battery, heater disabled: Because of the low battery the waveform is displayed without a range.

4.4.19.6.1. No-Protocol sensor: The wrong sensor has been connected.

4.4.19.6.2. Sensor failure, Calibration error: Sensor is defective or out of calibration.

4.4.19.6.3. Sensor failure, Eeprom: The sensor has failed, replace the sensor.

4.4.19.6.4. Sensor failure, Heater: The sensor's temperature control circuit or the CO<sub>2</sub> circuitry has failed.

4.4.19.6.5. Sensor failure, motor drive: Sensor's motor drive has failed.

4.4.19.6.6. Sensor temperature too high: Operating range is 10° to 46° C.

4.4.19.6.7. Warm up or warm: Sensor heater is warming up. Wait 20 to 30 seconds.

#### **4.4.20. Printer (if applicable):**

4.4.20.1. Loading paper:

4.4.20.2. Lay the monitor on its back to gain access to the bottom of the printer.

4.4.20.3. Squeeze the locks on the paper door toward each other and pull the door toward you to open it.

4.4.20.4. Lift the paper roll from the holder and pull out any paper remaining in the printing mechanism.

4.4.20.5. Place the new paper roll onto the holder, as shown below, and pull out several inches of paper.

4.4.20.6. Slide the end of the paper into the slot of the printing mechanism until it extends out of the paper exit slot.

4.4.20.7. Close the paper door.

4.4.20.8. Place the monitor on its feet.

4.4.20.9. Simultaneously press the Start/Stop button and the Print Trends button to produce a test print.

4.4.20.10. Printing a single trend:

4.4.20.10.1. Press the Print button in the Trends Menu.

**NOTE:** If you want to print a trend different from the one displayed, press Next Trend until the desired trend is shown.

4.4.20.10.2. Press the Print button; this will print the displayed trend. If you want to print a trend different from the one displayed, press Next Trend until the desired trend is shown.

4.4.20.11. Printing several trends:

4.4.20.11.1. From the Main Menu, press Setup>More>Printer>More. The printer trend select window appears.

4.4.20.11.2. Using the Next and Change buttons, select each of the trends you want printed and turn them on. Turn off all other trends.

4.4.20.11.3. Each time you want to print the selected trends, press Print Trends.

#### **4.4.21. Securing:**

4.4.21.1. The unit may be secured with the hanging bracket permanently attached to the unit to a stanchion pole or litter brace. Use a litter strap to secure the unit around the hanging bracket. Do not obstruct your view by wrapping the strap over the display and buttons.

4.4.21.2. It may also be secured to an equipment litter with a litter strap over the top of the unit under the hanging bar.

#### **4.4.22. Disassembly and Storage:**

4.4.22.1. Remove all cables from the unit. Remove the NIBP hose and cuff. Plug in the AC power cord to recharge the battery pack. The monitor and accessories should be wiped with a nearly dry cloth containing one of the mild cleaning solutions: warm water, hydrogen peroxide solution, Coverage, Liquid Soap, Wex-cide, Formula 409, Fantastik, Windex, Cidex, and T.B.Q. Thoroughly wipe off any excess residual cleaning solution from the Propaq. Do not allow cleaning solutions or water to run into the crevices or connector openings.

**CAUTION:** The side panel connectors of the unit have been specially designed to prevent water or other liquids from entering the monitor. However, liquids can get into the connectors. If liquid does get into the right side panel connectors, it will drain through a hole in the bottom of the panel. If moisture gets into any side panel connector, the connectors must be dried with warm air, and then all monitoring functions should be checked for proper operation.

4.4.22.2. Clean the Durasensor oxygen transducers with an isopropyl alcohol pad. Do not immerse.

4.4.22.3. The cuff may be cleaned using common hospital disinfectants, including Cidex, bleach (1:10) solution, isopropyl alcohol, Lysol solution, PhisoHex, Quadricide, Virex, and Vesphene. Wash gently with the solution, and then rinse. Do not allow the solution to enter the cuff tubes, as this will interfere with the functioning of the cuff.

### 7.8. Century "Smart Move" Infant/Toddler Car Seat.

Figure 7.6. The Century "Smart Move" Infant/Toddler Car Seat – Front View.



