# Isolette® Infant Incubator Service Manual

## Revisions

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Revisions

man223rh

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Purpose

This manual provides requirements for the Isolette® Infant Incubator normal operation and maintenance. It also includes parts lists (in chapter 5) for ordering replacement components.

Audience

This manual is intended for use by only facility-authorized personnel. Failure to observe this restriction can result in severe injury to people and serious damage to equipment.

Organization

This manual contains seven chapters.

Chapter 1: Introduction

In addition to a brief description of this service manual, chapter 1 also provides a product overview.

Chapter 2: Troubleshooting Procedures

Repair analysis procedures are contained in this chapter. Use these procedures to gather information, identify the maintenance need, and verify the effectiveness of the repair.

Chapter 3: Theory of Operation

This chapter describes the application of the mechanical, electrical, and hydraulic systems employed in this product.

Chapter 4: Removal, Replacement, and Adjustment Procedures

Chapter 4 contains the detailed maintenance procedures determined necessary in chapter 2.
Chapter 5: Parts List

This chapter contains the warranty, part-ordering procedure, and illustrated parts lists.

Chapter 6: General Procedures

Cleaning, preventive maintenance, and other general procedures are described in this chapter.

Chapter 7: Accessories

A list of additional products, that can be used in conjunction with the Isolette® Infant Incubator, is available in chapter 7. Installation procedures for these accessories are also included.
Typographical Conventions

This manual contains different typefaces and icons designed to improve readability and increase understanding of its content. Note the following examples:

- **Standard text**—used for regular information.
- **Boldface text**—emphasizes a word or phrase.
- **NOTE:**—sets apart special information or important instruction clarification.
- The symbol below highlights a WARNING or CAUTION:

**Figure 1-1. Warning and Caution**

⚠️

- A WARNING identifies situations or actions that may affect patient or user safety. Disregarding a warning could result in patient or user injury.
- A CAUTION points out special procedures or precautions that personnel must follow to avoid equipment damage.

- The symbol below highlights an ELECTRICAL SHOCK HAZARD WARNING:

**Figure 1-2. Electrical Shock Hazard Warning**

⚠️

- The symbol below indicates WARNING: CONSULT ACCOMPANYING DOCUMENTS:

**Figure 1-3. Warning: Consult Accompanying Documents**

⚠️
Typographical Conventions

Chapter 1: Introduction

- The symbol below indicates WARNING: HOT SURFACE:

  **Figure 1-4. Warning: Hot Surface**

- The symbol below indicates WEIGHT LOAD:

  **Figure 1-5. Weight Load**

- The symbol below indicates DANGER: EXPLOSION HAZARD—DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHETICS:

  **Figure 1-6. Danger: Explosion Hazard—Do Not Use in the Presence of Flammable Anesthetics**
Technical Definitions

This manual contains different technical terms. Note the following definitions:

- **Incubator temperature**—The air temperature at a point 4" (10 cm) above and centered over the mattress surface.

- **Control temperature**—The temperature controller’s set point selected by the user.

- **Average incubator temperature**—The average of the maximum and minimum incubator temperatures achieved during temperature equilibrium.

- **Incubator temperature equilibrium**—The condition reached when the average incubator temperature does not vary more than 1°C over a period of one hour. These measurements are taken at the control temperatures of 90°F (32°C) and 97°F (36°C).

- **Temperature uniformity**—The amount by which the average temperature of each of four points 4" (10 cm) above the mattress surface differs from the average incubator temperature at incubator temperature equilibrium.

- **Temperature rise time**—The time required for the incubator temperature to rise 20°F (11°C), when the air control temperature is at least 22°F (12°C) above the ambient temperature.

- **Temperature overshoot**—The amount by which incubator temperature exceeds average incubator temperature at incubator temperature equilibrium as a result of an increase in control temperature. Additionally, the incubator temperature equilibrium shall be restored within 15 min as a result of an increase in control temperature value.

- **Temperature correlation: Incubator temperature versus control temperature**—The amount the air temperature indicator at incubator temperature equilibrium differs from the control temperature.

- **Temperature correlation: Temperature indicator versus control temperature**—The amount the air temperature indicator in air mode at incubator temperature equilibrium differs from the control temperature.

- **Measurement points**—Measurements are taken at five points in a plane parallel to and 4" (10 cm) above the mattress surface: One point (A) is 4" (10 cm) above the center of the mattress, and the remaining four points (B) are the centers of four areas formed by lines that divide both the width and length into two parts (see figure 1-7 on page 1-8).
Figure 1-7. Measurement Points
Introduction

Overview

The Model C2000 Isolette® Infant Incubator provides a therapeutic environment for the care for low birth-weight neonates. The Model C2000 Isolette® Infant Incubator provides the following features:

- Data trending—The unit graphically trends critical data, such as air temperature, skin temperature, heater power, oxygen, and humidity, for intervals of 12 to 24 hours, and up to seven days for weight changes.
- Thermal performance—The unit’s thermal management capabilities provide a patented dual-air curtain that reduces radiant heat loss from the infant by warming the surface of the inner hood.
- Bi-directional airflow—Bi-directional airflow minimizes temperature fluctuations within the incubator when the access doors are opened. A microprocessor controller quickly and accurately regulates temperature, humidity, and oxygen levels within the incubator.
- Low operating sound levels—The unit’s low operating sound levels ensure a developmentally-supportive environment for infants.
- Centralized care for multiple births—The unit allows for co-bedding, enabling the caregiver to monitor and care for multiple births. The incubator mattress provides the needed space to care for two infants and enough room for both to grow comfortably.
- Integrated x-ray cassette tray—Located beneath the mattress, the x-ray cassette tray slides out smoothly to avoid disturbing the baby.
- Infant access—By using the front and side access, two clinicians can simultaneously care for an infant while he or she remains in the incubator, reducing handling and adverse stimulation.
- Servo-controlled oxygen—Oxygen delivery is simplified by selecting and controlling whole hood oxygen concentrations from 21% to 65%. Calibration can be performed in room air or in 100% oxygen. The process can be done while the caregiver monitors the infant, without interfering with the thermal environment.
- Servo-controlled humidity—The front-loading humidity reservoir requires filling only once every 24 hours. The caregiver can set the desired relative humidity, minimizing the infant’s evaporative heat loss.
- Remote monitoring—An RS-232 port and the VueLink™ software enable the user to view patient parameters from the Isolette® Infant Incubator on a bedside patient monitor or a central monitoring system.

1. VueLink™ is trademark of Philips Medical Systems.
Operating Precautions

For additional operating precautions for the Isolette® Infant Incubator and its accessories, refer to the Isolette® Infant Incubator User Manual.

Features

Oval Access Doors

Dual access doors are provided with a quiet latch.

Mattress Tilt Mechanism

A mattress tilt mechanism is provided, and is continuously variable from 0° to 12° from either end.

Pedestal Stand Assembly

The pedestal stand assembly is available in two models: fixed height and variable height adjustable.

Oxygen Control System (Optional)

The oxygen control system monitors and controls the oxygen concentration level within the incubator hood environment.

Humidity System (Optional)

The humidity system monitors and controls the humidity level within the incubator hood environment.

Weighing Platform (Optional)

A weighing platform located under the mattress measures the weight of the infant.
Specifications

Physical Description

For the physical specifications of the Model C2000 Isolette® Infant Incubator, see Table 1-1 on page 1-11.

Table 1-1. Physical Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height from floor (fixed pedestal stand model)</td>
<td>56&quot; ± ½&quot; (142 cm ± 12.7 mm)</td>
</tr>
<tr>
<td>Height from floor (variable height adjustable model)</td>
<td>52½&quot; ± ½&quot; to 60&quot; ± ½&quot; (133.35 cm ± 12.7 mm to 152 cm ± 12.7 mm)</td>
</tr>
<tr>
<td>Mattress to floor (fixed pedestal stand model)</td>
<td>39¾&quot; ± ½&quot; (100.97 cm ± 12.7 mm)</td>
</tr>
<tr>
<td>Mattress to floor (variable height adjustable model)</td>
<td>35½&quot; ± ½&quot; to 43½&quot; ± ½&quot; (90.17 cm ± 12.7 mm to 110.49 cm ± 12.7 mm)</td>
</tr>
<tr>
<td>Depth</td>
<td>&lt; 23½&quot; (59.69 cm)</td>
</tr>
<tr>
<td>Overall width with tilt knobs</td>
<td>&lt; 41&quot; (104 cm)</td>
</tr>
<tr>
<td>Weight (fixed pedestal stand model without options or accessories)</td>
<td>195 lb (88 kg)</td>
</tr>
<tr>
<td>Weight (variable height adjustable model without options or accessories)</td>
<td>200 lb (91 kg)</td>
</tr>
<tr>
<td>IV pole maximum static load</td>
<td>10.4 lb (4.7 kg)</td>
</tr>
<tr>
<td>Monitor shelf maximum static load</td>
<td>25 lb (11 kg)</td>
</tr>
<tr>
<td>Mattress tray width</td>
<td>31&quot; (79 cm)</td>
</tr>
<tr>
<td>Mattress tray depth</td>
<td>16&quot; (41 cm)</td>
</tr>
<tr>
<td>Mattress Trendelenburg/Reverse Trendelenburg tilt</td>
<td>Continuously variable to 12° ± 1°</td>
</tr>
<tr>
<td>Environmental temperature operating range</td>
<td>68°F (20°C) to 86°F (30°C)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-4°F (-20°C) to 140°F (60°C)</td>
</tr>
<tr>
<td>Air Mode temperature range</td>
<td>68°F (20°C) to 98.6°F (37.0°C)</td>
</tr>
<tr>
<td>Air Mode temperature range in Temperature Override Mode</td>
<td>98.6°F (37.0°C) to 102.2°F (39.0°C)</td>
</tr>
</tbody>
</table>
### Specifications

**Chapter 1: Introduction**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Mode temperature range</td>
<td>93.2°F (34.0°C) to 98.6°F (37.0°C)</td>
</tr>
<tr>
<td>Skin Mode temperature range in Temperature Override Mode</td>
<td>93.2°F (34.0°C) to 100.4°F (38.0°C)</td>
</tr>
<tr>
<td>Temperature rise time, typical at 72°F (22°C) ambient</td>
<td>&lt; 35 minutes</td>
</tr>
<tr>
<td>Temperature variability</td>
<td>&lt; 0.5°C maximum</td>
</tr>
<tr>
<td>Temperature overshoot</td>
<td>&lt; 0.5°C maximum</td>
</tr>
<tr>
<td>Temperature uniformity</td>
<td>&lt; 0.8°C</td>
</tr>
<tr>
<td>Correlation of the indicated air temperature to the actual incubator</td>
<td>≤ 0.8°C</td>
</tr>
<tr>
<td>temperature after temperature equilibrium is reached</td>
<td></td>
</tr>
</tbody>
</table>
**Electrical Description**

For Isolette® Infant Incubator electrical specifications, see table 1-2 on page 1-13.

**Table 1-2. Electrical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power requirements of an incubator with a fixed height pedestal stand (100V and 120V models)</td>
<td>100V/120V ± 10%, 50/60 Hz, 630 W maximum</td>
</tr>
<tr>
<td>Power requirements of an incubator with a variable height adjustable (VHA) pedestal stand (100V and 120V models)</td>
<td>100V/120V ± 10%, 50/60 Hz, 1900 W maximum</td>
</tr>
<tr>
<td>Power requirements of an incubator with a fixed height or a VHA pedestal stand (220V and 240V models)</td>
<td>220V or 240V ± 10%, 50/60 Hz, 2376 W maximum</td>
</tr>
<tr>
<td>Convenience outlets (100V and 120V models)</td>
<td>100V/120V ± 10%, 50/60 Hz, 500 W maximum</td>
</tr>
<tr>
<td>Convenience outlets (220V and 240V models)</td>
<td>220V or 240V, 500 W maximum</td>
</tr>
<tr>
<td>Chassis current leakage (110V and 120V models)</td>
<td>300 μA or less</td>
</tr>
<tr>
<td>Chassis current leakage (220V and 240V models)</td>
<td>500 μA or less</td>
</tr>
</tbody>
</table>
**Oxygen Control Description**

For Isolette® Infant Incubator oxygen control specifications, see table 1-3 on page 1-14.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen display range</td>
<td>18% to 100%</td>
</tr>
<tr>
<td>Oxygen display resolution</td>
<td>1% oxygen</td>
</tr>
<tr>
<td>Oxygen display accuracy (100% calibration)</td>
<td>± 3%</td>
</tr>
<tr>
<td>Oxygen display accuracy (21% calibration)</td>
<td>± 5%</td>
</tr>
<tr>
<td>Oxygen set resolution</td>
<td>1%</td>
</tr>
<tr>
<td>Oxygen setpoint range</td>
<td>21% to 65%</td>
</tr>
</tbody>
</table>

**Humidity Description**

For Isolette® Infant Incubator humidity specifications, see table 1-4 on page 1-14.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td>5% to 99% relative humidity (RH), non-condensing</td>
</tr>
<tr>
<td>Storage range</td>
<td>0% to 99% RH, non-condensing</td>
</tr>
<tr>
<td>Operating time without refilling</td>
<td>&gt; 24 hours maximum at 85% RH</td>
</tr>
<tr>
<td>Humidity control accuracy at 10% to 80%</td>
<td>± 6% RH</td>
</tr>
<tr>
<td>at 68°F (20°C) to 104°F (60°C)</td>
<td></td>
</tr>
<tr>
<td>Maximum humidity level at the incubator’s</td>
<td></td>
</tr>
<tr>
<td>set temperature of 102°F (39°C)</td>
<td>&gt; 85% RH</td>
</tr>
<tr>
<td>Humidity setpoint range</td>
<td>30% to 95% RH</td>
</tr>
</tbody>
</table>
Scale Description

For Isolette® Infant Incubator scale specifications, see table 1-5 on page 1-15.

Table 1-5. Scale Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight display range</td>
<td>0 kg (0 lb) to 7 kg (15 lb)</td>
</tr>
<tr>
<td>Weight display resolution</td>
<td>1 g or 1 oz</td>
</tr>
<tr>
<td>Weight display accuracy</td>
<td>± 2 g (0.07 oz) ≤ 2 kg (4.4 lb) or 5 g (0.18 oz) ≥ 5 kg (11 lb)</td>
</tr>
<tr>
<td>Weight zeroing limit during infant weighing</td>
<td>&gt; 3.5 kg (7.7 lb)</td>
</tr>
</tbody>
</table>

Regulations, Standards, and Codes

The Model C2000 Isolette® Infant Incubator meets the following specifications:

- IEC 601-1
- IEC 601-2-19
- UL-2601
- With respect to the International Electrotechnical Commission (IEC) 601-1, the incubator is Class 1, Type BF.
- On the variable height adjustable model, the mode of operation is continuous operation with short-time loading.
Model Identification and Series Changes

For Isolette® Infant Incubator model identification, see table 1-6 on page 1-16.

Table 1-6. Model Identification

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2000</td>
<td>Isolette® Infant Incubator</td>
</tr>
</tbody>
</table>

For Isolette® Infant Incubator hood/shell assembly series identification, see table 1-7 on page 1-16.

Table 1-7. Series Identification for the Hood/Shell Assembly

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2HS-1, C2HS1-400</td>
<td>Isolette® Infant Incubator hood/shell assembly with panel slide latches</td>
</tr>
<tr>
<td>C2HS01, C2HS-1, C2HS-1400</td>
<td>Isolette® Infant Incubator hood/shell assembly with pawl latches</td>
</tr>
<tr>
<td>C2HS-02</td>
<td>Isolette® Infant Incubator hood/shell assembly with hood lock</td>
</tr>
<tr>
<td>C2HS-03</td>
<td>Isolette® Infant Incubator hood/shell assembly with modification 170</td>
</tr>
</tbody>
</table>

For Isolette® Infant Incubator controller series identification, see table 1-8 on page 1-16.

Table 1-8. Series Identification for the Controller

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2C-2-00</td>
<td>Isolette® Infant Incubator controller</td>
</tr>
</tbody>
</table>
For Isolette® Infant Incubator fixed height pedestal stand assembly series identification, see table 1-9 on page 1-17.

**Table 1-9. Series Identification for the Fixed Height Pedestal Stand Assembly**

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2STD1-00</td>
<td>Isolette® Infant Incubator fixed height pedestal stand assembly with upper and lower column extrusion</td>
</tr>
<tr>
<td>C2STD1-01</td>
<td>Isolette® Infant Incubator fixed height pedestal stand assembly with upper and lower column weldment</td>
</tr>
<tr>
<td>C2STD2-00</td>
<td>Isolette® Infant Incubator fixed height pedestal stand assembly</td>
</tr>
</tbody>
</table>

For Isolette® Infant Incubator variable height adjustable pedestal stand assembly series identification, see table 1-10 on page 1-17.

**Table 1-10. Series Identification for the Variable Height Adjustable Stand Assembly**

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2VHA-1-00</td>
<td>Isolette® Infant Incubator variable height adjustable pedestal stand assembly</td>
</tr>
</tbody>
</table>

For Isolette® Infant Incubator humidity system series identification, see table 1-11 on page 1-17.

**Table 1-11. Series Identification for the Humidity System**

<table>
<thead>
<tr>
<th>Model/Series Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2RH-1-00</td>
<td>Isolette® Infant Incubator humidity system</td>
</tr>
<tr>
<td>C2RH-1-01</td>
<td>Isolette® Infant Incubator humidity system</td>
</tr>
<tr>
<td>C2RH-2-00</td>
<td>Isolette® Infant Incubator humidity system with manifold assembly</td>
</tr>
</tbody>
</table>
Safety Tips

**WARNING:**
Only facility-authorized personnel should troubleshoot the Model C2000 Isolette® Infant Incubator. Troubleshooting by unauthorized personnel could result in personal injury or equipment damage.

**WARNING:**
Do not use the incubator if it fails to function as described. Personal injury or equipment damage could occur. Refer the unit for servicing by qualified personnel.

**WARNING:**
To prevent personal injury or damage to the variable height adjustable pedestal stand when transporting, employ a person of sufficient strength to adequately control the incubator.

**WARNING:**
A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

**WARNING:**
Two people are required to lift the hood assembly. Failure to use at least two people could result in personal injury or equipment damage.

**WARNING:**
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

**WARNING:**
Follow the product manufacturer’s instructions. Failure to do so could result in personal injury or equipment damage.
WARNING: Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing cleaning procedures. A fire and explosion hazard exists when cleaning in an oxygen-enriched environment.

WARNING: Failure to clean the heater radiator and fan impeller could result in sufficient lint build-up to reduce airflow, which will affect temperature control and cause high oxygen concentrations. Infant injury could occur.

WARNING: Only facility-authorized personnel should perform preventive maintenance on the Model C2000 Isolette® Infant Incubator. Preventive maintenance performed by unauthorized personnel could result in personal injury or equipment damage.

WARNING: Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing maintenance procedures. A fire and explosion hazard exists when performing maintenance procedures in an oxygen-enriched environment.

WARNING: The hood/shell assembly must attach to the pedestal/stand using the screws provided. Failure to do so could result in the hood/shell assembly separating from the pedestal stand when sufficiently tilted, particularly with the hood open. Personal injury or equipment damage could occur.

WARNING: To keep the incubator from sliding when parked on an incline, the pedestal stand’s front locking casters must be facing down the incline and locked.
WARNING:
For the 21% oxygen calibration, the unit **must** be equipped with a standard sensor module lock. Failure to use a standard sensor module could result in incorrect calibration. Infant injury could occur.