**7.8.1. Purpose:** The Century "Smart Move" Car Seat is certified for restraint of infants and toddlers during transport in motor vehicles and aircraft.

**7.8.2. Description:** The Century Car Seat accommodates infants and toddlers from birth to 40 lbs. or 40 in. Car seat may be positioned forward or aft facing according to occupant's size. Seat belt threading points are available for both positions. The car seat has four adjustable seating positions numbered 1-4 on the left side. Two reclining positions (#1-fully reclined and #2-semi-reclined) provide a maximum 47 degree recline and do not lock in fixed position. On impact, the reclined seat automatically adjusts to an upright position for greater protection. Two sitting positions (#3-semi-upright and #4-upright) provide some upright adjustment and lock in fixed position. Either of two Blue Release Levers (one front and one rear) may be used to rotate the car seat to the selected position. An adjustable Five-Point Harness restrains the occupant as follows: A Two-Piece Harness Tie connects the shoulder straps at the chest (two points), and two Metal Tongues slide down the shoulder straps and plug into the Crotch Strap Buckle between the

legs (three points). Both buckles have push button, quick release mechanisms for rapid operation. The Shoulder Harness is threaded through one of three sets of matching slots in the seat back to accommodate shoulder height. The Crotch Strap extends upward from the seat bottom and is not adjustable. On the back of the car seat, the Shoulder Harness attaches to a Metal Splitter Plate connected to a black Quick Adjustment Strap. The black Quick Adjustment Strap and Release Tab are located at the front of the car seat and rapidly tighten or loosen the Harness Straps. A Level Indicator is located on the left side of the seat to ensure proper positioning when securing the seat (rear-facing only). And finally, a removable Infant Support Pillow supports neck and body alignment of smaller occupants. Turning the pillows inside out provides some adjustment to accommodate larger infants.

### **7.8.3. Components:**

7.8.3.1. Plastic Seat Frame and Styrofoam Liner (white).

7.8.3.2. Headrest Foam (yellow).

7.8.3.3. Seat Cover with four Attachment Clips.

7.8.3.4. Adjustable Infant Support Pillow with four Velcro Attachments.

7.8.3.5. Harness Strap with sliding Two-Piece Harness Tie (connects at chest) and two sliding Metal Tongues (connect to Crotch Strap Buckle).

7.8.3.6. Crotch Strap and Buckle secured by Metal Crotch Strap Clip underneath seat.

7.8.3.7. Locking Clip stored on bottom of seat (used on Combination Lap/Shoulder Belt with sliding Latch).

7.8.3.8. Quick Adjust Strap (long black) connected to Metal Splitter Plate.

7.8.3.9. Quick Release Pull Tab (short black).

7.8.3.10. Level Indicator. (left side of car seat)

### **7.8.4. Preflight.**

7.8.4.1. Observe the back of the Car Seat for manufacturer's "Do Not Use After" date, which is imprinted on the plastic of the seat back.

7.8.4.2. Inspect the Car Seat Frame, Styrofoam Liner, and Headrest Foam for general cleanliness and damage.

7.8.4.3. Observe Seat Cover's four attachment clips for serviceability and secure attachment.

7.8.4.4. Inspect Infant Support Pillow and four Velcro Connectors for cleanliness and function.

7.8.4.5. Test Front and Rear Release Levers lockup and release in all four-seat positions.

7.8.4.6. Confirm spring operation by manually pushing seat from reclining positions #1 and #2 to sitting position while observing spring resistance and return to selected position.

7.8.4.7. Confirm positive seat lock in fixed sitting positions #3 and #4.

7.8.4.8. Ensure Harness Straps are not frayed and stitching is intact.

7.8.4.9. Confirm Shoulder Harness Straps are threaded through matching slots (same height).

7.8.4.10. Inspect rear of seat for proper positioning of Harness Loops on Splitter Plate (right on first, then left with both inside splitter plate).

7.8.4.11. Examine Crotch Strap Clip underneath seat for secure attachment on metal plate.

7.8.4.12. Clear Buckle and Harness Tie of loose objects, food particles, or any other debris.

7.8.4.13. Connect Buckle of the two piece shoulder harness and, pull to test secure latching, and confirm function of quick release mechanism.

7.8.4.14. Connect metal tongues of shoulder harness to crotch strap buckle, and pull to test secure latching, and test quick release button on crotch strap.

7.8.4.15. Pull long black Quick Adjust Strap, observe harness tightening, and test lock-up by pulling shoulder harness.

7.8.4.16. Pull Quick Release Tab and pull shoulder harness to confirm proper release.

7.8.4.17. Visualize Level Indicator for movement of indicator ball.

**7.8.5. Operation:**

**NOTE:** The manufacturer's instructions were written for forward facing Motor Vehicle and Civilian Aircraft Seats. Therefore, Aeromedical Evacuation Applications may appear to be in conflict with strict interpretation of manufacturer's instruction manual and instruction stickers located on the car seat. Refer to this equipment guide for Aeromedical Evacuation applications.

**WARNING:** Preterm or low birth weight infants may be at special risk in a vehicle or aircraft. According to the American Academy of Pediatrics, these infants may suffer breathing difficulties while reclined in a car seat. Manufacturer advises the physician or hospital staff evaluate the infant and recommend proper car seat or bed before leaving the hospital. In the Aeromedical Evacuation Environment, the AECM shall secure the infant and ensure the airway is protected. Any questions or concerns should be addressed to the Flight Surgeon.

**NOTE:** Car seats will always be placed along the fuselage.

**NOTE:** When using car seat in reclined or semi-reclined positions, it is necessary to recline passenger seat, impeding egress behind it. Therefore, that seat will be kept vacant.

7.8.5.1. NATO Litter/Backrest Configuration.

**Figure 7.7. The Century Car Seat attached to NATO Litter/Backrest – Aft facing View.**



7.8.5.1.1. Litter/Backrest combination faces aft with backrest 90° upright at forward end of litter.

7.8.5.1.2. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.8.5.1.3. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.8.5.1.4. Now tighten litter strap one so that the buckle is beneath the bottom of the car seat's base so that it does not interfere with rotation of the car seat mechanism.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.8.5.1.5. Car seat is placed on the litter/backrest in the aft facing position and held firmly against the backrest and litter.

7.8.5.1.6. Level indicator is observed for green alignment.

7.8.5.1.7. Third litter strap is threaded through seat the car seat belt slots closest to backrest and passed through the litter stirrups to be buckled and tightened.

7.8.5.1.8. Wrap both ends of the second strap over the outside corners of the car seat's base and return to the stirrups for securing (a fourth strap is required to extend the strap for securing).

7.8.5.1.9. Rock car seat back and forth and side to side to ensure little or no movement occurs.

7.8.5.1.10. Re-check level indicator.

**CAUTION:** Cargo tie down straps if used should only be ratcheted tight enough to allow minimal movement of car seat in all directions. Over tightening can overstress molded plastic parts of the car seat resulting in weakening or damage.

7.8.5.2. Side facing troop Seat Configuration.

**Figure 7.8. The Century Car Seat attached to troop seat – Side View.**



**NOTE:** This method of securing is not intended for the troop seats on the C-17.

7.8.5.2.1. Car seat is always positioned aft facing on side facing Troop Seat.

7.8.5.2.2. Level car seat.

7.8.5.2.3. Take down the seat back webbing for two side-by-side seats.

7.8.5.2.4. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to it self, but do not tighten completely.

7.8.5.2.5. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.8.5.2.6. Tighten litter strap #1 so that the buckle is beneath the bottom of the car seat's base ensuring it does not interfere with rotation of the care seat mechanism. Place the car seat on a wool blanket.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.8.5.2.7. Place litter strap #3 through the seatbelt slots located at the back of the car seat.

7.8.5.2.8. Bring strap #3 around the front and the back of the seat bottom tubes and secure tightly below the seat.

7.8.5.2.9. Wrap both ends of strap #2 over the outside corners of the car seat's base and place around the front and the back of the seat bottom tubes. Secure tightly below the seat.