WARNING:
For the 100% oxygen calibration procedure, the incubator hood **must** be equipped with the 100% calibration fixture. Failure to use the 100% calibration fixture could result in incorrect calibration. Infant injury could occur.

WARNING:
Oxygen flow rates cannot be used as an accurate indication of oxygen concentration in an incubator. Continuously monitor the oxygen concentrations with a calibrated oxygen analyzer. Failure to do so could result in personal injury or equipment damage.

WARNING:
Ensure all sensor leads are properly routed. Use cable management clips to avoid entanglement and possible infant injury.

SHOCK HAZARD:
Ensure that the building power source is compatible with the electrical specifications shown on the right side of the incubator and the variable height adjustable pedestal stand. For proper grounding reliability, connect the power cord only to a properly marked, three wire, hospital-grade or hospital-use receptacle. Do not use extension cords.

SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.
\textbf{SHOCK HAZARD:}
Do not expose the unit to excessive moisture. Personal injury or equipment damage could occur.

\textbf{CAUTION:}
When using the variable height adjustable pedestal stand, always lower the incubator to its lowest position prior to transport for optimum stability. Failure to do so could result in personal injury or equipment damage.

\textbf{CAUTION:}
Replace both oxygen sensor cells at the same time. Failure to do so could result in equipment damage.

\textbf{CAUTION:}
When reconnecting the rear panel connectors, connect the sensor module-to-connector cable assembly to the sensor module connector only. Do not connect the sensor module cable to the RS-232 connector. Equipment damage could occur.

\textbf{CAUTION:}
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

\textbf{CAUTION:}
Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

\textbf{CAUTION:}
Do not use harsh cleansers, such as scouring pads or heavy-duty grease removers or solvents, such as acetone. Equipment damage could occur.

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
CAUTION:
Some chemical cleaning agents may be conductive and/or leave a residue that may enable a build-up of conductive dust or dirt. Do not permit cleaning agents to contact electrical components. Do not spray cleaning solutions onto any of these surfaces. Equipment damage could occur.

CAUTION:
When cleaning the interior of the incubator shell, prevent liquids from entering the motor shaft opening. Equipment damage could occur.

CAUTION:
Do not use alcohol for cleaning. Alcohol can cause crazing of the clear acrylic hood.

CAUTION:
Do not expose the hood assembly to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gaskets, fading of paint, and crazing of the clear acrylic hood.

CAUTION:
To prevent component damage, ensure that your hands are clean, and only handle the P.C. board by its edges.

CAUTION:
When handling electronic components, wear an antistatic strap. Failure to do so could result in component damage.

CAUTION:
For shipping and storage, place the removed P.C. board in an antistatic protective bag. Equipment damage can occur.

CAUTION:
Do not use silicone-based lubricants. Equipment damage could occur.
CAUTION:
When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.

CAUTION:
Before lifting the incubator hood for cleaning, ensure that all mounted accessories have been removed to prevent possible interference with the raised hood.

CAUTION:
To avoid equipment damage, use only distilled or sterile distilled water. Sterile water alone is not an acceptable substitute for distilled water.

CAUTION:
Use only the programming cable assembly (P/N 83 930 70) to install the software update. Using a standard RS-232 cable assembly could result in equipment damage.

CAUTION:
To prevent damage to the collar that secures the evaporator assembly to the shell assembly, be careful not to twist the evaporator assembly around the horizontal axis when installing its tubing.
**Warning and Caution Labels**

**Figure 1-8. Warning and Caution Labels**

**OXYGEN CONCENTRATION GUIDE**

- **OXYGEN SUPPLY**
  - 3 LPM: 30-45
  - 6 LPM: 40-60
  - 9 LPM: 45-75
  - 12 LPM: 50-85
  - 15 LPM: 60-90

*ALLOW OXYGEN CONCENTRATIONS TO STABILIZE*

**WARNING:**

OXYGEN FLOW RATES CANNOT BE USED AS AN ACCURATE INDICATION OF OXYGEN CONCENTRATIONS IN AN INCUBATOR. OXYGEN CONCENTRATIONS MUST BE CONTINUOUSLY MONITORED WITH A CALIBRATED OXYGEN ANALYZER.

**INLET 1**

**IMPORTANT:**

INSPECT AIR FILTER DURING CLEANING. REPLACE IF NECESSARY.

**WARNING:**

- IMPROPER USE OF SUPPLEMENTAL OXYGEN MAY BE ASSOCIATED WITH SERIOUS SIDE EFFECTS. OXYGEN SHOULD ONLY BE ADMINISTERED BY PROPERLY TRAINED PERSONNEL UNDER THE DIRECTION OF A QUALIFIED ATTENDING PHYSICIAN.
- THE OXYGEN CONCENTRATION INSPIRED BY AN INFANT DOES NOT ACCURATELY DETERMINE THE PARTIAL PRESSURE OF OXYGEN (pO2) IN THE BLOOD. THE pO2 SHOULD BE MEASURED BY AN ACCEPTED CLINICAL TECHNIQUE WHEN ADVISED BY THE ATTENDING PHYSICIAN.
- FIRE HAZARD - KEEP MATCHES AND OTHER SOURCES OF IGNITION OUT OF ROOM IN WHICH OXYGEN IS IN USE. COMBUSTIBLE MATERIALS ARE EASILY IGNITED AND BURN WITH GREAT INTENSITY IN OXYGEN ENRICHED AIR.
- USE OF ANESTHETIC AGENTS CAN INTERFERE WITH OXYGEN ANALYZER ACCURACY.

**DANGER:** EXPLOSION HAZARD. DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHESIA.

**INLET 2**

**- CAUTION -**

- **MAXIMUM 2 LBS WEIGHT (0.91 Kg)**
- **MAXIMUM 5 LBS WEIGHT (2.2 Kg)**
- **MAXIMUM 10 LBS WEIGHT (4.5 Kg)**
Chapter 2
Troubleshooting Procedures

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WARNING:
Only facility-authorized personnel should troubleshoot the Model C2000 Isolette® Infant Incubator. Troubleshooting by unauthorized personnel could result in personal injury or equipment damage.

Begin each procedure in this chapter with step 1. Follow the sequence outlined (each step assumes the previous step has been completed). In each step, the normal operation of the product can be confirmed by answering Yes or No to the statement. Your response will lead to another step in the procedure, a repair analysis procedure (RAP), or a component replacement. If more than one component is listed, replace them in the given order.

To begin gathering information about the problem, start with **Initial Actions**.

To isolate or identify a problem and to verify the repair after completing each corrective action (replacing or adjusting a part, seating a connector, etc.), perform the **Function Checks**.

To verify the repair, perform the **Final Actions** after the Function Checks.

If troubleshooting procedures do not isolate the problem, call Technical Support at (800) 437-2437 for assistance.

**Initial Actions**

To gather information from operators concerning problems with the Isolette® Infant Incubator, use Initial Actions. Note symptoms or other information concerning the problem that the operator describes. This information helps identify the probable cause.

1. Someone who can explain the problem is available.
   - Yes  No
   - ↓  → Go to “Function Checks” on page 2-6.

2. Ask that person to demonstrate or explain the problem. The problem can be duplicated.
   - Yes  No
   - ↓  → Go to “Function Checks” on page 2-6.

3. The problem is a result of improper operator action.
4. Instruct the operator to refer to the procedures in the *Isolette® Infant Incubator User Manual* (usr032). To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

**Function Checks**

**NOTE:**
Perform Function Checks before the incubator is first placed into service and after any disassembly for cleaning or maintenance.

**WARNING:**
Do not use the incubator if it fails to function as described. Personal injury or equipment damage could occur. Refer the unit for servicing by qualified personnel.

**SHOCK HAZARD:**
Ensure that the building power source is compatible with the electrical specifications shown on the right side of the incubator and the variable height adjustable pedestal stand. For proper grounding reliability, connect the power cord only to a properly marked, three-wire, hospital-grade or hospital-use receptacle. Do not use extension cords.

**WARNING:**
To prevent injury or damage to the variable height adjustable pedestal stand when transporting, employ a person of sufficient strength to adequately control the incubator.

**CAUTION:**
When using the variable height adjustable pedestal stand, always lower the incubator to its lowest position prior to transport for optimum stability.

1. Initial Actions have been performed.
   - **Yes**
   - **No**
     → Go to “Initial Actions” on page 2-5.

2. Connect the AC power cord to the pedestal stand, and apply power:
a. Plug the power cord into an appropriate power source.
b. Press the **Power** switch on the pedestal stand.
c. Press the **Power** switch on the incubator’s controller.

**NOTE:**
When turned on, the unit performs a self-test indicated by the **Power-Up Tests** screen. After the self-test, **Display #1** appears.

All indicator lamps light, and the audible alarm pulses.

Yes  No  
↓  → The unit fails the self-test, the alarm sounds, and one or more system failure messages appear in the **Trend** display on **Display #1**. Go to “System Failure Messages” on page 2-31.

3. The **Trend** display is free from any alarm or system prompt messages.

Yes  No  
↓  → Go to “Alarms” on page 2-23.

4. Perform the following:
   a. Allow the unit to operate for at least 3 minutes.
   b. Check the **Power Failure** alarm by unplugging the power cord from its power source.

The **Power Failure** alarm sounds, and the **Power Fail** light-emitting diode (LED) on the controller actuates.

Yes  No  
↓  → Go to RAP 2.1 on page 2-49.

5. Perform the following:
   a. Plug the power cord into an appropriate power source. Ensure that the power cord is fully plugged into the wall, the pedestal stand, and the incubator receptacles.
   b. Set the air set temperature to 95°F (35°C). Allow the unit to operate while checking the hood/shell.

The unit has a variable height adjustable (VHA) pedestal stand (A) (see figure 2-1 on page 2-8).

Yes  No  
↓  → Go to step 8.
Function Checks
Chapter 2: Troubleshooting Procedures

Figure 2-1. Isolette® Infant Incubator
6. Perform the following to check the operation of the VHA pedestal/stand (A):
   a. Using your foot, press the **Up** arrow on the front **Up/Down** switch (C) to raise the VHA pedestal/stand (A) to the maximum height.
   b. Press and hold the **Down** arrow on the **Up/Down** switch (C) to lower the VHA pedestal/stand (A) to the minimum height.
   c. Repeat using the rear **Up/Down** switch (C).

   The VHA pedestal/stand (A) operates smoothly and adjusts to the desired height.

   **Yes**  **No**
   ↓  → Go to RAP 2.2 on page 2-50.

7. The unit is equipped with a non-locking hood assembly (D).
   **Yes**  **No**
   ↓  → Go to step 9.

8. Perform the following to check the operation of the non-locking hood assembly (D) (see figure 2-1 on page 2-8):
   a. Disconnect the weighing scale cable (E) from the sensor module (F).
   b. Slowly tilt the hood assembly (D) back until it comes to rest.
   c. Close the hood assembly (D).
   d. Connect the weighing scale cable (E) to the sensor module (F).

   The hood assembly (D) opens and closes correctly.

   **Yes**  **No**
   ↓  → Go to RAP 2.6 on page 2-58.

9. The hood assembly (D) is equipped with a pivot/hood lock assembly bracket (G).
   **Yes**  **No**
   ↓  → Go to step 11.

10. On the hood assembly (D) equipped with a pivot/hood lock assembly bracket (G), perform the following:
    a. Disconnect the weighing scale cable (E) from the sensor module (F).
    b. Slowly tilt the hood assembly (D) back until it locks in place.
    c. Release the hood assembly (D) by pulling and holding the knob (H) located on the right rear pivot/hood lock assembly bracket (G) while closing the hood assembly (D).
Function Checks
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d. Connect the weighing scale cable (E) to the sensor module (F). The pivot/hood lock assembly bracket (G) operates properly.

<table>
<thead>
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| Go to RAP 2.6 on page 2-58.

11. Perform the following to check the operation of the access panel (I) (see figure 2-2 on page 2-10).

**Figure 2-2. Access Panels**

Series 00 hood

a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I).

or

On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).

b. Pivot the access panel (I) to the full-open position so it hangs straight down.

c. Check the rear access panel (I), if so equipped.

d. Close each access panel (I), and secure them using the blue slide access panel latches (J) or the access panel pawl latch knobs (K).
The blue slide access panel latches (J) or the access panel pawl latch knobs (K) are properly secured to avoid accidental opening of the access panel(s) (I).

<table>
<thead>
<tr>
<th>Yes</th>
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<tr>
<td>→ Go to RAP 2.25 on page 2-81.</td>
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</table>

12. The hood assembly (D) is equipped with an iris entry port (L) (see figure 2-3 on page 2-11).

<table>
<thead>
<tr>
<th>Yes</th>
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**Figure 2-3. Iris Entry Port and Access Doors**

13. Check the iris entry port (L) by rotating its outer ring (N). The iris entry port (L) opens and closes as rotation is continued through 360°.

<table>
<thead>
<tr>
<th>Yes</th>
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<tr>
<td>→ Go to RAP 2.26 on page 2-83.</td>
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14. The hood assembly (D) is equipped with an access door (O).

<table>
<thead>
<tr>
<th>Yes</th>
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<td>→ Go to step 17.</td>
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</table>
15. Press the door release (Q) of each access door (O). Each access door (O) swings open.
   Yes  No
   \[\rightarrow\] Go to RAP 2.27 on page 2-84.

16. Close the access doors (O), and check for proper latching and quietness. The gaskets (R) of each access door (O) are placed properly on the inner and outer walls.
   Yes  No
   \[\rightarrow\] Go to RAP 2.27 on page 2-84.

17. Perform the following:
   a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).
      or
      On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).
   b. Inspect the heat shield latches (S) and the heat shield (T) (see figure 2-4 on page 2-12).

Figure 2-4. Heat Shield
The heat shield latches (S) properly secure the heat shield (T).

Yes  No
↓    → Go to RAP 2.28 on page 2-86.

18. Perform the following to check the operation of the mattress tilt mechanisms:

a. Check the mattress elevators by rotating the right-hand mattress tilt mechanism knob (U) counterclockwise until it stops and the right end of the mattress tray (V) is at a 12° angle (see figure 2-5 on page 2-13).

Figure 2-5. Mattress Tray Assembly

b. Rotate the right-hand mattress tilt mechanism knob (U) clockwise until it stops and the mattress tray (V) is level.

c. Rotate the left-hand mattress tilt mechanism knob (U) clockwise and the left end of the mattress tray (V) is at a 12° angle.

d. Rotate the left-hand mattress tilt mechanism knob (U) counterclockwise and the mattress tray (V) is level.

The mattress tray (V) correctly tilts with the rotation of the mattress tilt mechanism knobs (U).

Yes  No
↓    → Go to RAP 2.29 on page 2-88.
19. Perform the following to check the mattress tray (V) operation:
   a. Slide out the mattress tray (V) to the fully-extended position.
   b. Gradually load a calibrated weight of 22 lb (10 kg) near the front-center of the extended mattress tray (V).

   The mattress tray (V) is a firm platform for an infant.

   Yes  No
   ↓   → Go to RAP 2.30 on page 2-90.

20. Perform the following to check the operation of the air intake microfilter (W) (see figure 2-6 on page 2-14):

**Figure 2-6. Air Intake Microfilter and Oxygen Input Connector**

NOTE:
Oxygen input connector shown removed for clarity.

   a. Return the mattress tray (V) to its original position (see figure 2-5 on page 2-13).
   b. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K) (see figure 2-2 on page 2-10).
WARNING:
A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

c. Loosen the two thumbscrews (X) on the air intake filter cover (Y) (see figure 2-6 on page 2-14).
d. Remove the air intake filter cover (Y) from the unit.
e. Inspect the air intake microfilter (W).

The air intake microfilter (W) has no visible dirt.

Yes  No
↓  → Go to RAP 2.31 on page 2-92.

21. Perform the following to check the operation of the air/oxygen system.

a. Introduce 9 lpm of oxygen into the oxygen input connector (Z).
b. Using a calibrated oxygen analyzer, monitor the oxygen levels within the hood assembly (D) (see figure 2-3 on page 2-11).

The oxygen levels meet the specification of 50% to 70% as indicated on the rear panel of the incubator.

Yes  No
↓  → Go to step 23.

22. Go to step 25.

23. The oxygen concentration level is lower than 50% to 70%.

Yes  No
↓  → The oxygen concentration level is higher than 50% to 70%.
   Go to RAP 2.5 on page 2-56.

24. Go to RAP 2.4 on page 2-54.
25. Perform the following to check the operation of the x-ray tray (AA) (see figure 2-7 on page 2-16):

**Figure 2-7. X-ray Tray**

![Diagram of x-ray tray](image)

- On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).
- **Or**
  - On a unit with a hood assembly (D) other than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).

b. Withdraw the x-ray tray (AA) (see figure 2-7 on page 2-16).

c. Return the x-ray tray (AA) to its original position.

d. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K) (see figure 2-2 on page 2-10).

The x-ray tray (AA) operates correctly (see figure 2-7 on page 2-16).

<table>
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<th>Yes</th>
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</table>
| Go to RAP 2.32 on page 2-94.
26. The hood assembly (D) is equipped with a sensor module lock (AB) (see figure 2-8 on page 2-17).

**Figure 2-8. Sensor Module and Sensor Module Lock**

![Diagram of sensor module and lock](Image)

<table>
<thead>
<tr>
<th>Yes</th>
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27. Perform the following to check the operation of the sensor module lock (AB).
   
a. Pull the sensor module lock (AB) down.
   
b. Slide the sensor module (F) out until it stops.
   
c. Pull the slide assemblies (AC) on the sides of the sensor module (F) to release its stop, and slide the sensor module (F) completely out of the hood assembly (D).
   
d. Return the sensor module (F) to the hood assembly (D). Ensure that the sensor module (F) is fully engaged in the sensor module lock (AB).
   
e. Push the sensor module lock (AB) up.
When the sensor module lock (AB) is raised, the sensor module (F) is locked securely in place.

Yes  No
↓  → Go to RAP 2.33 on page 2-96.

28. Perform the following to check the operation of Air Mode:
   a. Close all access openings.
   b. Allow the incubator to warm up to the air set temperature of 95°F (35°C).

   The incubator takes less than one hour to warm up to the air set temperature of 95°F (35°C).

   Yes  No
   ↓  → Go to RAP 2.34 on page 2-97.

29. When the Air Temperature display stabilizes, the digital display remains within 0.5°C of the set temperature for 15 minutes.

   Yes  No
   ↓  → Go to RAP 2.35 on page 2-99.

30. Perform the following to check the Low Air Temperature alarm:
   a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).
   or
   On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).
   b. Pivot the access panel (I) to the full-open position so it hangs straight down
   c. Allow the unit to operate.

   In less than 5 minutes, the Alarm indicators illuminate, the Low Air Temperature message appears on the Trend display, and an alarm sounds.

   Yes  No
   ↓  → Go to RAP 2.36 on page 2-100.

31. Perform the following to check the Low Skin Temperature alarm:
   a. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K).
   b. Connect the skin probe to skin connector #1 on the sensor module (F) (see figure 2-8 on page 2-17).
c. Place the skin probe 4" (10 cm) above the center of the mattress.

d. Select Skin Mode.

e. Set the skin set temperature to 95°F (35°C).

f. When the temperature stabilizes, position the skin probe outside of the incubator.

g. Allow the unit to operate.