7.8.5.2.10. Level car seat. Ensure rotation of car seat is not impeded.

7.8.5.3. Aft Facing Blue Seat Configuration.

**WARNING:** Car seat and occupant face aft regardless of age and size (40 lb., 40 in. maximum).

**NOTE:** Occupants up to 30 lbs. or 12 months will use reclined (#1) or semi-reclined (#2) position.

**NOTE:** Occupants over 30 lbs. or 12 months will use semi-upright (#3) or upright (#4) position.

7.8.5.3.1. To install Car Seat. Squeeze blue lever at front or rear of car seat and Move Car Seat to appropriate Reclined or Upright Position (#1-#4) by aligning pointer to desired position and confirm positive lock.

**NOTE:** Because of car seat design, you may experience some movement of the pointer in positions #1 and #2 during vehicle seat belt tightening. This is normal as long as the pointer stays within the red zone for the selected position.

7.8.5.3.2. Thread litter strap through openings closest to seat back (over top of blue recline lever and beneath straps) and buckle around the passenger seat.

7.8.5.3.3. Press down firmly in center of car seat to compress passenger seat cushion as you tighten the litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.8.5.3.4. Place aircraft seat belt around the front of the car seat and tighten securely.

**WARNING:** Car seat must be able to rotate freely from a Reclined to an Upright Position on impact. The seat frame or base must not be blocked in any way that could obstruct rotation.

7.8.5.3.5. Test for secure installation by pulling front to back and twisting side to side to assure seat has little or no movement.

**WARNING:** Level Car Seat. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone. Car seat must be properly leveled. If reclined excessively the results may contribute to injury or ejection. If placed in excessive upright position breathing difficulties may occur. Re-check level indicator once car seat is snugly anchored and infant is positioned in car seat.

7.8.5.4. Forward facing blue seat.

**WARNING:** Forward facing toddlers more than 20 lbs. must have car seat in semi-upright (#3) or upright (#4) position.

**NOTE:** Toddlers 20-30 lbs capable of sitting upright unassisted will be placed in the semi-upright (#3) or upright (#4) position and will face forward.

**NOTE:** Infants from birth to 20 lbs or up to 12 months will face aft and be secured in the following manner.

7.8.5.4.1. First litter strap is secured around the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.8.5.4.2. Thread second litter strap through the first litter strap at the back of the car seat base for future use.

7.8.5.4.3. Thread litter strap through car seat seatbelt slot closest to aircraft seat back.

7.8.5.4.4. Press down firmly in center of car seat to compress passenger seat cushion as you tighten litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.8.5.4.5. Take litter strap #2 and anchor it around the front post beneath foot of passenger seat.

7.8.5.4.6. Level car seat

7.8.5.4.7. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone.

7.8.5.4.8. Ensure rotation of the car seat is not impeded.

### **7.8.6. Place Child in Car Seat.**

7.8.6.1. Harness Straps must be placed in top, middle, or bottom set of matching slots, at or just below the top of the child's shoulders (see Section 7.6.5.3. Changing Harness Strap Slots).

**WARNING:** Do not use strap covers, blankets, thick cushions, or padding under harness straps or child. They interfere with proper fit of harness straps and child could be ejected.

7.8.6.2. Loosen Harness Straps by pulling and holding the short black tab of the Quick Release Strap while pulling gray Harness Straps.

7.8.6.3. Unbuckle Harness Tie at chest by pressing tab and pulling apart.

7.8.6.4. Press Red Button on Crotch Strap Buckle and remove Harness Tongues.

7.8.6.5. Place child in car seat with child's bottom and back firmly against the back of the car seat.

7.8.6.6. Place child's arms through Harness Straps and insert both Harness Tongues into Buckle.

**WARNING:** Child must be dressed in clothing with arms and legs that will not interfere with Buckling Latch Tongue

7.8.6.7. Pull up on Tongues to ensure Buckle is locked.

7.8.6.8. Position Harness Tie at mid chest or 3 inches below child's chin in order to keep Harness Straps snug on child's shoulders (helps to prevent ejection).

7.8.6.9. Lock Harness Tie at chest by snapping halves together and pull to confirm lock up.

7.8.6.10. Pull Quick Adjust Strap located at front of seat to tighten Harness Straps (long black strap with gray tab).

7.8.6.11. Harness Straps must be snug against child with just enough room for you to insert one finger between each Harness Strap and child's chest.

**WARNING:** Do not use Harness Straps that are loose or unbuckled. Harness Straps must be snug and positioned over shoulders or child could be seriously injured.

7.8.6.12. Use the Infant Support Pillow or two rolled towels if necessary to support baby's head and body.

### **7.8.7. Changing Harness Strap Slots.**

7.8.7.1. Loosen Harness Straps by pulling and holding the Quick Adjustment Tab (short black tab at lower front) while pulling gray Shoulder Harness.

7.8.7.2. Place Car Seat in Upright Position (#4) and remove both Harness Strap Loops from the Splitter Plate on the back of the seat.

7.8.7.3. Pull Harness Straps out of current slots and move to appropriate set of matching slots.

7.8.7.4. Re-attach Harness Strap Loops to Splitter Plate using one of the following steps:

7.8.7.4.1. Infants or Small Toddlers: Place top loop of right harness strap onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

7.8.7.4.2. Toddlers: Use the bottom loops of harness straps onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

**CAUTION:** Make sure ends of straps are behind opening of Splitter Plate and not twisted. Make sure the black Splitter Plate Strap/Quick Adjust Strap passes between Adjuster Lever and Car Seat Frame (i.e. not entangled with the operating mechanisms) and strap is not twisted.

**7.8.8. Re-attach seat pad.**

**Attachment 5****IC 2001-02 TO AFI 41-309, AEROMEDICAL EVACUATION EQUIPMENT STANDARDS****15 OCTOBER 2001*****SUMMARY OF REVISIONS***

This Interim Change 2001-2 corrects erroneous paragraph numbering contained in previous Interim Change 2001-1. Review the added equipment items in their entirety prior to operational use. Follow pre-flight guidance before use in-flight.

**7.9. Century "Smart Move" Infant/Toddler Car Seat.****Figure 7.9. The Century "Smart Move" Infant/Toddler Car Seat – Front View.**

**7.9.1. Purpose:** The Century "Smart Move" Car Seat is certified for restraint of infants and toddlers during transport in motor vehicles and aircraft.

**7.9.2. Description:** The Century Car Seat accommodates infants and toddlers from birth to 40 lbs. or 40 in. Car seat may be positioned forward or aft facing according to occupant's size. Seat belt threading points are available for both positions. The car seat has four adjustable seating positions numbered 1-4 on

the left side. Two reclining positions (#1-fully reclined and #2-semi-reclined) provide a maximum 47 degree recline and do not lock in fixed position. On impact, the reclined seat automatically adjusts to an upright position for greater protection. Two sitting positions (#3-semi-upright and #4-upright) provide some upright adjustment and lock in fixed position. Either of two Blue Release Levers (one front and one rear) may be used to rotate the car seat to the selected position. An adjustable Five-Point Harness restrains the occupant as follows: A Two-Piece Harness Tie connects the shoulder straps at the chest (two points), and two Metal Tongues slide down the shoulder straps and plug into the Crotch Strap Buckle between the legs (three points). Both buckles have push button, quick release mechanisms for rapid operation. The Shoulder Harness is threaded through one of three sets of matching slots in the seat back to accommodate shoulder height. The Crotch Strap extends upward from the seat bottom and is not adjustable. On the back of the car seat, the Shoulder Harness attaches to a Metal Splitter Plate connected to a black Quick Adjustment Strap. The black Quick Adjustment Strap and Release Tab are located at the front of the car seat and rapidly tighten or loosen the Harness Straps. A Level Indicator is located on the left side of the seat to ensure proper positioning when securing the seat (rear-facing only). And finally, a removable Infant Support Pillow supports neck and body alignment of smaller occupants. Turning the pillows inside out provides some adjustment to accommodate larger infants.

### **7.9.3. Components:**

7.9.3.1. Plastic Seat Frame and Styrofoam Liner (white).

7.9.3.2. Headrest Foam (yellow).

7.9.3.3. Seat Cover with four Attachment Clips.

7.9.3.4. Adjustable Infant Support Pillow with four Velcro Attachments.

7.9.3.5. Harness Strap with sliding Two-Piece Harness Tie (connects at chest) and two sliding Metal Tongues (connect to Crotch Strap Buckle).