In less than 5 minutes, the **Alarm** indicators illuminate, the **Low Skin Temperature** message appears in place of the **Trend** display, and the alarm sounds.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>Go to RAP 2.37 on page 2-101.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
The sensor module is equipped to accept two skin probes. However, when the second skin probe is connected to the sensor module in Skin Mode, an alarm sounds, and the message **Remove Skin 2 Probe** appears. To connect the second skin probe, first select Air Mode, the controller then displays two temperatures.

32. Perform the following to check the **Skin Probe Disconnect** alarm:

a. Remove the skin probe from the 2 skin connector on the sensor module (F) (see figure 2-8 on page 2-17).

b. Select Skin Mode.

c. Disconnect the skin probe from the 1 skin connector on the sensor module (F).

The alarm sounds, the **Skin Temperature** display goes blank (---), and the message **Skin Probe Disconnect** appears.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→</td>
</tr>
<tr>
<td>Go to RAP 2.38 on page 2-102.</td>
<td></td>
</tr>
</tbody>
</table>

33. Perform the following to check the maximum air temperature.

a. Press the **Silence/Reset** key to silence the **Skin Probe Disconnect** alarm for 5 minutes.

b. Connect a skin probe to the 1 skin connector on the sensor module (F) to return the unit to normal operation.

c. If necessary, select Skin Mode.

d. Select a skin temperature setpoint of greater than 99°F (37°C).
Function Checks

Chapter 2: Troubleshooting Procedures

e. Place the skin probe outside of the incubator.
f. Allow the incubator to heat.
g. When the Skin Temperature alarm sounds, press the Silence/Reset key.

The incubator’s temperature stays below 102.0°F (38.9°C), as indicated by the Air Temperature display.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     | Go to RAP 2.39 on page 2-103.

34. The incubator is equipped with a scale assembly.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     | Go to step 38.

35. Perform the following to check the operation of the scale assembly:
   a. Ensure that the mattress tray is level and not in Trendelenburg or Reverse Trendelenburg.
   b. If you desire a pounds/ounces display, refer to “Installation and Set-up” on page 6-13.
   c. Remove any objects from the mattress.
   d. Select Display 2, and press the Weigh softkey.
   e. Press the Zero softkey twice in succession.

The Weight display reads 0, and the Weight Sample bar begins to fill.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     | Go to RAP 2.47 on page 2-114.

36. Place a weight of known value less than 15 lb (7 kg) on the mattress. The correct weight appears, and when the Weight Sample bar is filled, a beep sounds and the weight is locked into the Weight display.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     | Go to RAP 2.47 on page 2-114.

37. Perform the following:
   a. Press the Home key to return to Display 2.
   b. Press the Weigh softkey.

The display again displays the value of the weight on the mattress.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     | Go to RAP 2.47 on page 2-114.
38. If necessary, remove the weight from the mattress, and press the **Home** softkey. The incubator is equipped with an oxygen system accessory.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→ Go to step 43.</td>
</tr>
</tbody>
</table>

39. Perform the following to check the operation of the oxygen system accessory:

a. Place a calibrated oxygen analyzer inside the hood assembly at 4" (10 cm) above the center mattress.

b. At **Display 1**, press the **Oxygen** softkey.

c. Turn on **Oxygen** control.

d. Set the oxygen setpoint to 45%.

Within 5 minutes, the oxygen analyzer and the **Oxygen** display both read 45% ± 5%.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→ Go to step 41.</td>
</tr>
</tbody>
</table>

40. Go to step 43.

41. The oxygen concentration level is **lower** than 50% to 70%.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→ The oxygen concentration level is <strong>higher</strong> than 50% to 70%. Go to RAP 2.5 on page 2-56.</td>
</tr>
</tbody>
</table>

42. Go to RAP 2.4 on page 2-54.

43. The incubator is equipped with a humidity system accessory.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>→ Go to “Final Actions” on page 2-22.</td>
</tr>
</tbody>
</table>
44. Perform the following to check the operation of the humidity system accessory:

⚠️ CAUTION:
To avoid equipment damage, use **only** distilled or sterile distilled water. Sterile water alone is **not** an acceptable substitute for distilled water.

- a. Fill the humidity reservoir with distilled water **only**.
- b. Place the probe of a calibrated hygrometer inside the hood assembly at 4" (10 cm) above the center mattress.
- c. If necessary, select Air Mode.
- d. Pre-warm the incubator to 95°F (35°C).
- e. At Display 1, press the **Humidity** softkey to turn on the humidity.
- f. Set the humidity setpoint to **50%**.

**NOTE:**
The humidity system sensor has a tolerance of ± 6% relative humidity (RH). Some hygrometers have an additional tolerance of ± 3% RH. When using a hygrometer to determine the performance of the humidity system, allow for a total of ± 6% RH, plus the hygrometer tolerance.

Within 30 to 60 minutes, the hygrometer and **Humidity** display both read **50% ± 6%**.

Yes  No  ↓  Go to RAP 2.40 on page 2-104.

45. Go to “Final Actions” on page 2-22.

---

**Final Actions**

1. Complete the required preventive maintenance procedures. See “Preventive Maintenance Checklist” on page 6-12.

2. Complete all required administrative tasks.
High and Low Air and Skin Temperature Alarms

The high and low air or skin temperature alarms activate if the skin or air temperature fluctuates from the set temperature as follows:

- Skin temperature—± 1.0°C
- Air temperature—+1.5°C, -2.5°C

NOTE:
The skin temperature limits may also be set to ±0.5°C. Refer to “Installation and Set-up” on page 6-13.

A temperature below the air or skin set temperature is indicated by the message **Low Air Temperature** or **Low Skin Temperature** in the message center, an audible alarm, flashing indicators, and a low temperature reading. A temperature above the air or skin set temperature is indicated by the message **High Air Temperature** or **High Skin Temperature** in the message center, an audible tone, flashing indicators, and a high temperature reading.

The high and low air or skin temperature alarms are self-resetting; that is, if the alarm condition is corrected, the alarm automatically silences and the **Alarm** indicators turn off. To silence the audible portion of the **High** and **Low Air** or **Skin Temperature** alarms, press the **Silence/Reset** key; the activation of other audible and visual alarms are not affected by use of the 15-minute audible alarm silence. When the alarm silences, the **Alarm** indicators remain on until the alarm condition is corrected. If the alarm condition is not corrected within 15 minutes, the alarm sounds.

In addition, if the air or skin set temperature changes (either high or low) after the incubator is in operation, the **High Temperature** and **Low Temperature** alarms automatically silence for a specific amount of time after the operator raises or lowers the air or skin set temperature from the current temperature. As a general rule, the greater the change from the current incubator temperature, the longer the alarm remains silent. If the incubator fails to reach the new set temperature after the specified time, the alarm sounds.

Alternately, before changing the current air or skin set temperature, the operator may press the **Silence/Reset** key to place the unit in Procedural Silence Mode. In Procedural Silence Mode, the **Low Temperature** alarm silences for up to 15 minutes. If a **High Temperature**, **Airflow**, or **Probe** alarm occurs, Procedural Silence Mode terminates.
Alarm and System Prompt Messages

During an alarm condition or procedure, alarm and system prompt messages replace the Trend display or the Oxygen and Humidity displays. If two or more alarms occur simultaneously, or one after the other, the messages that describe the alarms appear in sequence. A total of six messages can post.
For an explanation of system alarms, refer to table 2-1 on page 2-25. For more information, refer to “System Failure Messages” on page 2-31.

### Table 2-1. System Alarms

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Failure</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and an alarm beeps to indicate that primary power to the incubator failed, or the power cord is unplugged from its power source.</td>
<td>Go to RAP 2.41 on page 2-106.</td>
</tr>
<tr>
<td><strong>Motor Failure</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate a motor malfunction.</td>
<td>Go to RAP 2.20 on page 2-75.</td>
</tr>
<tr>
<td><strong>Heater Failure 1 And 2</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate a heater malfunction.</td>
<td>Go to RAP 2.18 on page 2-72.</td>
</tr>
<tr>
<td><strong>Controller Failure 1 Through 17</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate an internal malfunction.</td>
<td>Go to “System Failure Messages” on page 2-31.</td>
</tr>
<tr>
<td><strong>Key Stuck</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate a controller key malfunction.</td>
<td>Go to RAP 2.23 on page 2-79.</td>
</tr>
<tr>
<td><strong>Air Probe Failure</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate an air probe malfunction.</td>
<td>Go to RAP 2.8 on page 2-62.</td>
</tr>
<tr>
<td><strong>Low Airflow</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate a lack of air circulation within the incubator.</td>
<td>Go to RAP 2.44 on page 2-111.</td>
</tr>
<tr>
<td><strong>Sensor Module Failure</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate a sensor module malfunction or that it is not connected to the incubator.</td>
<td>Go to RAP 2.45 on page 2-112.</td>
</tr>
<tr>
<td><strong>Sensor Out Of Position</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate that the sensor module is not in the correct position to perform calibration or continue operation.</td>
<td>Go to RAP 2.22 on page 2-78.</td>
</tr>
<tr>
<td><strong>Sensor Disconnected</strong></td>
<td>The <strong>Alarm</strong> indicator flashes and a continuous alarm sounds to indicate that the sensor module experienced a communications failure.</td>
<td>Go to RAP 2.21 on page 2-76.</td>
</tr>
</tbody>
</table>

For an explanation of temperature alarms, refer to table 2-2 on page 2-26.
### Table 2-2. Temperature Alarms

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Air Temperature</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the incubator air temperature is 2.5°C below the air set temperature.</td>
<td>Go to RAP 2.35 on page 2-99.</td>
</tr>
<tr>
<td>High Air Temperature</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the incubator air temperature is 1.5°C above the air set temperature.</td>
<td>Go to RAP 2.39 on page 2-103.</td>
</tr>
<tr>
<td>Skin Mode Disabled</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that Skin Mode is disabled.</td>
<td>To activate Skin Mode, press the <strong>Skin</strong> softkey.</td>
</tr>
<tr>
<td>Low Skin Temperature</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the Skin 1 Probe reports that the baby’s skin temperature is 1°F (or 0.5°C) below the skin set temperature.</td>
<td>Go to RAP 2.3 on page 2-52.</td>
</tr>
<tr>
<td>High Skin Temperature /High Skin 1 Temperature</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that Skin 1 Probe reports that the baby’s skin temperature is 1°F (or 0.5°C) above the skin set temperature.</td>
<td>Go to RAP 2.39 on page 2-103.</td>
</tr>
<tr>
<td>High Temperature Cut Out</td>
<td>The alarm message appears, an alarm sounds, and the steady <strong>Alarm</strong> indicators illuminate to indicate that incubator air temperature has reached 99.5°F (37.5°C) ± 0.5°C for set temperatures up to 98.6°F (37.0°C) and 103.1°F (39.5°C) for set temperatures greater than 98.6°F (37.0°C).</td>
<td>Go to RAP 2.39 on page 2-103.</td>
</tr>
</tbody>
</table>
| Remove Skin 2 Probe        | The alarm message appears, an alarm sounds, and the **Alarm** indicators flash to indicate one of the following:  
  • A second skin probe is connected to the sensor module during Skin Mode.  
  • A second skin probe is connected to the sensor module during Air Mode, and an attempt to enter Skin Mode was made. | Go to RAP 2.46 on page 2-113.               |
<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin 1 Probe Failure</td>
<td>The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the Skin 1 Probe malfunctioned. To silence this alarm for 5 min, press the Silence/Reset key.</td>
<td>Go to RAP 2.42 on page 2-107.</td>
</tr>
<tr>
<td>Skin Probe Disconnect</td>
<td>The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that Skin 1 Probe is disconnected from the sensor module during Skin Mode.</td>
<td>Go to RAP 2.42 on page 2-107.</td>
</tr>
<tr>
<td>Connect Skin 1 Probe</td>
<td>The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the Skin 1 Probe was disconnected from the sensor module during Air Mode and an attempt has been made to enter Skin Mode.</td>
<td>Go to RAP 2.42 on page 2-107.</td>
</tr>
</tbody>
</table>

For an explanation of humidity alarms, refer to table 2-3 on page 2-27.

**Table 2-3. Humidity Alarms**

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Humidity</td>
<td>The alarm message appears with an audible alarm and flashing alarm indicator to indicate that the humidity tray is empty.</td>
<td>Go to RAP 2.40 on page 2-104.</td>
</tr>
<tr>
<td>Humidity Heater Failure</td>
<td>The alarm message appears to inform the user that the humidity system malfunctioned.</td>
<td>Go to RAP 2.40 on page 2-104.</td>
</tr>
</tbody>
</table>
For an explanation of oxygen alarms, refer to table 2-4 on page 2-28.

**Table 2-4. Oxygen Alarms**

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Oxygen %</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the oxygen concentration within the hood environment is below the oxygen setpoint.</td>
<td>Go to RAP 2.4 on page 2-54.</td>
</tr>
<tr>
<td>High Oxygen %</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the oxygen concentration within the hood environment is above the oxygen setpoint.</td>
<td>Go to RAP 2.5 on page 2-56.</td>
</tr>
<tr>
<td>Oxygen Calibration Required</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the oxygen control system requires calibration.</td>
<td>Go to RAP 2.43 on page 2-110.</td>
</tr>
<tr>
<td>Oxygen Cell Different</td>
<td>The alarm message appears, an alarm sounds, and the <strong>Alarm</strong> indicators flash to indicate that the oxygen cell readings differ by greater than 3%.</td>
<td>Go to RAP 2.43 on page 2-110.</td>
</tr>
<tr>
<td>Oxygen Solenoid Fail</td>
<td>This message informs the user that the oxygen solenoid has failed.</td>
<td>Go to RAP 2.43 on page 2-110.</td>
</tr>
</tbody>
</table>

For an explanation of weighing scale alarms, refer to table 2-5 on page 2-28.

**Table 2-5. Weighing Scale Alarms**

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too Much Weight</td>
<td>The alarm message appears with an audible alarm and flashing alarm indicators to indicate that the weight on the mattress is in excess of 15 lb (7 kg), or when zeroing, this message appears if a weight in excess of 2 lb (1 kg), or with software version 2.05 or higher, 7.7 lb (3.5 kg) is on the mattress.</td>
<td>Go to RAP 2.47 on page 2-114.</td>
</tr>
<tr>
<td>Scale Disconnected</td>
<td>The alarm message appears if the cable between the scale and the sensor module is disconnected.</td>
<td>Go to RAP 2.47 on page 2-114.</td>
</tr>
<tr>
<td>Clear Mattress</td>
<td>The alarm message appears if extraneous objects are on the mattress.</td>
<td>Go to RAP 2.47 on page 2-114.</td>
</tr>
</tbody>
</table>
For an explanation of system prompt messages, refer to table 2-6 on page 2-29.

### Table 2-6. System Prompt Messages

<table>
<thead>
<tr>
<th>Prompt Message</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power-On Test in Progress</strong></td>
<td>This message indicates that the controller is performing the power up test.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>21% Cal</strong></td>
<td>This message indicates that the oxygen control system is performing the 21% calibration procedure.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>100% Cal</strong></td>
<td>This message indicates that the oxygen control system is performing the 100% calibration procedure.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>Cal Pass</strong></td>
<td>This message indicates that the oxygen control system is successfully calibrated.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>Cal Fail</strong></td>
<td>This message indicates that the oxygen control system has failed to calibrate.</td>
<td>Go to RAP 2.48 on page 2-117.</td>
</tr>
<tr>
<td><strong>Procedural Silence</strong></td>
<td>This message indicates that the 5-minute Procedural Silence is active. During this time, <strong>Low Skin/Air Temperature</strong> alarms automatically silence for 15 minutes, and the <strong>Low Oxygen %</strong> alarm automatically silences for 4 minutes.</td>
<td>No action required.</td>
</tr>
<tr>
<td><strong>Not Installed</strong></td>
<td>This message informs the user that the humidity or oxygen systems are not activated or installed.</td>
<td>Install the humidity system (refer to procedure 7.3 on page 7-14), or Install the oxygen system (refer to procedure 7.2 on page 7-8).</td>
</tr>
<tr>
<td><strong>Slide Out Sensor</strong></td>
<td>This message advises the user to withdraw the sensor module from the hood during 21% oxygen calibration.</td>
<td>Withdraw the sensor module assembly from the hood.</td>
</tr>
<tr>
<td><strong>Slide In Sensor</strong></td>
<td>This message advises the user to return the sensor module inside the hood during 21% oxygen calibration.</td>
<td>Slide the sensor module assembly into the hood.</td>
</tr>
<tr>
<td><strong>Zeroing Failed</strong></td>
<td>This message informs the user that the weight is greater than 7.7 lb (3.5 kg) on the mattress during infant <strong>ZERO</strong>.</td>
<td>Go to RAP 2.47 on page 2-114.</td>
</tr>
</tbody>
</table>
For an explanation of **Silence/Reset** key functions, refer to table 2-7 on page 2-30.

**Table 2-7. Silence/Reset Key Functions**

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Silence/Reset Key Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Air/Skin Temperature</td>
<td>Silence the alarm for a period of 15 minutes.</td>
</tr>
<tr>
<td>High Air/Skin Temperature</td>
<td>Silence the alarm for a period of 15 minutes.</td>
</tr>
<tr>
<td>Humidity Low</td>
<td>Silence the alarm for a period of 15 minutes.</td>
</tr>
<tr>
<td>Power Failure</td>
<td>Silence the alarm for a period of 15 minutes.</td>
</tr>
<tr>
<td>Skin 1 Probe Failure</td>
<td>Silence the alarm for a period of 5 minutes.</td>
</tr>
<tr>
<td>Skin Probe Disconnect</td>
<td>Silence the alarm for a period of 5 minutes.</td>
</tr>
<tr>
<td>High Temperature Cut Out</td>
<td>Silence the alarm for a period of 5 minutes.</td>
</tr>
<tr>
<td>Oxygen High %</td>
<td>Silence the alarm for a period of 4 minutes.</td>
</tr>
<tr>
<td>Oxygen Low %</td>
<td>Silence the alarm for a period of 4 minutes.</td>
</tr>
<tr>
<td>Oxygen Calibration Required</td>
<td>Silence the alarm for a period of 4 minutes.</td>
</tr>
<tr>
<td>Oxygen Cell Different</td>
<td>Silence the alarm for a period of 4 minutes.</td>
</tr>
<tr>
<td>High Temperature Cut Out</td>
<td>Resets the alarm, or cancels the alarm if the alarm condition no longer exists.</td>
</tr>
<tr>
<td>Sensor Module Failure</td>
<td>Resets the alarm, or cancels the alarm if the alarm condition no longer exists.</td>
</tr>
<tr>
<td>Power Fail</td>
<td>Resets the alarm, or cancels the alarm if the alarm condition no longer exists.</td>
</tr>
</tbody>
</table>
System Failure Messages

In the event of a system failure, a message appears on the controller screen. For system failure messages, their possible causes, and the appropriate action to take, refer to table 2-8 on page 2-31.

Table 2-8. System Failure Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller Failure 1</td>
<td>The EEPROM circuitry fails.</td>
<td>Go to RAP 2.7 on page 2-61.</td>
</tr>
<tr>
<td>Controller Failure 3</td>
<td>The ambient air probe fails.</td>
<td>Go to RAP 2.8 on page 2-62.</td>
</tr>
<tr>
<td>Controller Failure 4</td>
<td>The controller’s cooling fan fails.</td>
<td>Go to RAP 2.9 on page 2-63.</td>
</tr>
<tr>
<td>Controller Failure 5</td>
<td>The display test fails.</td>
<td>Go to RAP 2.10 on page 2-64.</td>
</tr>
<tr>
<td>Controller Failure 6</td>
<td>The external serial port loop-back test fails.</td>
<td>For assistance, call Technical Support at (800) 437-2437.</td>
</tr>
<tr>
<td>Controller Failure 7</td>
<td>The power supply voltage fails.</td>
<td>Go to RAP 2.11 on page 2-65.</td>
</tr>
<tr>
<td>Controller Failure 8</td>
<td>The RAM test fails.</td>
<td>Go to RAP 2.12 on page 2-66.</td>
</tr>
<tr>
<td>Controller Failure 9</td>
<td>The real-time clock fails.</td>
<td>Go to RAP 2.13 on page 2-67.</td>
</tr>
<tr>
<td>Controller Failure 10</td>
<td>The watchdog timer fails.</td>
<td>Go to RAP 2.14 on page 2-68.</td>
</tr>
<tr>
<td>Controller Failure 11</td>
<td>The relay test fails.</td>
<td>Go to RAP 2.15 on page 2-69.</td>
</tr>
<tr>
<td>Controller Failure 13</td>
<td>A heater circuit failure is detected after all relays are off for 5 seconds, or the currents exceed the maximum limits during power-up.</td>
<td>Go to RAP 2.16 on page 2-70.</td>
</tr>
<tr>
<td>Controller Failure 14</td>
<td>A low heater current is detected.</td>
<td>Go to RAP 2.17 on page 2-71.</td>
</tr>
<tr>
<td>Controller Failure 15</td>
<td>The non-volatile RAM contains an invalid parameter.</td>
<td>Go to RAP 2.49 on page 2-118.</td>
</tr>
</tbody>
</table>
# System Failure Messages

## Chapter 2: Troubleshooting Procedures

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Controller Failure 16</strong></td>
<td>The non-volatile RAM integrity fails.</td>
<td>Go to RAP 2.50 on page 2-119.</td>
</tr>
<tr>
<td><strong>Controller Failure 17</strong></td>
<td>The non-volatile RAM parameter consistency check fails.</td>
<td>Go to RAP 2.51 on page 2-120.</td>
</tr>
<tr>
<td><strong>Heater Failed 1</strong></td>
<td>The heater thermocouple voltage exceeds ±40 mV.</td>
<td>Go to RAP 2.18 on page 2-72.</td>
</tr>
<tr>
<td><strong>Heater Failed 2</strong></td>
<td>The heater thermocouple wires are open or shorted.</td>
<td>Go to RAP 2.18 on page 2-72.</td>
</tr>
<tr>
<td><strong>Humidity Heater Failure</strong></td>
<td>The humidity heater draws too much current.</td>
<td>Go to RAP 2.19 on page 2-74.</td>
</tr>
<tr>
<td><strong>Motor Failed</strong></td>
<td>For software version 2.06, the fan motor speed exceeds ±450 rpm; for previous software versions, the fan motor speed exceeds ±200 rpm.</td>
<td>Go to RAP 2.20 on page 2-75.</td>
</tr>
<tr>
<td><strong>Sensor Disconnect</strong></td>
<td>Communications fail between the sensor module and the controller.</td>
<td>Go to RAP 2.21 on page 2-76.</td>
</tr>
<tr>
<td><strong>Sensor Out of Position</strong></td>
<td>The sensor module is not in the hood or the calibration position.</td>
<td>Go to RAP 2.22 on page 2-78.</td>
</tr>
<tr>
<td><strong>Stuck Key</strong></td>
<td>A stuck key is detected.</td>
<td>Go to RAP 2.23 on page 2-79.</td>
</tr>
<tr>
<td><strong>Check Settings</strong></td>
<td>The non-volatile memory (NVM) integrity test fails.</td>
<td>Go to RAP 2.24 on page 2-80.</td>
</tr>
</tbody>
</table>
Diagnostic Menus

To aid in troubleshooting, the Isolette® Infant Incubator has a series of diagnostic menus. Perform one of the following:

- To access the System Configuration menu, refer to “Entering the System Configuration Menu” on page 2-33.
- To access the Diagnostic Info menu without first powering the unit down and accessing the System Configuration menu, refer to “Entering the Diagnostic Information Menu” on page 2-35.

Entering the System Configuration Menu

1. Turn off the controller’s Power switch, and then press the Silence/Reset key (A) while simultaneously turning on the controller power switch. The System Configuration menu appears (see figure 2-9 on page 2-33).

Figure 2-9. System Configuration Menu
2. After viewing the current settings, perform one of the following:
   - Return the System Configuration menu to the original settings as shown in table 2-9 on page 2-34 by pressing the Hard Default key (B).
   - View the Diagnostic Information menu by pressing the Diag Info key (C). Go to “Entering the Diagnostic Information Menu” on page 2-35.
   - Enter the desired system configuration settings, and press the Silence/Reset key (A) to return to Display 1.

Table 2-9. System Configuration Factory Default Settings

<table>
<thead>
<tr>
<th>Feature</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Mode</td>
<td>ON</td>
</tr>
<tr>
<td>Skin Mode</td>
<td>ON</td>
</tr>
<tr>
<td>Air set temperature</td>
<td>95.0°F (35.0°C)</td>
</tr>
<tr>
<td>Skin set temperature</td>
<td>97.7°F (36.5°C)</td>
</tr>
<tr>
<td>Humidity control mode</td>
<td>OFF</td>
</tr>
<tr>
<td>Humidity set value</td>
<td>50% RH</td>
</tr>
<tr>
<td>Oxygen control mode</td>
<td>OFF</td>
</tr>
<tr>
<td>Oxygen calibration level</td>
<td>21%</td>
</tr>
<tr>
<td>Temperature units</td>
<td>°C</td>
</tr>
<tr>
<td>Weight units</td>
<td>Kg</td>
</tr>
<tr>
<td>Trend</td>
<td>Air, 2 hours</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
</tr>
<tr>
<td>Altitude</td>
<td>&lt; 0' (0 m)</td>
</tr>
<tr>
<td>VueLink™</td>
<td>OFF</td>
</tr>
</tbody>
</table>

a. VueLink™ is a trademark of Philips Medical Systems.
Entering the Diagnostic Information Menu

To access the Diagnostic Info menu without turning the unit off, perform the following:

1. Ensure that the keypad is unlocked. If necessary, press the Keypad Lock key (R) to unlock the keypad (see figure 2-10 on page 2-35).

Figure 2-10. Trend Display

2. Press the Display Selection key (J). The Trend display appears.

3. Press the Trend key (S).

4. Press the Up arrow key (Q).

5. Press the Keypad Lock key (R).

6. Press the Down arrow key (T).
7. Press the **Display Selection** key (J). The **Diagnostic Info** menu appears (see figure 2-11 on page 2-36).

**Figure 2-11. Diagnostic Information Menu**

```
DIAGNOSTIC INFO

Software Version 2.09
Sensor Module Firmware 1.10
Firmware Part Number 2001-0098
ROM Checksum AD298B11
Fan Speed 1500 RPM
Total Unit Run Time 000010 Hr

Ambient Temp 1 21.1°C, 70.0°F
Ambient Temp 2 21.1°C, 70.0°F
```

°C
For a description of the information listed on the Diagnostic Info menu, refer to table 2-10 on page 2-37.

**Table 2-10. Diagnostic Information Menu**

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software version</td>
<td>This displays the current version of the controller software.</td>
</tr>
<tr>
<td>Sensor module firmware</td>
<td>This displays the current version of the sensor module firmware.</td>
</tr>
<tr>
<td>Firmware part number</td>
<td>This displays the identification number of the controller firmware.</td>
</tr>
<tr>
<td>ROM checksum</td>
<td>This verifies the operation of the controller software.</td>
</tr>
<tr>
<td>Fan speed</td>
<td>This displays the current impeller speed.</td>
</tr>
<tr>
<td>Total unit run time</td>
<td>This displays the total time the controller has been powered on.</td>
</tr>
<tr>
<td>Ambient temp 1</td>
<td>This displays the current ambient temperature probe 1 reading.</td>
</tr>
<tr>
<td>Ambient temp 2</td>
<td>This displays the current ambient temperature probe 2 reading.</td>
</tr>
</tbody>
</table>

After viewing the current diagnostic information, perform one of the following:

- View the **System Test (1 of 3)** screen by pressing the System Test key (D). Go to “System Test Menu” on page 2-38.
- View the **Data Summary** screen by pressing the Data Summary key (E). Go to “Data Summary Menu” on page 2-44.
- Return to Display 1 by pressing the Home key (F).
System Test Menu

System Test (1 of 3) Menu

For a description of the information listed on the System Test (1 of 3) menu, refer to table 2-11 on page 2-39 (see figure 2-12 on page 2-38).

Figure 2-12. System Test (1 of 3) Menu
### Table 2-11. System Test (1 of 3) Menu

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂ monitor cell</td>
<td>This displays the installation status of the oxygen monitor fuel cell.</td>
</tr>
<tr>
<td>O₂ control cell</td>
<td>This displays the installation status of the oxygen control cell.</td>
</tr>
<tr>
<td>Humidity sensor</td>
<td>This displays the installation status of the humidity sensor.</td>
</tr>
<tr>
<td>Scale</td>
<td>This displays the connection status of the scale assembly.</td>
</tr>
<tr>
<td>Skin probe 1</td>
<td>This displays the connection status of the skin temperature probe 1.</td>
</tr>
<tr>
<td>Skin probe 2</td>
<td>This displays the connection status of the skin temperature probe 2.</td>
</tr>
<tr>
<td>Hood door</td>
<td>This displays the open/closed status of the front or back access panel assembly.</td>
</tr>
<tr>
<td>Heater</td>
<td>This displays the on/off status of the unit’s heater.</td>
</tr>
<tr>
<td>Humidifier</td>
<td>This displays the on/off of the humidity evaporator assembly.</td>
</tr>
<tr>
<td>RTC battery</td>
<td>This displays the pass/fail status of the real-time clock (RTC) battery.</td>
</tr>
</tbody>
</table>

After viewing the current system test results, perform one of the following:

- Check the system checksum by pressing the **Checksum** key (G).
- Check the system RAM by pressing the **System RAM** key (H).
- Check the display RAM by pressing the **Display RAM** key (I).
- View the **System Test (2 of 3)** screen by pressing the **Display Selection** key (J). Go to “System Test (2 of 3) Menu” on page 2-40.
- Return to the **Diagnostic Info** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.
System Test (2 of 3) Menu

The System Test (2 of 3) menu displays the OK/fail results of the microprocessor’s verification of the operation of the following components (see figure 2-13 on page 2-40):

Figure 2-13. System Test Menu (2 of 3)

- The sensor module P.C. board
- The humidity EEPROM
- The sensor module fan
- The sensor module analog/digital (A/D) converter
- The sensor module random access memory (RAM)
- The scale load cell
- The scale A/D converter
- The scale’s communication to the unit
Perform one of the following:

- View the key check display by pressing the **Key Test** key (K). Go to “Key Check Display” on page 2-43.
- Light all segments of the display by pressing the **Display Test** key (L).
- Initiate the LED test by pressing the **LED Test** key (M). All LEDs light in succession.
- Call up the **System Test (3 of 3)** screen by pressing the **Display Selection** key (J). Go to “System Test (3 of 3) Menu” on page 2-41.
- Return to the **Diagnostic** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.

**System Test (3 of 3) Menu**

For a description of the information listed on the **System Test (3 of 3)** menu, refer to table 2-12 on page 2-42 (see figure 2-14 on page 2-41).

**Figure 2-14. System Test (3 of 3) Menu**

<table>
<thead>
<tr>
<th>System Test (3 of 3)</th>
<th>Audio Test</th>
<th>Watchdog</th>
<th>Air Flow</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door</td>
<td>Close</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan Speed</td>
<td>1500 RPM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Probe</td>
<td>9.66V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Probe</td>
<td>9.44V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Flow Status</td>
<td>Good</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

37°C
Table 2-12. System Test (3 of 3) Menu

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door</td>
<td>This displays the open/closed status of the front or back access panel.</td>
</tr>
<tr>
<td>Fan speed</td>
<td>This displays the current impeller speed.</td>
</tr>
<tr>
<td>Long probe</td>
<td>This displays information no longer applicable to the operation of the unit.</td>
</tr>
<tr>
<td>Short probe</td>
<td>This displays information no longer applicable to the operation of the unit.</td>
</tr>
<tr>
<td>Air flow status</td>
<td>This displays the status of the impeller movement detection (IMD) P.C. board.</td>
</tr>
</tbody>
</table>

Perform one of the following:

- Initiate the audio test by pressing the **Audio Test** key (N).
- Test the watchdog by pressing the **Watchdog** key (O).
- Test the airflow by pressing the **Airflow** key (P).
- To view the **System Test (1 of 3)** screen, press the **Display Selection** key (J). Go to “System Test (1 of 3) Menu” on page 2-38.
- Return to the **Diagnostic** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.
Key Check Display

Perform the following to test the keys at the Key Check display (see figure 2-15 on page 2-43):

**Figure 2-15. Key Check Display**

1. Press each key in succession. Each key’s respective box lights.
   
   **Yes**  **No**
   
   → Go to RAP 2.23 on page 2-79.

2. Exit the Key Check display by pressing the **Up** arrow key (Q) for 3 seconds.
Data Summary Menu

Data Summary (1 of 2) Menu

For a description of the information listed on the Data Summary (1 of 2) menu, refer to table 2-13 on page 2-45 (see figure 2-16 on page 2-44).

Figure 2-16. Data Summary (1 of 2) Menu

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>0</td>
</tr>
<tr>
<td>Humidity</td>
<td>254</td>
</tr>
<tr>
<td>Weight</td>
<td>0</td>
</tr>
<tr>
<td>Air Temp</td>
<td>2800</td>
</tr>
<tr>
<td>Skin 1 Temp</td>
<td>1560</td>
</tr>
<tr>
<td>Skin 2 Temp</td>
<td>4062</td>
</tr>
<tr>
<td>Ambient Temp 1</td>
<td>3260</td>
</tr>
<tr>
<td>Ambient Temp 2</td>
<td>3257</td>
</tr>
<tr>
<td>Control Fan Speed</td>
<td>2470 RPM</td>
</tr>
</tbody>
</table>
### Table 2-13. Data Summary (1 of 2) Menu

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>This displays the current data used by the microprocessor to figure the oxygen reading.</td>
</tr>
<tr>
<td>Humidity</td>
<td>This displays the current data used by the microprocessor to figure the humidity reading.</td>
</tr>
<tr>
<td>Weight</td>
<td>This displays the current data used by the microprocessor to figure the weight reading.</td>
</tr>
<tr>
<td>Air temp</td>
<td>This displays the current data used by the microprocessor to figure the air temperature reading.</td>
</tr>
<tr>
<td>Skin 1 temp</td>
<td>This displays the current data used by the microprocessor to figure the skin temperature probe 1 reading.</td>
</tr>
<tr>
<td>Skin 2 temp</td>
<td>This displays the current data used by the microprocessor to figure the skin temperature probe 2 reading.</td>
</tr>
<tr>
<td>Ambient temp 1</td>
<td>This displays the current data used by the microprocessor to figure the ambient temperature probe 1 reading.</td>
</tr>
<tr>
<td>Ambient temp 2</td>
<td>This displays the current data used by the microprocessor to figure the ambient temperature probe 2 reading.</td>
</tr>
<tr>
<td>Control fan speed</td>
<td>This displays the current controller cooling fan speed.</td>
</tr>
</tbody>
</table>

Perform one of the following:

- Return to the **Diagnostic Into** menu by pressing the **Home** key (**F**). Go to “Entering the System Configuration Menu” on page 2-33.
- View the **Data Summary (2 of 2)** screen by pressing the **Display Selection** key (**J**). Go to “Data Summary (2 of 2) Menu” on page 2-46.
Data Summary (2 of 2) Menu

For a description of the information listed on the Data Summary (2 of 2) menu, refer to table 2-13 on page 2-45 (see figure 2-17 on page 2-46).

Table 2-14. Data Summary (2 of 2) Menu

<table>
<thead>
<tr>
<th>Information Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long air flow sensor</td>
<td>This displays information no longer applicable to the operation of the unit.</td>
</tr>
<tr>
<td>Short air flow sensor</td>
<td>This displays information no longer applicable to the operation of the unit.</td>
</tr>
<tr>
<td>AC current</td>
<td>This displays the instantaneous power consumption of the unit.</td>
</tr>
<tr>
<td>Heater thermocouple</td>
<td>This displays the current status of the heater.</td>
</tr>
<tr>
<td>O₂ solenoid voltage</td>
<td>This displays the current voltage present on the oxygen solenoid.</td>
</tr>
</tbody>
</table>
Perform one of the following:

- Return to the **Diagnostic Info** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.

- View the **Data Summary (1 of 2)** screen by pressing the **Display Selection** key (J). Go to “Data Summary (1 of 2) Menu” on page 2-44.
2.1 There Is No Power, and Power Failure Alarm Does Not Activate

1. The Power switch is in the On position.
   
   Yes  No
   ↓  → Press the Power switch. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. For assistance, call Technical Support at (800) 437-2437.
2.2 Variable Height Adjustable (VHA) Pedestal/Stand Does Not Move Up or Down

1. Check the variable height adjustable (VHA) pedestal stand:
   a. Turn on the main **Power** switch (A) (see figure 2-18 on page 2-51).
   b. Use your foot to press the **Up** arrow of the up/down switch (B) to raise the VHA pedestal/stand to its maximum height.
   c. Press and hold the **Down** arrow of the up/down switch (B) to lower the VHA pedestal/stand to its minimum height.
   d. Repeat using the rear up/down switch (B).

The problem still exists.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| ↓ | Go to “Final Actions” on page 2-22.

2. Inspect the main **Power** switch (A). The main power switch (A) is in the **On** position.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| ↓ | Turn on the main **Power** switch (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Inspect the power cord (C). The unit is plugged into an appropriate power source.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| ↓ | Plug the unit into an appropriate power source. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

4. Call Technical Support at (800) 437-2437 for assistance.
Figure 2-18. Variable Height Adjustable Pedestal/Stand
2.3 Skin Set Temperature Cannot Be Achieved or Maintained

1. The **Low Skin Temperature** alarm sounds.
   
   \[\begin{align*}
   \text{Yes} & \quad \text{No} \\
   \downarrow & \quad \rightarrow \text{Go to RAP 2.37 on page 2-101.}
   \end{align*}\]

2. Perform the following:

   a. Silence the **Low Skin Temperature** alarm for 15 minutes by pressing the **Silence/Reset** softkey (A) (see figure 2-19 on page 2-52).

   ![Figure 2-19. Hood/Shell Assembly](image)

   **NOTE:**

   Sensor module assembly shown removed for clarity.

   b. Check all access doors (B) and iris entry ports (C).

   All access doors (B) and iris entry ports (C) are closed.

   \[\begin{align*}
   \text{Yes} & \quad \text{No} \\
   \downarrow & \quad \rightarrow \text{Close all access doors (B) and iris entry ports (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.}
   \end{align*}\]
3. Check the unit’s mode of operation. The unit is in Skin Mode.
   
   **Yes**  **No**
   
   \[\downarrow\] → Place the unit in Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

4. Check the skin probe (D). The skin probe (D) is properly secured to the infant’s skin.
   
   **Yes**  **No**
   
   \[\downarrow\] → Properly secure the skin probe (D) to the infant’s skin. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

5. Call Technical Support at (800) 437-2437 for assistance.
2.4 Oxygen Concentration is Low

1. Perform the following:
   a. If the Low Oxygen % alarm sounds, press the Silence/Reset softkey (A) to silence it for 4 minutes (see figure 2-20 on page 2-54).