7.9.3.6. Crotch Strap and Buckle secured by Metal Crotch Strap Clip underneath seat.

7.9.3.7. Locking Clip stored on bottom of seat (used on Combination Lap/Shoulder Belt with sliding Latch).

7.9.3.8. Quick Adjust Strap (long black) connected to Metal Splitter Plate.

7.9.3.9. Quick Release Pull Tab (short black).

7.9.3.10. Level Indicator. (left side of car seat)

### **7.9.4. Preflight.**

7.9.4.1. Observe the back of the Car Seat for manufacturer's "Do Not Use After" date, which is imprinted on the plastic of the seat back.

7.9.4.2. Inspect the Car Seat Frame, Styrofoam Liner, and Headrest Foam for general cleanliness and damage.

7.9.4.3. Observe Seat Cover's four attachment clips for serviceability and secure attachment.

7.9.4.4. Inspect Infant Support Pillow and four Velcro Connectors for cleanliness and function.

7.9.4.5. Test Front and Rear Release Levers lockup and release in all four-seat positions.

7.9.4.6. Confirm spring operation by manually pushing seat from reclining positions #1 and #2 to sitting position while observing spring resistance and return to selected position.

7.9.4.7. Confirm positive seat lock in fixed sitting positions #3 and #4.

7.9.4.8. Ensure Harness Straps are not frayed and stitching is intact.

7.9.4.9. Confirm Shoulder Harness Straps are threaded through matching slots (same height).

7.9.4.10. Inspect rear of seat for proper positioning of Harness Loops on Splitter Plate (right on first, then left with both inside splitter plate).

7.9.4.11. Examine Crotch Strap Clip underneath seat for secure attachment on metal plate.

7.9.4.12. Clear Buckle and Harness Tie of loose objects, food particles, or any other debris.

7.9.4.13. Connect Buckle of the two piece shoulder harness and, pull to test secure latching, and confirm function of quick release mechanism.

7.9.4.14. Connect metal tongues of shoulder harness to crotch strap buckle, and pull to test secure latching, and test quick release button on crotch strap.

7.9.4.15. Pull long black Quick Adjust Strap, observe harness tightening, and test lock-up by pulling shoulder harness.

7.9.4.16. Pull Quick Release Tab and pull shoulder harness to confirm proper release.

7.9.4.17. Visualize Level Indicator for movement of indicator ball.

#### **7.9.5. Operation:**

**NOTE:** The manufacturer's instructions were written for forward facing Motor Vehicle and Civilian Aircraft Seats. Therefore, Aeromedical Evacuation Applications may appear to be in conflict with strict interpretation of manufacturer's instruction manual and instruction stickers located on the car seat. Refer to this equipment guide for Aeromedical Evacuation applications.

**WARNING:** Preterm or low birth weight infants may be at special risk in a vehicle or aircraft. According to the American Academy of Pediatrics, these infants may suffer breathing difficulties while reclined in a car seat. Manufacturer advises the physician or hospital staff evaluate the infant and recommend proper car seat or bed before leaving the hospital. In the Aeromedical Evacuation Environment, the AECM shall secure the infant and ensure the airway is protected. Any questions or concerns should be addressed to the Flight Surgeon.

**NOTE:** Car seats will always be placed along the fuselage of the C-9A. For all aircraft, car seats will not be secured in seats adjacent to an "Emergency Exit" or interfere with the distribution of "Emergency Oxygen Masks."

**NOTE:** When using car seat in reclined or semi-reclined positions, it is necessary to recline passenger seat, impeding egress behind it. Therefore, that seat will be kept vacant.

7.9.5.1. NATO Litter/Backrest Configuration.

**Figure 7.10. The Century Car Seat attached to NATO Litter/Backrest – Aft facing View.**



7.9.5.1.1. Litter/Backrest combination faces aft with backrest 90° upright at forward end of litter.

7.9.5.1.2. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.9.5.1.3. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.9.5.1.4. Now tighten litter strap one so that the buckle is beneath the bottom of the car seat's base so that it does not interfere with rotation of the car seat mechanism.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.9.5.1.5. Car seat is placed on the litter/backrest in the aft facing position and held firmly against the backrest and litter.