   ![Figure 2-20. Hood/Shell Assembly](image)

   **NOTE:**
   Oxygen input connector shown removed for clarity.

   b. Inspect the oxygen source.

   The oxygen source is securely connected to the oxygen input connector (B).

   \[\text{Yes} \quad \text{No}\]
   \[\downarrow\quad \rightarrow\quad \text{Securely connect the oxygen source to the oxygen input connector (B). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.}\]

2. Check all access doors (C) and iris entry ports (D). All access doors (C) and iris entry ports (D) are closed.

   \[\text{Yes} \quad \text{No}\]
   \[\downarrow\quad \rightarrow\quad \text{Close all access doors (C) and iris entry ports (D). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.}\]
3. Check the sleeves on the iris entry ports (D). All sleeves are properly installed.
   Yes  No
   \[\rightarrow\] Properly install the sleeves on the iris entry ports (D) (refer to procedure 4.11 on page 4-31). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

4. Check the access grommets (E). The access grommets (E) are properly installed.
   Yes  No
   \[\rightarrow\] Properly install the access grommets (E) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. Check the air intake microfilter cover (F). The air intake microfilter cover (F) is properly secured.
   Yes  No
   \[\rightarrow\] Tighten the two thumbscrews (G) that secure the air intake microfilter cover (F) to the unit. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.

6. Perform the following:
   a. Loosen the two thumbscrews (G) on the air intake microfilter cover (F).
   b. Remove the air intake microfilter cover (F) from the unit.
   c. Check the air intake microfilter (H).
   The air intake microfilter (H) is installed.
   Yes  No
   \[\rightarrow\] Install the air intake microfilter (H) (refer to procedure 4.19 on page 4-49). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 7.

7. Go to RAP 2.31 on page 2-92. This solves the problem.
   Yes  No
   \[\rightarrow\] For assistance, call Technical Support at (800) 437-2437.

8. Go to “Final Actions” on page 2-22.
2.5 Oxygen Concentration is High

1. Perform the following:
   a. If the High Oxygen % alarm sounds, press the Silence/Reset softkey (A) to silence it for 4 minutes (see figure 2-21 on page 2-56).

   ![Figure 2-21. Hood/Shell Assembly](image)

   b. Go to RAP 2.31 on page 2-92.

   The problem still exists.

   Yes No
   ↓ → Go to “Final Actions” on page 2-22.

2. Perform the following:
   a. Slowly tilt the hood assembly (B) back until it comes to rest.
   b. Remove the foam mattress (C), the mattress tray (D), and the x-ray tray (E) from the shell assembly (F) (see figure 2-22 on page 2-57).
NOTE:
Hood assembly removed for clarity.

c. Remove the two lift bars (G) and the deck (H) from the shell assembly (F).
d. Remove the scroll cover (I) from the shell assembly (F).
e. Check the impeller assembly (J).
The impeller assembly (J) is clean.

Yes  No
↓    → Clean the impeller assembly (J). If this solves the problem, go to
     "Final Actions" on page 2-22. Otherwise, go to step 3.

3. Replace the impeller assembly (J) (refer to procedure 4.8 on page 4-20).
   This solves the problem.

Yes  No
↓    → For assistance, call Technical Support at (800) 437-2437.

4. Go to "Final Actions" on page 2-22.
2.6 Hood Does Not Tilt or Close Properly

1. Perform the following:
   a. Disconnect the weighing scale cable (A) from the sensor module assembly (B) (see figure 2-23 on page 2-59).
   b. Slowly tilt the hood assembly (C) back until it comes to rest.
      The hood assembly (C) rests once it reaches its fully opened position.
      Yes  No
      ↓  → Replace the pivot/hook lock assembly bracket (D) or the pivot bracket (E) (refer to procedure 4.28 on page 4-74). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:
   a. On a unit equipped with the pivot/hook lock assembly bracket (D), pull on and hold the knob (F) located on the right rear pivot/hook lock assembly bracket (D).
   b. Lower the hood assembly (C) to its closed position.
      The problem still exists.
      Yes  No
      ↓  → Connect the weighing scale cable (A) to the sensor module assembly (B), and go to “Final Actions” on page 2-22.

3. Check the area around the hood assembly (C) for obstruction, such as blankets between the hood assembly (C) and the shell assembly (G), or objects above the hood assembly (C). The area around the hood assembly (C) is free from obstruction.
   Yes  No
   ↓  → Remove the obstruction. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

4. Replace the hood assembly (C) (refer to procedure 4.5 on page 4-12). This solves the problem.
   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-2437.
Figure 2-23. Hood Assembly
5. Perform the following:
   a. Connect the weighing scale cable (A) to the sensor module assembly (B).
   b. Go to “Final Actions” on page 2-22.
2.7 Controller Failure #1—EEPROM Circuitry Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.
   Yes   No
   ↓     → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.8 Controller Failure #2—Ambient Air Probe Failure

1. Access the Data Summary (1 of 2) screen. The readings for Ambient Temp 1 and Ambient Temp 2 are approximately the same.
   \[ \text{Yes} \quad \rightarrow \text{Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.} \]
   \[ \text{No} \quad \rightarrow \] 

2. The Control Fan Speed reading meets the specification of **2500 rpm ± 50%**.
   \[ \text{Yes} \quad \rightarrow \text{Go to RAP 2.9 on page 2-63. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.} \]
   \[ \text{No} \quad \rightarrow \]

3. Replace the electroluminescent EL CPU P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.
   \[ \text{Yes} \quad \rightarrow \text{For assistance, call Technical Support at (800) 437-2437.} \]
   \[ \text{No} \quad \rightarrow \] 

4. Go to “Final Actions” on page 2-22.
2.9 Controller Failure #4—Controller Cooling Fan Failure

1. Access the Data Summary (1 of 2) screen (see “Diagnostic Menus” on page 2-33). The Control Fan Speed meets the specification of 2500 rpm ± 50%.

   Yes  No
   ↓    → Replace the controller assembly’s fan assembly (refer to procedure 4.16 on page 4-43). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

   Yes  No
   ↓    → For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.10 Controller Failure #5—Display Test Failure

1. Turn the controller assembly off, and then turn it back on. The screen flashes briefly, and then turns black.
   Yes   No
   ↓     → Replace the electroluminescent (EL) display (refer to procedure 4.15 on page 4-41). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the EL central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.
   Yes   No
   ↓     → For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.11 Controller Failure #7—Power Supply Voltage Failure

1. Replace the power supply P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.
   Yes  No
   ↓    → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.12 Controller Failure #8—RAM Test Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

   Yes   No
   ↓     → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.13 Controller Failure #9—Real-Time Clock Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.14 Controller Failure #10—Watchdog Timer Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

   Yes   No
   \downarrow   \rightarrow For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.15 Controller Failure #11—Relay Test Failure

1. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

   Yes  No
   \downarrow  \rightarrow For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.16 Controller Failure #13—Heater Circuit Failure Detected

1. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.17 Controller Failure #14—Low Heater Current Detected

1. Access the Data Summary (2 of 2) screen (see “Diagnostic Menus” on page 2-33). The AC Current meets the specification of 3 A.
   Yes  No
   ↓    → Replace the heater assembly (refer to procedure 4.20 on page 4-50). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.
   Yes  No
   ↓    → For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.18 Heater Thermocouple Does Not Work Properly

1. Perform the following:

   a. Remove the two wingnuts (A) and the two flat washers (B) that secure the controller assembly (C) in the unit (see figure 2-24 on page 2-72).

   ![Figure 2-24. Controller Assembly](image)

   b. Slide the controller assembly (C) from the unit (refer to procedure 4.4 on page 4-10).

   c. Check the connection of the heater assembly’s wiring harness assembly (D) at the interface/power supply module in the controller assembly (C).

   The heater assembly’s wiring harness assembly (D) is securely connected at the controller assembly (C).

   **Yes**  **No**

   → Securely connect the heater assembly’s wiring harness assembly (D) at the interface/power supply module in the controller assembly (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Replace the AC wiring harness assembly (D) (refer to procedure 4.22 on page 4-57). The problem still exists.

   Yes  No
   ↓    → Go to “Final Actions” on page 2-22.

3. Replace the heater assembly (refer to procedure 4.20 on page 4-50). This solves the problem.

   Yes  No
   ↓    → For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.
2.19 Humidity Heater Draws Too Much Current

1. Replace the evaporator reservoir assembly (refer to procedure 7.3 on page 7-14). This solves the problem.
   Yes   No
   ↓   → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.20 Motor Fails

1. Access the Diagnostic Info screen (see “Diagnostic Menus” on page 2-33). The Software Version meets the specification of 2.06 or later.
   Yes  No
   ↓  → Upgrade the firmware to the latest version (refer to procedure 6.8 on page 6-34). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:
   a. Close all access panels.
   b. At the Diagnostic Info screen, check the Fan Speed.
      The Fan Speed meets the specification of 1550 rpm ± 450 rpm.
      Yes  No
      ↓  → Replace the impeller movement detection sensor (refer to procedure 4.21 on page 4-53). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

3. Go to step 5.

4. Replace the impeller assembly (refer to procedure 4.8 on page 4-20). The problem still exists.
   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

5. Replace the motor assembly (refer to procedure 4.9 on page 4-22). This solves the problem.
   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-7437

2.21 Communication Between the Sensor Module and the Controller Fails

1. Perform the following:
   a. Remove the two wingnuts (A) and the two flat washers (B) that secure the controller assembly (C) in the unit (see figure 2-25 on page 2-76).

   **Figure 2-25. Controller Assembly**

   b. Slide the controller assembly (C) from the unit.

   c. Check the connection of the sensor module-to-controller cable assembly (D) at the controller assembly (C).

   The sensor module-to-controller cable assembly (D) is securely connected at the controller assembly (C).

   **Yes**  **No**

   → Securely connect the sensor module-to-controller cable assembly (D) to the controller assembly (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Replace the sensor module-to-controller cable assembly (D) (refer to procedure 4.23 on page 4-62). The problem still exists.
   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

3. Replace the sensor module assembly (refer to procedure 4.2 on page 4-6). This solves the problem.
   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.
2.22 Sensor Module Is Out of Position

1. The sensor module assembly (A) is properly positioned in the hood or calibration fixture (see figure 2-26 on page 2-78).

![Diagram of sensor module assembly](image)

**Figure 2-26. Sensor Module Assembly**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>→ Properly position the sensor module assembly (A) in the hood or calibration fixture. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.</td>
</tr>
</tbody>
</table>

2. Replace the sensor module assembly (A) (refer to procedure 4.2 on page 4-6). This solves the problem.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>→ For assistance, call Technical Support at (800) 437-2437.</td>
</tr>
</tbody>
</table>

3. Go to “Final Actions” on page 2-22.
2.23 A Stuck Key Is Detected

1. Perform the following:
   a. Access the Key Check screen (see “Diagnostic Menus” on page 2-33).
   b. Press each key in succession.
      Each box on the screen illuminates when its respective key is pressed.

      | Yes | No |
      |-----|----|
      |     |    |

      → Replace the electroluminescent display (refer to procedure 4.14 on page 4-39). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The problem still exists.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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<tbody>
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</table>

   → Go to “Final Actions” on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.
2.24 Unit Fails the Non-Volatile Memory (NVM) Integrity Test

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

```
Yes  No
↓    → For assistance, call Technical Support at (800) 437-2437.
```

2. Go to “Final Actions” on page 2-22.
2.25 Access Panel Assembly Does Not Latch Properly

1. Check the area around the access panel assembly (A) for obstruction (see figure 2-27 on page 2-81). The area around the access panel assembly (A) is free from obstruction.

   ![Figure 2-27. Side Access Panel](image)

Series 00 hood

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>→ Remove the obstruction from the access panel assembly (A). If this solves the problem, go to &quot;Final Actions&quot; on page 2-22. Otherwise, go to step 2.</td>
</tr>
</tbody>
</table>

2. The access panel assembly (A) is a Series 00 model.

  Yes | No
  --- | ---
  ↓   | → Go to step 5.

3. Slide the blue slide of the access panel latch assemblies (B) back and forth. The blue slides of the access panel latch assemblies (B) slide properly.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>→ Replace the access panel assembly (A) (refer to procedure 4.10 on page 4-27). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.</td>
</tr>
</tbody>
</table>

5. Rotate the access panel knob and latch assemblies (C). The access panel knob and latch assemblies (C) rotate properly.
   \begin{itemize}
   \item \textbf{Yes} \quad \rightarrow \text{Replace the access panel knob and latch assembly (C) (refer to procedure 4.24 on page 4-67). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.}
   \item \textbf{No} \quad \rightarrow \text{For assistance, call Technical Support at (800) 437-2437.}
   \end{itemize}

6. Replace the access panel assembly (A) (refer to procedure 4.10 on page 4-27). This solves the problem.

7. Go to “Final Actions” on page 2-22.
2.26 Iris Entry Port Does Not Open or Close Properly

1. Replace the sleeve of the iris entry port (refer to procedure 4.11 on page 4-31). The problem still exists.
   
   **Yes**  **No**
   
   \[\text{↓} \quad \rightarrow \text{Go to “Final Actions” on page 2-22.}\]

2. Replace the two large flanged iris port retaining rings (refer to procedure 4.25 on page 4-70). This solves the problem.
   
   **Yes**  **No**
   
   \[\text{↓} \quad \rightarrow \text{For assistance, call Technical Support at (800) 437-2437.}\]

3. Go to “Final Actions” on page 2-22.
2.27 Access Door Does Not Operate or Latch Properly

1. Inspect each access door (A) (see figure 2-28 on page 2-84). The access doors (A) are free from cracks and in good condition.

![Figure 2-28. Access Door](m223gl139)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Replace the access door (A) (refer to procedure 4.13 on page 4-36). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.</td>
</tr>
</tbody>
</table>

2. Inspect the area around the access door (A) for possible obstruction. The area around the access door (A) is free from obstruction.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Remove the obstruction from the access door (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.</td>
</tr>
</tbody>
</table>

3. Close each access door (A). Each access door (A) closes properly.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Replace the access door gasket (B) (refer to procedure 4.27 on page 4-73). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.</td>
</tr>
</tbody>
</table>
4. Press the access door latch (C) at each access door (A). Each access door (A) swings open.
   Yes  No
   ↓  → Replace the access door latch (C) (refer to procedure 4.12 on page 4-33). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. The problem is solved.
   Yes  No
   ↓  → Replace the pivot hinges (D) and the torsion spring on the access door (A) (refer to procedure 4.13 on page 4-36). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2.28 Heat Shield Does Not Latch Properly

1. Using the heat shield latches (A), properly secure the top of the heat shield (B) to the access panel (C) (see figure 2-29 on page 2-86). The problem still exists.

   Figure 2-20. Heat Shield

   ![Diagram of heat shield with labels A, B, and C]

   **Yes**  **No**
   ↓  → Go to “Final Actions” on page 2-22.

2. Check the area between the heat shield (B) and the access panel (C) for possible obstruction. The area between the heat shield (B) and access panel (C) is free from obstruction.

   **Yes**  **No**
   ↓  → Remove the obstruction from between the heat shield (B) and the access panel (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Replace the heat shield latches (A) (refer to procedure 4.29 on page 4-77). The problem still exists.

   **Yes**  **No**
   ↓  → Go to “Final Actions” on page 2-22.
4. Replace the heat shield (B) (refer to procedure 4.30 on page 4-79). This solves the problem.

Yes  No
↓  → For assistance, call Technical Support at (800) 437-2437.

5. Go to “Final Actions” on page 2-22.
2.29 Mattress Tray Does Not Tilt Properly

1. Check the area around the mattress tray (A) for possible obstruction (see figure 2-30 on page 2-88). The mattress tray (A) is free from obstruction.

   Figure 2-30. Mattress Tray Assembly

   Yes    No
   ↓      → Remove the obstruction from the mattress tray (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Inspect the condition of the mattress tray (A). The mattress tray (A) is in good condition.

   Yes    No
   ↓      → Go to RAP 2.30 on page 2-90.

3. Rotate the right-hand mattress tilt mechanism knob (B) counterclockwise until it stops. The right end of the mattress tray (A) is at a 12° angle.

   Yes    No
   ↓      → Replace the right-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.
4. Rotate the right-hand mattress tilt mechanism knob (B) clockwise until it stops. The mattress tray (A) is level.
   Yes  No
   ↓  → Replace the right-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. Rotate the left-hand mattress tilt mechanism knob (B) clockwise. The left end of the mattress tray (A) is at a 12° angle.
   Yes  No
   ↓  → Replace the left-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

6. Rotate the left-hand mattress tilt mechanism knob (B) counterclockwise. The mattress tray (A) is level.
   Yes  No
   ↓  → Replace the left-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

7. Go to “Final Actions” on page 2-22.
2.30 Mattress Tray Is Damaged

1. Perform the following:
   a. On a unit with a Series 00 hood assembly, slide the blue slide access panel latches, and open the access panel (see figure 2-2 on page 2-10).
   or
   On a unit with a hood assembly later than Series 00, rotate the access panel pawl latch knobs, and open the access panel.
   b. Pivot the access panel to the full-open position so it hangs straight down.
   c. Slide out the mattress tray (A) to the fully-extended position (see figure 2-31 on page 2-90).

   ![Figure 2-31. Mattress Tray](image)

   d. Gradually load a calibrated weight of 22 lb (10 kg) (B) near the front-center of the extended mattress tray (A), ensuring a firm infant platform.

   The mattress tray (A) is a firm platform for an infant.
2.30 Mattress Tray Is Damaged

Chapter 2: Troubleshooting Procedures

Yes  No
↓  → Replace the mattress tray (A) (refer to procedure 4.7 on page 4-18). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. Perform the following:
   a. Return the mattress tray (A) to its original position.
   b. Close the access panel, and secure it using its blue slide access panel latches or its access panel pawl latch knobs.
   c. Go to “Final Actions” on page 2-22.
2.31 Air Intake Is Not Working Properly

1. Perform the following:
   a. Loosen the two thumbscrews (A) on the air intake filter cover (B), and remove the air intake filter cover (B) (see figure 2-32 on page 2-92).

![Figure 2-32. Air Intake Microfilter](image)

   b. Inspect the air intake filter cover (B).

   The air intake filter cover (B) is free from obstruction.

   Yes | No
   ↓   | ➔ Remove the obstruction from the air intake filter cover (B). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

⚠️ WARNING:
A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.
2. Inspect the air intake microfilter (C). The air intake microfilter (C) has no visible dirt, is dry, and has been used for less than three months.

   Yes  No

   \[ \rightarrow \] Replace the air intake microfilter (C) (refer to procedure 4.19 on page 4-49). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

3. Go to “Final Actions” on page 2-22.
2.32 X-ray Tray Does Not Operate Properly

1. Perform the following:

   a. On a unit with a Series 00 hood assembly, slide the blue slide access panel latches, and open the access panel (see figure 2-2 on page 2-10). or
      On a unit with a hood assembly later than Series 00, rotate the access panel pawl latch knobs, and open the access panel.
   
   b. Pivot the access panel to the full-open position so it hangs straight down.
   
   c. Withdraw the x-ray tray (A) (see figure 2-33 on page 2-94).

   d. Return the x-ray tray (A) to its original position.