7.9.5.1.6. Level indicator is observed for green alignment.

7.9.5.1.7. Third litter strap is threaded through seat the car seat belt slots closest to backrest and passed through the litter stirrups to be buckled and tightened.

7.9.5.1.8. Wrap both ends of the second strap over the outside corners of the car seat's base and return to the stirrups for securing (a fourth strap is required to extend the strap for securing).

7.9.5.1.9. Rock car seat back and forth and side to side to ensure little or no movement occurs.

7.9.5.1.10. Re-check level indicator.

**CAUTION:** Cargo tie down straps if used should only be ratcheted tight enough to allow minimal movement of car seat in all directions. Over tightening can overstress molded plastic parts of the car seat resulting in weakening or damage.

7.9.5.2. Side facing troop Seat Configuration.

**Figure 7.11. The Century Car Seat attached to troop seat – Side View.**



**NOTE:** This method of securing is not intended for the troop seats on the C-17.

7.9.5.2.1. Car seat is always positioned aft facing on side facing Troop Seat.

7.9.5.2.2. Level car seat.

7.9.5.2.3. Take down the seat back webbing for two side-by-side seats.

7.9.5.2.4. First litter strap is placed through the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.9.5.2.5. Thread second litter strap through the first litter strap at the front base at the foot of the car seat for future use.

7.9.5.2.6. Tighten litter strap #1 so that the buckle is beneath the bottom of the car seat's base ensuring it does not interfere with rotation of the care seat mechanism. Place the car seat on a wool blanket.

**NOTE:** Ensure strap #2 does not fall beneath the car seat when tightening strap #1.

7.9.5.2.7. Place litter strap #3 through the seatbelt slots located at the back of the car seat.

7.9.5.2.8. Bring strap #3 around the front and the back of the seat bottom tubes and secure tightly below the seat.

7.9.5.2.9. Wrap both ends of strap #2 over the outside corners of the car seat's base and place around the front and the back of the seat bottom tubes. Secure tightly below the seat.

7.9.5.2.10. Level car seat. Ensure rotation of car seat is not impeded.

7.9.5.3. Aft Facing Blue Seat Configuration.

**WARNING:** Car seat and occupant face aft regardless of age and size (40 lb., 40 in. maximum).

**NOTE:** Occupants up to 30 lbs. or 12 months will use reclined (#1) or semi-reclined (#2) position.

**NOTE:** Occupants over 30 lbs. or 12 months will use semi-upright (#3) or upright (#4) position.

7.9.5.3.1. To install Car Seat. Squeeze blue lever at front or rear of car seat and Move Car Seat to appropriate Reclined or Upright Position (#1-#4) by aligning pointer to desired position and confirm positive lock.

**NOTE:** Because of car seat design, you may experience some movement of the pointer in positions #1 and #2 during vehicle seat belt tightening. This is normal as long as the pointer stays within the red zone for the selected position.

7.9.5.3.2. Thread litter strap through openings closest to seat back (over top of blue recline lever and beneath straps) and buckle around the passenger seat.

7.9.5.3.3. Press down firmly in center of car seat to compress passenger seat cushion as you tighten the litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.9.5.3.4. Place aircraft seat belt around the front of the car seat and tighten securely.

**WARNING:** Car seat must be able to rotate freely from a Reclined to an Upright Position on impact. The seat frame or base must not be blocked in any way that could obstruct rotation.

7.9.5.3.5. Test for secure installation by pulling front to back and twisting side to side to assure seat has little or no movement.

**WARNING:** Level Car Seat. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone. Car seat must be properly leveled. If reclined excessively the results may contribute to injury or ejection. If placed in excessive upright position breathing difficulties may occur. Re-check level indicator once car seat is snugly anchored and infant is positioned in car seat.

7.9.5.4. Forward facing blue seat.

**WARNING:** Forward facing toddlers more than 20 lbs. must have car seat in semi-upright (#3) or upright (#4) position.

**NOTE:** Toddlers 20-30 lbs capable of sitting upright unassisted will be placed in the semi-upright (#3) or upright (#4) position and will face forward.

**NOTE:** Infants from birth to 20 lbs or up to 12 months will face aft and be secured in the following manner.

7.9.5.4.1. First litter strap is secured around the length of the car seat base, entering beneath the front blue release handle and exiting beneath the rear blue release handle. Connect the strap to itself, but do not tighten completely.

7.9.5.4.2. Thread second litter strap through the first litter strap at the back of the car seat base for future use.

7.9.5.4.3. Thread litter strap through car seat seatbelt slot closest to aircraft seat back.

7.9.5.4.4. Press down firmly in center of car seat to compress passenger seat cushion as you tighten litter strap. (Knee will need to be used for tightening to press firmly into the blue seat).

7.9.5.4.5. Take litter strap #2 and anchor it around the front post beneath foot of passenger seat.

7.9.5.4.6. Level car seat

7.9.5.4.7. If any part of the ball falls within the red zones, place folded towel under car seat until entire ball is in green zone.

7.9.5.4.8. Ensure rotation of the car seat is not impeded.

#### **7.9.6. Place Child in Car Seat.**

7.9.6.1. Harness Straps must be placed in top, middle, or bottom set of matching slots, at or just below the top of the child's shoulders (see Section 7.6.5.3. Changing Harness Strap Slots).

**WARNING:** Do not use strap covers, blankets, thick cushions, or padding under harness straps or child. They interfere with proper fit of harness straps and child could be ejected.

7.9.6.2. Loosen Harness Straps by pulling and holding the short black tab of the Quick Release Strap while pulling gray Harness Straps.

7.9.6.3. Unbuckle Harness Tie at chest by pressing tab and pulling apart.

7.9.6.4. Press Red Button on Crotch Strap Buckle and remove Harness Tongues.

7.9.6.5. Place child in car seat with child's bottom and back firmly against the back of the car seat.

7.9.6.6. Place child's arms through Harness Straps and insert both Harness Tongues into Buckle.

**WARNING:** Child must be dressed in clothing with arms and legs that will not interfere with Buckling Latch Tongue

7.9.6.7. Pull up on Tongues to ensure Buckle is locked.

7.9.6.8. Position Harness Tie at mid chest or 3 inches below child's chin in order to keep Harness Straps snug on child's shoulders (helps to prevent ejection).

7.9.6.9. Lock Harness Tie at chest by snapping halves together and pull to confirm lock up.

7.9.6.10. Pull Quick Adjust Strap located at front of seat to tighten Harness Straps (long black strap with gray tab).

7.9.6.11. Harness Straps must be snug against child with just enough room for you to insert one finger between each Harness Strap and child's chest.

**WARNING:** Do not use Harness Straps that are loose or unbuckled. Harness Straps must be snug and positioned over shoulders or child could be seriously injured.

7.9.6.12. Use the Infant Support Pillow or two rolled towels if necessary to support baby's head and body.

#### **7.9.7. Changing Harness Strap Slots.**

7.9.7.1. Loosen Harness Straps by pulling and holding the Quick Adjustment Tab (short black tab at lower front) while pulling gray Shoulder Harness.

7.9.7.2. Place Car Seat in Upright Position (#4) and remove both Harness Strap Loops from the Splitter Plate on the back of the seat.

7.9.7.3. Pull Harness Straps out of current slots and move to appropriate set of matching slots.

7.9.7.4. Re-attach Harness Strap Loops to Splitter Plate using one of the following steps:

7.9.7.4.1. Infants or Small Toddlers: Place top loop of right harness strap onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

7.9.7.4.2. Toddlers: Use the bottom loops of harness straps onto Splitter Plate slot, then place top loop of left harness strap on Splitter Plate slot.

**CAUTION:** Make sure ends of straps are behind opening of Splitter Plate and not twisted. Make sure the black Splitter Plate Strap/Quick Adjust Strap passes between Adjuster Lever and Car Seat Frame (i.e. not entangled with the operating mechanisms) and strap is not twisted.

#### **7.9.8. Re-attach seat pad.**