The problem still exists.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>↓</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>Go to “Final Actions” on page 2-22.</td>
</tr>
</tbody>
</table>
2. Inspect the x-ray tray (A). The x-ray tray (A) is free from obstruction.
   Yes  No
   ↓  → Remove the obstruction from the x-ray tray (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Replace the x-ray tray (A) (refer to procedure 4.7 on page 4-18). The problem still exists.
   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

4. Replace the mattress tray (B) (refer to procedure 4.7 on page 4-18). This solves the problem.
   Yes  No
   ↓  → For assistance, call Technical Support at (800) 437-2437.

5. Go to “Final Actions” on page 2-22.
2.33 Sensor Module Lock Does Not Secure the Sensor Module (Units Equipped With the Sensor Module Lock Only)

1. Check the area around the sensor module (A) for obstruction (see figure 2-34 on page 2-96). The sensor module (A) is free from obstruction.

   Figure 2-34. Sensor Module

   Yes  No
   ↓   → Remove the obstruction from the sensor module (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the sensor module lock (B) (refer to procedure 4.33 on page 4-91). This solves the problem.

   Yes  No
   ↓   → For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.34 Incubator Takes Longer Than One Hour to Warm Up to the Air Set Temperature

1. Close all access panels (A) and access doors (B) (see figure 2-35 on page 2-97). This solves the problem.

![Figure 2-35. Hood Assembly](image)

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Go to step 3.</td>
</tr>
</tbody>
</table>

2. Go to “Final Actions” on page 2-22.

3. Check all access grommets (C). All access grommets (C) are securely installed.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓</td>
<td>Securely install access grommets (C) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.</td>
</tr>
</tbody>
</table>
4. All access grommets (C) are in good condition.
   Yes  No
   ↓    → Replace the access grommet (C) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. Go to RAP 2.18 on page 2.72. This solves the problem.
   Yes  No
   ↓    → For assistance, call Technical Support at (800) 437-2437.

2.35 Air Set Temperature Cannot Be Maintained

1. The unit is in Air Mode.
   - Yes
   - No
   → Change the mode of operation to Air Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The air set temperature is set to at least 95°F (35°C).
   - Yes
   - No
   → Set the air set temperature to at least 95°F (35°C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Go to RAP 2.18 on page 2-72. This solves the problem.
   - Yes
   - No
   → For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.
2.36 Low Air Temperature Alarm or High Air Temperature Alarm Does Not Sound When Air Temperature Drops or Rises Out of Specification

Chapter 2: Troubleshooting Procedures

2.36 Low Air Temperature Alarm or High Air Temperature Alarm Does Not Sound When Air Temperature Drops or Rises Out of Specification

1. The unit is in Air Mode.
   \[\text{Yes} \quad \text{No}\]
   \[\downarrow \quad \rightarrow \text{Change the mode of operation to Air Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.}\n
2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). The problem still exists.
   \[\text{Yes} \quad \text{No}\]
   \[\downarrow \quad \rightarrow \text{Go to “Final Actions” on page 2-22.}\n
3. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.
   \[\text{Yes} \quad \text{No}\]
   \[\downarrow \quad \rightarrow \text{For assistance, call Technical Support at (800) 437-2437.}\n
4. Go to “Final Actions” on page 2-22.
2.37 Low Skin Temperature Alarm or High Skin Temperature Alarm Does Not Sound When Skin Temperature Drops or Rises Out of Specification

1. The unit is in Skin Mode.
   Yes No
   ↓ Change the mode of operation to Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). The problem still exists.
   Yes No
   ↓ Go to “Final Actions” on page 2-22.

3. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.
   Yes No
   ↓ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.
2.38 When Skin Probes are Disconnected, Connect Skin 1 Probe Alarm Does Not Sound

Chapter 2: Troubleshooting Procedures

2.38 When Skin Probes are Disconnected, Connect Skin 1 Probe Alarm Does Not Sound

1. The unit is in Skin Mode.
   - Yes  No
   \[ \rightarrow \] Change the mode of operation to Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Go to RAP 2.42 on page 2-107.
2.39 Incubator’s Air Temperature Exceeds Air Set Temperature by 1.5°C or Greater, or Infant’s Skin Temperature Exceeds Skin Set Temperature by 1.0°C or Greater

1. The unit is in Air Mode.
   - Yes
   - No
   → Go to step 4.

2. The High Air Temperature alarm sounds.
   - Yes
   - No
   → Go to RAP 2.36 on page 2-100.

3. Go to step 5.

4. The High Skin Temperature alarm sounds.
   - Yes
   - No
   → Go to RAP 2.37 on page 2-101.

5. Perform the following:
   a. Silence the High Air/Skin Temperature alarm for 15 minutes or silence the High Temperature Cut Out alarm for 5 minutes by pressing the Silence/Reset softkey.
   b. Check the airflow vents on the surface of the shell assembly.

   The vents are free from obstruction.
   - Yes
   - No
   → Remove the obstruction from the airflow vents. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.

6. The heater automatically turns itself off.
   - Yes
   - No
   → Go to RAP 2.18 on page 2-72. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

7. The problem still exists.
   - Yes
   - No
   → Go to “Final Actions” on page 2-22.

8. For assistance, call Technical Support at (800) 437-2437.
2.40 Humidity System Is Not Working Properly

1. Perform the following:
   a. If the Low Humidity alarm sounds, press the Silence/Reset key (A) to silence it for 5 minutes (see figure 2-36 on page 2-104).

   ![Image of Humidity System]

   b. Withdraw the humidity tray (B) to the fill position.
   c. Check the humidity reservoir (C).

   The humidity reservoir (C) is filled.

   Yes  No
   ↓  → Fill the humidity reservoir (C) with distilled water (refer to procedure 6.7 on page 6-33). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:
   a. Warm the incubator to 95°F (35°C).
   b. At Display 1, press the Humidity softkey to turn on the humidity.
   c. Set the humidity setpoint to 50%.
d. Using a calibrated hygrometer, monitor the relative humidity level within the hood assembly (D).

Within 30 to 60 minutes, the hygrometer and **Humidity** display do not both read **50% ± 9%**.

**Yes**  **No**

↓  → Go to “Final Actions” on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.
2.41 Power Failure Alarm Sounds

1. Perform the following:
   a. Silence the **Power Failure** alarm for 15 minutes by pressing the **Silence/Reset** softkey.
   b. Plug the unit into an appropriate power source

   This solves the problem.

   **Yes**  **No**
   ↓  → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.
2.42 Skin 1 Probe Does Not Work Properly

1. Perform the following:
   a. If the Skin Probe Fail alarm sounds, press the Silence/Reset softkey (A) to silence it for 5 minutes.

   ![Figure 2-37. Skin 1 Probe](image)

   b. Check the skin probe (B).

   The skin probe (B) is securely attached to the infant’s skin.

   **Yes**  **No**
   └───→ Securely attach the skin probe (B) to the infant’s skin. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

2. Disconnect the skin probe (B) from the 1 skin connector at the sensor module assembly (C). The Skin Probe Disconnect alarm sounds.

   **Yes**  **No**
   └───→ Go to step 5.
3. The unit is in Air Mode. Perform the following:
   a. Press the Silence/Reset softkey (A) to silence the Skin Probe Disconnect alarm.
   b. Set the unit in Skin Mode.
This solves the problem.
   Yes   No
   ↓   → Go to step 6.

4. Go to “Final Actions” on page 2-22.

5. Check the mode of operation. The unit is in Skin Mode.
   Yes   No
   ↓   → Set the unit in Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.

6. The Connect Skin 1 Probe alarm sounds.
   Yes   No
   ↓   → Go to RAP 2.38 on page 2-102. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 7.

7. Perform the following:
   a. Connect the skin probe (B) to the skin connector on the sensor module assembly (C).
   b. Access the System Test (1 of 3) menu (see “Diagnostic Menus” on page 2-33). Skin Probe 1 reads as Connected.
   Yes   No
   ↓   → Securely connect the skin probe (B) to the sensor module assembly (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 8.

8. Access the Data Summary (1 of 2) screen (see “Diagnostic Menus” on page 2-33). The Skin 1 Temp reads 0.
   Yes   No
   ↓   → For assistance, call Technical Support at (800) 437-2437.

9. Replace the skin probe (B) (refer to procedure 4.1 on page 4-5). The problem still exists.
   Yes   No
   ↓   → Go to “Final Actions” on page 2-22.
10. Replace the sensor module assembly (C) (refer to procedure 4.2 on page 4-6). This solves the problem.

Yes  No
↓ → For assistance, call Technical Support at (800) 437-2437.

11. Go to “Final Actions” on page 2-22.
2.43 Oxygen System Is Not Working Properly (Units Equipped With an Oxygen System Only)

1. The Oxygen Solenoid Fail alarm sounds.
   
   Yes  No
   ↓  → Go to step 3.

2. Replace the oxygen solenoid (refer to procedure 7.2 on page 7-8). The problem still exists.
   
   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

3. Perform the following:
   a. Press the Silence/Reset softkey to silence the Oxygen Calibration Required alarm for 5 minutes, if necessary.
   b. Calibrate the oxygen sensors (refer to procedure 6.2 on page 6-19). The problem still exists.

   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

4. Replace the oxygen sensors (refer to procedure 7.2 on page 7-8). The problem still exists.

   Yes  No
   ↓  → Go to “Final Actions” on page 2-22.

5. For assistance, call Technical Support at (800) 437-2437.
2.44 Poor Air Circulation Exists Within the Incubator

1. Check the air vents around the interior of the hood assembly for obstruction. The air vents are free from obstruction.
   Yes  No
   \[\rightarrow\] Remove the obstruction from the air vents. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the fan motor (refer to procedure 4.9 on page 4-22). This solves the problem.
   Yes  No
   \[\rightarrow\] For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.45 Sensor Module Assembly Fails

1. The sensor module is properly installed on the hood assembly.
   - Yes  → Go to RAP 2.22 on page 2-78. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
   - No

2. The sensor module is properly connected to the unit.
   - Yes  → Go to RAP 2.21 on page 2-76. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.
   - No

3. Replace the sensor module assembly (refer to procedure 4.2 on page 4-6). This solves the problem.
   - Yes  → For assistance, call Technical Support at (800) 437-2437.
   - No

4. Go to “Final Actions” on page 2-22.
2.46 Remove Skin 2 Probe Alarm Sounds

1. Perform the following:
   a. Disconnect the skin probe from the 2 connector on the sensor module assembly.
   b. Check the unit’s mode of operation.
      The unit is in Air Mode.
      Yes  No
      ↓   → Place the unit in Air Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. Press the Silence/Reset key, and then enter Skin Mode. This solves the problem.
   Yes  No
   ↓   → For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.
2.47 Scale Is Not Working Properly

1. Inspect the mattress tray (A) (see figure 2-38 on page 2-115). The mattress tray (A) is level.
   
   Yes  No
   ↓ → Using the mattress tilt mechanism knobs (B), place the mattress tray (A) in the level position. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The **Too Much Weight** alarm sounds.
   
   Yes  No
   ↓ → Go to step 6.

3. Perform the following:
   a. Silence the **Too Much Weight** alarm for 5 minutes by pressing the **Silence/Reset** key (C).
   b. Remove the excess weight from the mattress (D).
      The problem still exists.
   
   Yes  No
   ↓ → Go to “Final Actions” on page 2-22.

4. The **Scale Disconnected** alarm sounds.
   
   Yes  No
   ↓ → Go to step 6.

5. Go to step 10.

6. Perform the following:
   a. If you desire a pounds/ounces display, refer to “Installation and Set-up” on page 6-13.
   b. Remove any objects from the mattress (D).
   c. Select **Display 2**, and press the **Weigh** softkey.
   d. Press the **Zero** softkey twice in succession.
      The **Weight** display reads 0, and the **Weight Sample** bar begins to fill.
   
   Yes  No
   ↓ → Remove all objects from the mattress (D). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 10.
Figure 2-38. Scale Assembly

NOTE:
Hood assembly shown removed for clarity.
7. Place a weight of known value less than 15 lb (7 kg) on the mattress (D). The correct weight appears, and when the Weight Sample bar is filled, a beep sounds and the weight is locked into the Weight display.

Yes  No
↓  → Go to step 10.

8. Perform the following:
   a. Press the Home key to return to Display 2.
   b. Press the Weigh softkey.

The display again displays the value of the weight on the mattress (D).

Yes  No
↓  → For assistance, call Technical Support at (800) 437-2437.


Yes  No
↓  → Go to “Final Actions” on page 2-22.

10. Check the connection of the scale assembly cable (E) at the sensor module assembly (F). The scale assembly cable (E) is securely connected to the sensor module assembly (F).

Yes  No
↓  → Securely connect the scale assembly cable (E) to the sensor module assembly (F). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 11.

11. Replace the sensor module assembly (F) (refer to procedure 4.2 on page 4-6). The problem still exists.

Yes  No
↓  → Go to “Final Actions” on page 2-22.

12. Replace the scale assembly (refer to procedure 7.1 on page 7-5). This solves the problem.

Yes  No
↓  → For assistance, call Technical Support at (800) 437-2437.

2.48 Oxygen System's Cal Fail System Prompt Message Appears

1. Calibrate the oxygen system (refer to procedure 6.2 on page 6-19). The problem still exists.
   Yes   No
   ↓     → Go to “Final Actions” on page 2-22.

2. Attempt to calibrate the oxygen system again (refer to procedure 6.2 on page 6-19). The problem still exists.
   Yes   No
   ↓     → Go to “Final Actions” on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.
2.49 Controller Failure #15—Invalid Parameter in NVRAM

Chapter 2: Troubleshooting Procedures

2.49 Controller Failure #15—Invalid Parameter in NVRAM

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).

2. Go to “Final Actions” on page 2-22.
2.50 Controller Failure #16—NVRAM Integrity Failure

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).

2. Go to “Final Actions” on page 2-22.
2.51 Controller Failure #17—Non-volatile RAM Parameter Consistency Check Failure

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).

2. Go to “Final Actions” on page 2-22.
Chapter 3
Theory of Operation

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Controller Assembly

Figure 3-1. Controller Assembly Block Diagram

- Display
- Display driver
- Central processing unit
- Keypad interface
- Keypad
- SpO₂ module
- SpO₂ module interface
- Watchdog
- LED interface
- LEDs
- Sensor module interface
- Analog interface
- Audible alarm
- Speaker
- RS-232 interface
- O₂ solenoid driver
- To oxygen solenoid
- Power switch
- Fan driver
- To fan motor
- Ambient temperature sensors
- AC power drivers
- To heater
- Airflow sensor
- To humidifier
- Power supply

m222g942
Figure 3-2. Controller Power Supply Schematic Diagram

Refer to fold-out FO 3-1 at the rear of this manual.
Figure 3-3. Interface P.C. Board Schematic Diagram

Refer to fold-out FO 3-2 at the rear of this manual.
Figure 3-4. Central Processing Unit P.C. Board Schematic Diagram

Refer to fold-out FO 3-3 at the rear of this manual.
Variable Height Adjustable Pedestal/Stand Assembly

Figure 3-5. Variable Height Adjustable Pedestal/Stand Assembly Wiring Diagram

Front switches

1 #18 white/black (17" (43 cm))

Up

2 #18 white/brown (14.5" (36.8 cm))

Bottom (NC) (red)

Down

Top (NO) (green)

3 #18 white/red (14.5" (36.8 cm))

Top (NO) (green)

Bottom (NC) (red)

Down

5 #18 white/yellow (17" (43 cm))

Up

#18 white/brown

Ground safety

Ground green/ yellow

#18 orange (motor down)

#18 red (motor up)

Chassis ground

Actuator plug

Dual breaker 15 amp

Ground

Clamped AC cord

ACN black

ACH brown

120/220 (hot feed)

9 #18 white/brown (14.5" (36.8 cm))

11 #18 white/brown (7.7" (19.6 cm))

#18 white/brown

(2) #18 white/black

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Hood/Shell Assembly

Figure 3-6. Sensor Module Functional Block Diagram

Refer to fold-out FO 3-4 at the rear of this manual.
Figure 3-7. Sensor Module P.C. Board Schematic Diagram

Refer to fold-out FO 3-5 at the rear of this manual.
Figure 3-8. Sensor Module P.C. Board Layout
Figure 3-9. Scale P.C. Board Schematic Diagram

Refer to fold-out FO 3-6 at the rear of this manual.
Figure 3-10. Scale P.C. Board Layout
Figure 3-11. Impeller Movement Detector P.C. Board Schematic Diagram

Refer to fold-out FO 3-7 at the rear of this manual.
Figure 3-12. Impeller Movement Detector P.C. Board Layout
Figure 3-13. Shell Assembly Cable Routing

Refer to fold-out FO 3-8 at the rear of this manual.
Figure 3-14. Scale Assembly Cable Routing

Refer to fold-out FO 3-9 at the rear of this manual.
Theory of Operation

Electrical System

Sensor Module

The sensor module P.C. board provides the interface for the patient and incubator requirements that the infant incubator must support. The sensor module assembly reads and processes the following parameters:

- Temperature
- Oxygen
- Humidity
- Weight information, collected from external sensors and cables

This information is periodically updated and transmitted to the main controller upon request.

The sensor module P.C. board does not require manual calibration. Calibration performs automatically and periodically during normal operation. To provide safe monitoring and control, both the temperature information and oxygen information have redundant circuitry to prevent single-fault failures.

All signals are transmitted through serial data communication.

The sensor module connects to a sensor P.C. board that has the following parameters required for the system:

- Air temperature
- Oxygen
- Humidity
- Fan operation

Power Supply

The power to the sensor module P.C. board is provided through connector J4, providing ±12V AC for the system. U21, U19, and U15 regulate the voltages by providing +5V, digital +5V and analog -5V, respectively. U20 provides a precision +5V source for analog signal conversions.
Sensor Position Detection

Hall effect sensors sense the magnets in the slide mechanism. The sensors, U9 and U2, determine the calibration position. The sensors, U16 and U22, determine the hood's position during normal operation. The output is normally high. These devices provide a low output if a significant south pole magnetic field is applied to their surface.

Remote Light Alarm Indicator

DS1 provides an alarm indication with a high field of view. A positive signal, RMLITE, at the gate of transistor Q3 illuminates DS1.

Scale Interface

The connector J3 provides the interface and power for the scale module. The scale module supports serial data communication. The signal SCCLK is used for scale communication only and is normally high when the scale is disconnected. The signal CDATA is bi-directional and is normally in the low state when the scale is not connected.

Fan Control/Feedback Circuit

To drive the DC fan on the sensor board, the signal FANON pulses Q1 on its gate at a 50% duty cycle at approximately 48 Hz to maintain proper speed and to increase fan life. Every 4 seconds, the microcontroller asserts FANON for 42 milliseconds, and the fan pulse detection begins.

U1A handles the pulse detection and, through the resistors R3 and R7, samples the current spikes from the fan produced across R1. The amplifier operates as a differentiator, providing high gain for the current spikes. D1 and C16 then rectify and filter this signal and then feed it to the Analog/Digital (A/D) converter as signal FANPUL. This provides a semi-DC level as a function of the fan rotation.

Temperature Measurement

The temperature data acquisition circuit starts with the analog multiplexers, U6 and U5, each allowing an 8-to-1 signal switching. The microcontroller selects the multiplexer channel by the signals MSEL0, MSEL1, and MSEL2. Each multiplexer output can be inhibited by either signal TM1SEL or TM2SEL, depending on the multiplexer; only one multiplexer is active at a time. With each multiplexer output into the amplification under control, this data acquisition is viewed as a 16-to-1 analog temperature selector. The microcontroller selects a new temperature channel every 21 milliseconds.
The resistor R14 provides the constant voltage drive required for each thermistor as it is selected from the appropriate multiplexer. This voltage is amplified by a factor of 2.1083, and is sent to the A/D converter as signal TCOM.

To provide automatic calibration of the circuit and eliminate temperature and aging drifts, R44 and R45 introduce precise calibration values into each multiplexer. These values are read through the multiplexers and are used in software processing to eliminate the gain and offset errors of each multiplexer/amplifier combination. These values equate to 120.87°F (49.37°C) and 72.72°F (22.62°C), which allow for precise circuit calibration.

Resistor R43 is an additional check to the circuit, which provides a resistance simulating 98.57°F (36.98°C).

The sensor module supports the following three air temperature sensors on the sensor board:

- AIRTE
- AIRTC
- AIRTM

These signals interface through J2-6 to J2-8. The thermistors then route to temperature multiplexers U5 and U6, which provide analog signal processing into the A/D converter.

The skin temperature probes contain dual thermistors. The sensor module supports two probes that plug into connectors J6 and J7. The two thermistors connect to SKNT1M and SKNT1C or SKNT2M and SKNT2C, with a common connector at AGND. Both probes have high frequency filtering by inductor networks LN1 and LN2. In addition, each skin probe has a resistor that is input to the multiplexers. The microcontroller uses these signals, SKNT1D and SKNT2D, to determine if the probes are installed.

**Humidity Measurement**

Humidity measurement originates with the humidity sensor on the sensor P.C. board, connected to J2-5 and J2-14 (AGND and HS2, respectively). The sensor is a capacitive-type that changes capacitance as a function of humidity; the net range of capacitances is from approximately 160 pF to 200 pF. The sensor connects to the amplifier U7A/U8A, which is set up as a multi-vibrator. The sensor capacitance charges up through R20 and R21 to a threshold voltage established by R30 and R26.
When the capacitor voltage reaches the threshold, the capacitor U7A/U8A goes high to 2.5V as controlled by R19 and R28, and turns on Q2. This discharges the humidity sensor through R20 until it reaches the lower threshold established by R24, R26, and R30. The capacitor voltage goes from approximately 0.2V to 0.7V. At this point, the comparators output goes low, releasing the drive to Q2 and allowing the humidity to start charging again. This produces a frequency output as a function of capacitance, such as humidity.

The output signal, which is only 2.5V peak, is then input into U7B/U8B to condition the 5V signal. Hysteresis is provided through the use of R23, R29, and R32 to ensure stable frequency switching. The output signal, JUMPUL, is then sent to the microcontroller for processing. A typical frequency would be around 37 KHz.

**Microcontroller**

The microcontroller is a Priority-Interrupt Controller (PIC) 16C73, used for signal-processing and for control of all signals on the sensor module. The device has three external ports, configurable as inputs and outputs. The microcontroller operates from a precise time-base of crystal Y1, operating at 4 MHz. The instruction cycle time of the PIC is ¼ of that, namely at 1 MHz or 1 microsecond.

To ensure a clean power-up, U10 provides a fixed power-up reset to the microcontroller. This integrated circuit also generates a reset in the event of a brownout condition when the D+5 falls below a predetermined threshold.

If the main controller determines that the sensor module requires reset intervention, the reset line of the microcontroller, SMRES, is available to the main controller.

The PIC device operates with an internal watchdog timer device that asserts SMRES if the program execution operates outside normal conditions.

**Expansion Devices**

The digital multiplexer, U3, allows additional digital signals for processor control. It is a dual, 4-to-1 multiplexer that allows the microcontroller to use two ports for 8-bits of information. The signals, DVSEL0 and DVSEL1, control U18.
The buffered line-drivers, U13A/B and U14A, are used for signals that are going off-board, namely SMDATA, SCDATA, and SCCLK. The SMDATA line is used as a bi-directional line that can change from input or output “on-the-fly” for data communication to the main controller. The SCDATA is similar, with connection to the scale at connector J3. SCCLK is the buffered clock line used for scale communications.

Buffer U14B provides an inversion for TM1SEL, producing TM2SEL to alternately enable and disable the temperature multiplexers.

**Analog/Digital (A/D) Conversions**

The A/D converter, U11, is an eight-channel, 12-bit, serial, interface device. Control for the channels is software-configurable by the serial communication line SSPCLK, ADCDIN, and COMOUT. The signal, ACENI, enables the A/D converter for signal processing and is asserted twice every 21 milliseconds; the A/D converter is read twice. In addition, the ADCIN and COMOUT are driven at 21 millisecond intervals. The SSPCLK is shared with the EEPROM on the sensor board and scale clock; therefore, the timing is not periodic.

All temperature information appears as a multiplexed signal on Channel 0, and oxygen information appears as a multiplexed signal on Channel 2. Channel 4 enables the A/D converter to read its maximum input, and Channel 5 enables the A/D converter to read its minimum input to determine proper A/D functioning.

The analog representation of fan pulses apply to Channel 6.

**Controller**

The controller accepts input voltages between the range of 90V AC and 264V AC through a universal input switching power supply. Voltages above the safe operating range are clamped using a transorb diode.

The controller accepts input frequencies between the range of 48 Hz to 62 Hz through a universal input switching power supply.

The stand supplies the input power and protective ground to the controller and incorporates a 15A circuit breaker and electromagnetic interference (EMI) filtering components.
The controller provides AC power to the heater and the humidifier. These outputs are fused in the controller to protect the controller in the event of a short circuit or electrical overload.

- Maximum heater voltage—264V AC
- Maximum heater current—4.8A
- Maximum humidifier voltage—264 V AC
- Maximum heater current—1.2A
- Heater/humidifier fuse rating—6.3A

The controller provides DC power to the following:

- The fan
- The sensor module
- The scale
- The SPO₂ module, if available
- The airflow sensors
- The door switches

These outputs are current-limited in the controller to protect the controller and the powered device if a circuit shorts or electrically overloads. These outputs are regulated to ensure the output voltage is within the voltage specification for the powered device. The microprocessor feeds and monitors the outputs 1 and 2 into the A/D converter.

**Impeller Movement Detector (IMD) P.C. Board**

The Impeller Movement Detector (IMD) P.C. board is positioned so that magnets pressed into the bottom of the impeller pass directly over a Hall effect sensor mounted to the IMD P.C. board. The IMD circuit monitors the Hall effect sensor’s pulse train, produced by the magnets when the impeller rotates. The speed of the impeller is measured and compared with the pre-determined maximum and minimum acceptance limits. If the impeller’s rotational speed is too fast or too slow, an impeller error signal generates. The IMD circuit also detects if one, two, or all three magnets are missing or if an old impeller without magnets is used. These errors produce the same error signal to the controller as for low or high impeller speeds.
The controller’s +12V supplies the power for the IMD circuit through a 301Ω resistor. This resistor and the load of the IMD circuit form a voltage divider that sets the LONG signal voltage that remains constant. U1, a voltage regulator, supplies +5V DC to the Hall effect sensor (U3) and the microcontroller (U2). As the magnets pass above the Hall effect sensor, its open-drain output, U3-2, goes low, detecting the magnets’ field. When the magnets’ field is removed, the oscillator is used as a reference. When an error condition is detected, U2-2, the microcontroller’s output, drives low, which accomplishes the following:

- Turns off Q1.
- Releases a portion of the load on the short signal, allowing it to rise above the LONG signal voltage.

R2, the switch portion of the SHORT signal load, and R4, the unswitch position of the SHORT signal load, adjust to provide an approximate 1V swing between the error and non-error outputs. The capacitors, C1 and C2, filter the system’s supply.

The IMD P.C. board supports in-circuit programming (ICP) of the microcontroller. Programming is done after the unprogrammed microcontroller is populated with all the other components by connecting a programmer to the pads labeled VPP, +5V, CLK, DTA, and GND.

**Fan Motor**

The controller sets the fan motor speed if the watchdog is not tripped. The microprocessor supplies a pulse-width modulation (PWM) signal to an optocoupler for isolation. The output connects to an integrator circuit that converts the PWM signal to an analog signal for the motor controller. The motor incorporates the Hall effect sensors for monitoring and control. One of the Hall effect sensor outputs is fed to the microprocessor for measuring the motor speed. If the watchdog timer trips, the fan motor speed is maintained at 1500 rpm ± 450 rpm.

The controller provides an alarm to indicate a failure of the fan to rotate. When this occurs, the heater and humidifier disable, and an audible alarm with a visual indication activates.
Theory of Operation
Chapter 3: Theory of Operation

Heater Power

The controller monitors the heater power. A current transformer is in series with the power to the heater and the humidifier. The output of the current transformer connects to the A/D converter.

The system enables control of the incubator’s heater. The microprocessor controls a solid state relay that controls the power to the heater. The microprocessor and the watchdog circuit control the safety relay, K3. The release of the safety relay removes power from the heater regardless of the functionality of the heater triac.

Humidity Heater Power

The controller monitors the humidity heater power. A current transformer is in series with the power to the heater and humidifier. The output of the current transformer connects to the A/D converter.

The system enables control of the humidity heater. The microprocessor controls a solid state relay that controls the power to the humidity heater. The microprocessor and the watchdog circuit control the safety relay, K3. The release of the safety relay removes power from the humidifier heater regardless of the functionality of the humidity heater triac.

Oxygen Control

The system enables control of the oxygen pneumatics. The microprocessor provides a PWM signal to the solenoid’s metal oxide semiconductor field-effect transistor (MOSFET).

The voltage to the oxygen solenoid is monitored and fed into the A/D converter. This circuit monitors the 12V power supply and thermal fuse.

Light-Emitting Diodes (LEDs)

The microprocessor drives each light-emitting diode (LED). The hardware watchdog timer circuit drives the alarm/system fail indicator. The power fail detection circuitry drives the Power Fail indicator.
**Audio Alarms**

The audible alarm circuit incorporates an oscillator circuit to generate the three alarm frequencies used:
- 600 Hz
- 1500 Hz
- 2500 Hz

The microprocessor, the watchdog circuit, and the power failure detection circuitry drive the audible alarm circuit.

The audio volume is capable of three discrete sound levels. An analog switch, incorporated in the audible alarm amplifier circuit, selects a 57 dB, 62 dB, or 65 dB output, as measured by International Electrotechnical Commission (IEC) 601-19-2:102.3. The microprocessor, the watchdog circuit, and the power failure detection circuit control the analog switch.

**Power Fail**

The controller provides an audio output for power fail conditions. The alarm oscillator is set for 600 Hz at 65 dB output, as measured by IEC 601-19-2:102.3. A timer circuit generates the cadence tone during power failures.

When a **Power Failure** alarm is activated, the following occurs:
- The **Power Fail** indicator on the front panel illuminates.
- An alarm sounds.

A high energy storage capacitor powers the power failure detection circuitry and supplies power to the audible alarm and indicator for a minimum of 10 minutes. This capacitor charges while the unit is operating. When power is lost to the controller and the **Power** switch remains in the **On** position, the storage capacitor supplies power to the power failure circuitry. The power failure circuitry incorporates a timer circuit that periodically enables the audible alarm and **Power Fail** indicator at a cadence of 520 milliseconds off and 98 milliseconds on until one of the following occurs:
- The **Power** switch is turned off.
- The power is restored.
- The storage capacitor is depleted.
The **Power Failure** alarm silence is hardware-controlled. Pressing the **Alarm Silence** key during power failure silences the alarm for the duration of the power failure. The **Power Fail** indicator flashes until one of the following occurs:

- The storage capacitor is depleted.
- The **Power** switch is turned off
- The power is restored.

The **System Failure** alarm is unaffected by the **Alarm Silence** key.

**Interfacing**

An interface port enables an RS-232 serial communication link. The serial port is fully isolated from the remaining controller circuitry. The power to the serial port interface circuitry derives from an isolated winding on the power supply transformer. The RS-232 interface connector is a female DB-9, mounted on the rear of the controller. An RS-232 transceiver converts the RS-232 to logic voltage levels and vice versa. Optocouplers provide the isolation barrier and interface the RS-232 transceiver to the PCI16550 UART. The UART interfaces the serial port to the microprocessor bus. All lines connected to the RS-232 connector are filtered to block EMI. The RS-232 transceiver incorporates electrostatic discharge (ESD) protection.

An interface enables communication between the controller module and the sensor module. The sensor module interface connector is a female DB-9, mounted on the rear of the controller and comprised of a bi-directional data line, a clock output line, and a reset output line. The data lines are fully isolated and optocoupled to the microprocessor. The controller provides isolated power to the sensor module.

**Door Switches**

The controller connects to the two door switches that are wired in parallel. The controller performs the following:

- Provides no more than 5 milliamperes (mA) of current to the switches
- Provides less than 6V of power to the switches
- Monitors the return current to determine if either door is open

The switches are open when the door is closed. The input is protected with transorb diodes and is filtered to block EMI and prevent ESD damage to the controller.
Cooling Fan

The cooling fan provides a continuous flow of air through the controller to remove heat generated by the various components inside the controller enclosure. The cooling fan operates whenever power is applied to the controller. The cooling fan is equipped with a tachometer output signal that is supplied to the microprocessor.

Ambient Temperature Sensors

The temperature sensors, located in the airflow of the cooling fan, are NTC thermistors. The output signals of the redundant sensors feed into the A/D converter.

Watchdogs

The first watchdog timer is internal to the microprocessor. If the software does not update the watchdog timer within the required time frame, the internal watchdog resets the microprocessor and all peripherals connected to the external reset line.

The second watchdog timer circuit attaches to the microprocessor bus. The microprocessor continuously writes the following data to the watchdog timer:

- Data 55 hex (01010101 binary) to watchdog register #1.
- Data AA hex (10101010 binary) to watchdog register #2.

The watchdog timer trips in 1 second ± 0.4 second unless the above sequence is completed. Once the watchdog timer trips, the following occurs:

- The safety relay turns off, removing power from the heater and the humidifier.
- The fan control reverts to closed loop control, maintaining a constant fan speed regardless of the door’s position.
- The oxygen solenoid control from the microprocessor is overridden, and the oxygen solenoid turns off so that no oxygen enters the hood.
- A constant alarm sounds for a minimum of 500 milliseconds.
- The system failure indicator illuminates.

The microprocessor resets the watchdog timer after a watchdog trip by sending the above data sequence.
Factory Defaults

Factory defaults are stored in program memory, flash EEPROM. System parameters are configured and stored in the real time clock (RTC) module or serial EEPROM. The RTC memory and random access memory (RAM) are protected against corruption during power failures and are battery-backed for a period of time.

The program is stored in reprogrammable memory and may be reprogrammed through a cable connected to the serial port of a computer. The program memory is stored in a flash EEPROM. The RS-232 serial port operates at speeds of 115,200 baud to expedite the speed of the program download.

Power Supply

The power supply is so designed that 1 second after disconnection of the plug, the voltage between the supply pins of the plug and between either supply pin and the enclosure does not exceed 60V by using a bleeder resistor across the mains filter capacitor, if necessary.

Air System

Overall Functional Description

The controller displays the air temperature and the skin temperature on an electroluminescent display. Optional displays of the humidity and oxygen concentration levels within the hood environment and the infant’s weight are available. In addition, Trend displays of 2, 4, 8, 12, and 24 hours of all parameters (except weight, which is presented in days) are user-selectable.

To indicate which mode of operation, Air Mode or Skin Mode, is in control, the set temperature of the controlling parameter remains on adjacent to the actual displayed temperature. In addition, the rotating wheel in the Air or Skin softkey designator rotates.

The forced air circulation system controls the temperature, humidity, and oxygen concentration (see figure 3-15 on page 3-29). The motor-driven impeller in the shell draws a controlled amount of approximately 7 liters per minute (lpm) of room air through the air intake filter.
Figure 3-15. Air/Oxygen Circulation System

Sensor module assembly

Front
The impeller also provides the internal circulation at a much greater flow than that of the fresh gas inflow. The total flow of fresh and circulated air is directed past the airflow sensor and around the heater. The air enters the infant compartment up through the slots at the front and rear of the main deck and then passes between the front and rear inner walls. The air circulates past the sensor module, which contains the temperature sensing probe that encapsulates the air temperature control thermistor and a high air temperature alarm thermistor. After circulating within the infant compartment, the air then recirculates down through a slot in the right end of the main deck, and back to the impeller. When the access panel of the hood is open, the air continues to flow upward past the opening, creating a warm air curtain to minimize the drop in air temperature in the incubator. The temperature is regulated using either the incubator’s air or the infant’s skin temperature as the controlling parameter; the desired mode is selected by the front panel keys.

In either mode of operation, the heater output is proportional to the amount of heat required to maintain the desired temperature.

**Air Mode**

In Air Mode, the air temperature is maintained from 68°F to 99°F (20°C to 37°C) (99°F to 102°F (37°C to 39°C) in Temperature Override Mode), as selected by the **Air Set Temperature** Up and Down arrow keys on the front panel. A probe located in the sensor module monitors the incubator’s air temperature and compares it with the air’s set temperature setting. The probe supplies this information to the heater control circuitry, which regulates the heater output to maintain the air temperature setting. The actual air temperature appears on the **Air Temperature** display. A second sensor within the air temperature probe serves as a backup to limit the maximum incubator temperature. If the high temperature limit activates, the heater shuts off.

In Air Mode, the infant’s temperature is a function of the air temperature and the infant’s ability to establish and maintain its own temperature. A small infant, or one with underdeveloped homeostatic control, may not be able to maintain a stable temperature at the desired level.

In Air Mode, there is a 15-minute setpoint retention. When you first power the unit on, the air setpoint temperature is 95°F (35°C); for example, if you change the air setpoint temperature to 95.9°F (35.5°C), and a power failure occurs, the air setpoint temperature comes up to 95.9°F (35.5°C) if the unit turns on again before 15 minutes elapse.
Skin Mode

In Skin Mode, the infant's temperature is selected from 93°F to 99°F (34°C to 37°C) (99°F to 100°F (37°C to 38°C) in Temperature Override Mode) by the Skin Set Temperature Up and Down arrow keys on the front panel. A temperature sensing probe attaches directly to the infant's skin. The probe supplies information to the heater control circuitry, which proportions the heater output to maintain the skin set temperature.

The air temperature still appears in Skin Mode, but as information only. If Air Mode is selected while the skin probe remains connected, the Skin Temperature display continues to display actual skin temperature, but it does not control.

The sensor module accepts two skin probes. However, when the second skin probe connects to the sensor module in Skin Mode, an alarm sounds, and the message Remove Skin 2 Probe appears. To connect the second skin probe, first select Air Mode. The controller then displays the two temperatures.

If Skin Probe 1 disconnects from its receptacle during Skin Mode, the Skin Temperature display goes blank, an alarm sounds, and the heater turns off.

Oxygen Control

An oxygen sensor assembly mounted inside the sensor module adjusts the flow of oxygen into the hood and controls the oxygen concentration level within the incubator's hood environment.

A valve regulates the flow into the incubator and periodically interrupts the flow of oxygen into the incubator.

The sensor module houses two independent oxygen fuel cells that monitor and control the oxygen concentration levels inside the incubator.

If the sensor module is outside of the hood environment during Oxygen Mode, audible and visual alarms are enabled, and the flow of oxygen is interrupted.

In Oxygen Mode, the user sets the oxygen level control point from 21% to 65%. The high and low alarm limits automatically set to ±3% from the control point. If the oxygen concentration level rises above or falls below the selected setpoint limits, an audible and visual alarm occurs.
Humidity Control Valve

The built-in humidifier provides humidification of the incubator from 30% to 95% RH in 1% increments. The humidifier reservoir permits visual inspection of the water level.

If the water level in the chamber is depleted, an audible and visual Low Humidity alarm occurs, indicating a need to replenish the water supply.

Hardware

Weighing Mode

Two load cells in a platform under the mattress perform the actual weighing function. These cells provide a voltage that is proportional to the load on it. The controller processes the voltage and displays it in either kilograms or pounds/ounces on the Weight display.

The weighing routine is initiated by placing the infant on the mattress. If the infant is already on the mattress, lift the infant off the mattress; when the system zeros, return the infant to the mattress to obtain the weight.

The Weigh key enables repeated weighing of the infant after the weighing routine is initiated as described above.

Trend Displays

Four standard parameters are presented on Trend displays:

• Air temperature
• Skin temperature #1
• Skin temperature #2
• Heater power

Additional Trend displays are available when the unit is equipped with any of the following options:

• Oxygen
• Weight
• Humidity

The Trend time is user selectable in intervals of 2, 4, 8, 12, and 24 hours for all parameters, except for weight, which provides a trend of 7 days.
Interface Connections

A serial interface port is configured as a data terminal device and provides an RS-232 output. This RS-232 port can be used to connect the device to a bedside patient monitor or a central monitoring system using the VueLink™ system software functionality to views the following parameters:

The following parameters are available:

- Air and skin setpoint temperatures
- Current air and skin temperatures
- Oxygen setpoint
- Oxygen level
- Humidity setpoint
- Humidity level
- Infant weight

1. VueLink™ is a trademark of Philips Medical Systems.
RS-232 Serial Port Protocol

The RS-232 serial port connector is next to the AC power connector on the front of the incubator. The serial port is configured for 2400 baud, 8 data, 1 stop, no parity, and is output only (see figure 3-16 on page 3-34).

Figure 3-16. RS-232 Connector Pin Outs

RS-232 port connector
9-pin D-female
1 NC
2 RXD
3 TXD
4 NC
5 GND
6 NC
7 NC
8 NC
9 NC

During normal operation, a data packet transmits every 5 seconds. Each data packet is entirely in American Standard Code Information Interchange (ASCII) and is readable when displayed on any standard RS-232 terminal device. A data packet consists of one 82-character line of text that is composed of a prefix, a data portion, a suffix, a checksum, and a carriage return/line feed (CR/LF) pair.

The prefix identifies the data line. It consists of an opening bracket and an ID character that are unique to the data line. The format of the data portion depends on the specific data line. Any character positions within the data portion that are undefined transmit as spaces to enhance the readability of the output. The suffix property limits the data portion and consists of a closing bracket.

The checksum is two ASCII hexadecimal digits and represents an 8-bit acclamation of the ASCII characters from the prefix to the suffix, inclusive.
All monitored parameters, including temperature, oxygen, humidity, and weight, transmit at the 5-second interval. Asynchronous events, such as alarms or mode changes, transmit as they occur.

Example of the data string:

00000000001111111112222222223333333444444444555555555666
12345678901234567890123456789012345678901234567890123
[ ISOLETTE 000000000000 361A 385 387 360 220 050 76 75 21 21 1245 ]8D

<table>
<thead>
<tr>
<th>Columns</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>Prefix: 2 characters, ‘[‘ followed by the ID character (see table 3-2 on page 3-36)</td>
</tr>
<tr>
<td>4 through 11</td>
<td>Product ID: 8 characters</td>
</tr>
<tr>
<td>13 and 14</td>
<td>Mode bit flags: 2 hexadecimal digits (see table 3-3 on page 3-36)</td>
</tr>
<tr>
<td>15 through 24</td>
<td>Alarm bit flags: 10 hexadecimal digits (see table 3-4 on page 3-37)</td>
</tr>
<tr>
<td>26 through 28</td>
<td>Setpoint temperature: 3 digits, 1 decimal, Celsius</td>
</tr>
<tr>
<td>29</td>
<td>Air/Skin Mode: 1 character “A or B”</td>
</tr>
<tr>
<td>31 through 33</td>
<td>Skin temperature 1: 3 digits, 1 decimal, Celsius</td>
</tr>
<tr>
<td>35 through 37</td>
<td>Skin temperature 2: 3 digits, 1 decimal, Celsius</td>
</tr>
<tr>
<td>39 through 41</td>
<td>Air temperature: 3 digits, 1 decimal, Celsius</td>
</tr>
<tr>
<td>43 through 45</td>
<td>Ambient temperature: 3 digits, 1 decimal, Celsius</td>
</tr>
<tr>
<td>47 through 49</td>
<td>Heater power: 3 digits, range 0 to 250</td>
</tr>
<tr>
<td>51 and 52</td>
<td>Humidity: 2 digits, 0 decimal</td>
</tr>
<tr>
<td>54 and 55</td>
<td>Setpoint humidity: 2 digits</td>
</tr>
<tr>
<td>57 and 58</td>
<td>Oxygen: 2 digits, 0 decimal</td>
</tr>
<tr>
<td>60 and 61</td>
<td>Setpoint oxygen: 2 digits</td>
</tr>
<tr>
<td>63 through 66</td>
<td>Weight: 4 digits, 3 decimals, kilograms</td>
</tr>
<tr>
<td>78</td>
<td>Suffix: 1 character, ‘[‘</td>
</tr>
<tr>
<td>79 and 80</td>
<td>Checksum: 2 hexadecimal digits</td>
</tr>
<tr>
<td>81 and 81</td>
<td>CR/LF: 2 control characters</td>
</tr>
</tbody>
</table>
### Table 3-2. ID Character

<table>
<thead>
<tr>
<th>Character</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;space&gt;</td>
<td>Normal mode</td>
</tr>
<tr>
<td>1</td>
<td>Special/Test Mode is in effect (data may be invalid)</td>
</tr>
</tbody>
</table>

### Table 3-3. Mode Bit Flags

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Humidity on</td>
</tr>
<tr>
<td>02</td>
<td>Oxygen on</td>
</tr>
<tr>
<td>04</td>
<td>Baby Mode configuration</td>
</tr>
<tr>
<td>08</td>
<td>0.5°C baby alarm limit</td>
</tr>
<tr>
<td>10</td>
<td>Reserved</td>
</tr>
<tr>
<td>20</td>
<td>Reserved</td>
</tr>
<tr>
<td>40</td>
<td>Reserved</td>
</tr>
<tr>
<td>80</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

For example: If “Humidity on” and “Baby Mode configuration” are selected, the character is **05**.
<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000000001</td>
<td>Low control temperature</td>
</tr>
<tr>
<td>00000000002</td>
<td>High control temperature</td>
</tr>
<tr>
<td>00000000004</td>
<td>Low oxygen</td>
</tr>
<tr>
<td>00000000008</td>
<td>High oxygen</td>
</tr>
<tr>
<td>00000000010</td>
<td>High temperature cut-out</td>
</tr>
<tr>
<td>00000000020</td>
<td>Skin 1—probe failure</td>
</tr>
<tr>
<td>00000000040</td>
<td>Skin probe—disconnect</td>
</tr>
<tr>
<td>00000000080</td>
<td>Oxygen calibration required</td>
</tr>
<tr>
<td>00000000100</td>
<td>Sensor out of position</td>
</tr>
<tr>
<td>00000000200</td>
<td>Water level low</td>
</tr>
<tr>
<td>00000000400</td>
<td>Procedural Silence</td>
</tr>
<tr>
<td>00000000800</td>
<td>Motor failed</td>
</tr>
<tr>
<td>0000001000</td>
<td>Low air flow</td>
</tr>
<tr>
<td>0000002000</td>
<td>Heater failed</td>
</tr>
<tr>
<td>0000004000</td>
<td>EEPROM failed</td>
</tr>
<tr>
<td>0000008000</td>
<td>Sensor module failure</td>
</tr>
<tr>
<td>0000010000</td>
<td>Controller failure 1</td>
</tr>
<tr>
<td>0000020000</td>
<td>Controller failure 2</td>
</tr>
<tr>
<td>0000040000</td>
<td>Controller failure 3</td>
</tr>
<tr>
<td>0000080000</td>
<td>Controller failure 4</td>
</tr>
<tr>
<td>0000100000</td>
<td>Air probe failed</td>
</tr>
<tr>
<td>0000200000</td>
<td>Oxygen cell different</td>
</tr>
<tr>
<td>0000400000</td>
<td>Scale disconnect</td>
</tr>
<tr>
<td>0000800000</td>
<td>Too much weight</td>
</tr>
<tr>
<td>0001000000</td>
<td>Scale failed</td>
</tr>
</tbody>
</table>

**Example:** If the air temperature and oxygen are low and Procedural Silence is initiated, such as when an access door is open, the 10 character value equals **000000405**.

Certain fields, such as air temperature, have an implied decimal point. The decimal point does not physically appear in the data stream.
Chapter 4
Removal, Replacement, and Adjustment Procedures

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4.1 Skin Temperature Probe

Tools required: None

Removal

Disconnect the skin temperature probe (A) from the sensor module assembly (D) (see figure 4-1 on page 4-5).

![Skin Temperature Probe Diagram]

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.2 Sensor Module Assembly

Tools required: None

Removal

1. Disconnect the sensor module assembly (A) from the shell assembly (B) (see figure 4-2 on page 4-6).

![Figure 4-2. Sensor Module](image)

2. If the unit is equipped with a sensor module locking assembly (C), lower it.

3. Withdraw the sensor module assembly (A) from the hood assembly (D) until it stops.

4. Pull out the clip on the left side of the sensor module assembly (A), and slide the sensor module assembly (A) out of the hood assembly (D).

5. If necessary, disconnect any skin temperature probes (E) from the sensor module assembly (A) (refer to procedure 4.1 on page 4-5).

6. If necessary, disconnect any cable assemblies from the sensor module assembly (A).
Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.3 Oxygen Sensor Cell

Tools required: Phillips head screwdriver

Removal

1. Remove the sensor module assembly from the unit (refer to procedure 4.2 on page 4-6).

2. Remove the two screws (A) that secure the mounting plate (B) to the bottom of the sensor module assembly (C) (see figure 4-3 on page 4-8).

![Figure 4-3. Oxygen Sensor Cell](image)

3. Remove the mounting plate (C) from the sensor module assembly (A).

4. Disconnect the leads (D) from the two oxygen sensor cells (E).

⚠️ CAUTION:
Replace both oxygen sensor cells at the same time. Failure to do so could result in equipment damage.
5. Unscrew the two oxygen sensor cells (E) from the mounting plate (B), and remove them both from the unit.

**Replacement**

1. Screw both replacement oxygen sensor cells (E) on the mounting plate (B).

2. Connect the leads (D) of the sensor module assembly (C) to the two oxygen sensor cells (E).

3. Install the two screws (A) to secure the mounting plate (B) to the sensor module assembly (C).

4. Install the sensor module assembly in the hood assembly (refer to procedure 4.2 on page 4-6).

5. Calibrate the oxygen system (refer to procedure 6.2 on page 6-19).

6. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.4 Controller Assembly

Tools required: None

Removal

⚠️ SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.

2. From under the shell assembly (A), perform the following (see figure 4-4 on page 4-11):
   a. Disconnect the AC power cord from its connector (B) on the back of the controller assembly (C).
   b. If necessary, disconnect the cable attached to the RS-232 port (D).
   c. Remove the two wing nuts (E) located next to the AC power connector (B) and the RS-232 port (D).

3. Slide the controller assembly (C) out from the shell assembly (A) until its cable connectors are visible.

4. Disconnect the cables from the controller assembly (C).

5. Remove the controller assembly (C) from the shell assembly (A).

Replacement

⚠️ CAUTION:
When reconnecting the rear panel connectors, connect the sensor module-to-connector cable assembly to the sensor module connector only. Do not connect the sensor module cable to the RS-232 connector. Equipment damage could occur.

1. Perform the removal procedure in reverse order. When connecting the cables to the controller assembly (C), connect the sensor module-to-controller cable assembly (F) to the sensor module connector (G), not the RS-232 port (D).

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
Figure 4-4. Controller
4.5 Hood Assembly

Tools required: None

Removal

⚠️ SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the back of the controller assembly (A) (see figure 4-5 on page 4-13).

2. Remove the sensor module assembly from the hood assembly (refer to procedure 4.2 on page 4-6).

3. Remove the scale connector cable (B) from the cable clamps (C) on the end of the hood assembly (D).

4. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

5. Tilt the hood assembly (D) back until it is fully open.

⚠️ WARNING:
Two people are required to lift the hood assembly. Failure to use at least two people could result in personal injury or equipment damage.

6. Stand one person behind the incubator at each end of the hood assembly (D), and have each person lift their end of the hood assembly (D) straight up from the shell assembly (E). If the shell assembly (E) is equipped with a latching mechanism (F), the person at that end of the hood assembly (D) must release the knob (G) while lifting.

7. Carefully remove the hood assembly (D) from the unit.

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
Figure 4-5. Hood Assembly
4.6 Check Valve Assembly

Tools required: Phillips head screwdriver
12" long wooden prop
Pliers

Removal

⚠️ SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-6 on page 4-15).

2. Remove the four Nylok® screws (B) that secure the shell bottom (C) to the shell assembly (D). Discard the four Nylok® screws (B).

3. Remove the extrusion bumper (I) from between the shell assembly (D) and the shell bottom (C).

4. Stand at the same end of the shell assembly (D) as the controller assembly (A), and perform the following:
   a. Using the mattress tilt knob (E) and the rear hood hinge (F), lift the shell assembly (D).
   b. Insert a 12" long wooden prop between the shell assembly (D) and the shell bottom (C).

5. Using pliers, disconnect the three hoses from the existing check valve assembly (J).

6. Remove the air intake microfilter cover (G) (refer to procedure 4.19 on page 4-48).

7. Remove the Nylok® screw (H) that secures the check valve assembly (J) to the shell bottom (C). Discard the Nylok® screw (H).

8. Remove the check valve assembly (J) from the shell bottom (C).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 4-6. Check Valve Assembly
4.6 Check Valve Assembly

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Replacement

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

1. Install a new Nylok® screw (H) to secure the replacement check valve assembly (J) to the shell bottom (C).

2. Connect the three hoses to the replacement check valve assembly (J).

⚠️ CAUTION:
Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

3. Stand at the same end of the shell assembly (D) as the controller assembly (A), and perform the following:
   a. Remove the 12" long wooden prop from between the shell assembly (D) and the shell bottom (C).
   b. Carefully lower the shell assembly (D) in place on the shell bottom (C).
   c. Ensure that no cables are pinched between the shell assembly (D) and the shell bottom (C).
   d. Ensure that the extrusion bumper (I) fits properly between the shell assembly (D) and the shell bottom (C).

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

4. Install four new Nylok® screws (B) to secure the shell bottom (C) to the shell assembly (D).

5. Install the air intake microfilter cover (G) on the unit (refer to procedure 4.19 on page 4-48).

6. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.7 Mattress, Mattress Tray, and X-ray Tray

Tools required: None

Removal

1. Lift the hood assembly, and carefully tilt it back to its open position.

2. Remove the mattress (A) from the mattress tray (B) (see figure 4-7 on page 4-17).

**Figure 4-7. Mattress Platform Assembly**

3. If necessary, remove the mattress tray (B) and the x-ray tray (C) from the unit.

4. If necessary, remove the x-ray tray (C) from the mattress tray (B).

**NOTE:**
Hood assembly removed for clarity.
Replacement

1. Perform the removal procedure in reverse order. Ensure that the mattress tray (B) aligns with the mattress lift bars (D).

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.8 Impeller Assembly

Tools required:  Pliers

Removal

⚠️ SHOCK HAZARD.

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-8 on page 4-19).

Figure 4-8. Impeller Assembly

NOTE:
Hood assembly removed for clarity.

2. Lift the hood assembly, and carefully tilt it back to its open position.

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

4. Pull the two mattress tilt bars (B) up through the main deck (C), and remove them from the unit.
5. Remove the main deck (C) from the unit.

6. Remove the heater/impeller cover (D) from the unit.

7. Using pliers, remove the wire hose clamp (E) that secures the impeller assembly (F) to the shell assembly (G).

8. Remove the impeller assembly (F) from the shell assembly (G).

**Replacement**

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.9 Motor Assembly

Tools required: Phillips head screwdriver
Pliers
Flat, padded surface

Removal

⚠️ SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-9 on page 4-22).

2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

5. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).

6. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).

7. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).

8. Remove the four Nylok® screws (C) that secure the shell bottom (D) to the shell assembly (B). Discard the four Nylok® screws (C).

9. Remove the extrusion bumper (E) from between the shell assembly (B) and the shell bottom (D).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 4-9. Shell Assembly
10. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
   
a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (B) enough to access the corrugated hose (H) at the check valve assembly (I).
   
b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (B) and the shell bottom (D).
   
c. Carefully remove the shell assembly (B) from the shell bottom (D), and place it upside down on a flat, padded surface.

11. Remove the four screws (J) and the four lockwashers (K) that secure the motor assembly (L) to the shell assembly (B) (see figure 4-10 on page 4-23). **Retain** the four screws (J) and the four lockwashers (K).

   **Figure 4-10. Motor Assembly**

12. Remove the motor assembly (L) and the four vibration isolators (M) from the shell assembly (B). **Retain** the four vibration isolators (M).

13. Disconnect the motor assembly (L) from the incubator motor-to-controller cable assembly (N).
4.9 Motor Assembly

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Replacement

1. Install the four screws (J) and the four lockwashers (K) to secure the motor assembly (L) and the four vibration isolators (M) to the shell assembly (B).

2. Connect the motor assembly (L) to the incubator motor-to-controller cable assembly (N), and route the incubator motor-to-controller cable assembly (N) through the slots in the shell assembly (B).

3. Connect the corrugated hose (H) to the shell assembly (B).

⚠️ CAUTION:
Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

4. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following (see figure 4-9 on page 4-22):
   a. Connect the corrugated hose (H) to the check valve assembly (I).
   b. Carefully lower the shell assembly (B) in place on the shell bottom (D).
   c. Ensure that no cables are pinched between the shell assembly (B) and the shell bottom (D).
   d. Ensure that the extrusion bumper (E) fits properly between the shell assembly (B) and the shell bottom (D).

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

5. Install four new Nylok® screws (C) to secure the shell bottom (D) to the shell assembly (B).

6. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).

7. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
8. Install the impeller assembly on the unit (refer to procedure 4.8 on page 4-19).

9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).

11. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).

12. Plug the power cord into the controller assembly (A).

13. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.10 Access Panel

Tools required: 1/8" hex head wrench
Phillips head screwdriver
Access panel gauge (P/N 83 900 14)

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-11 on page 4-26).
   or
   On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

   Figure 4-11. Hood Assembly

2. Pivot the access panel (C) to the full-open position so it hangs straight down.

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Pull the two mattress tilt bars (E) up through the main deck (F), and remove them from the unit (see figure 4-12 on page 4-27).

**Figure 4-12. Mattress Platform Assembly**

5. Close and latch the access panel (C) (see figure 4-11 on page 4-26).
6. Using a 1/8" hex head wrench, remove the two shoulder screws (G) and the two flat washers (H) that secure the access panel hinges (I) to the hood assembly (A) (see figure 4-13 on page 4-28). **Retain** the two shoulder screws (G) and the two flat washers (H).

![Figure 4-13. Access Panel](image)

7. Remove the access panel (C) from the hood assembly (A).

**Replacement**

1. Install the two shoulder screws (G) and the two flat washers (H) to secure the access panel hinges (I) to the hood assembly (A).

2. Adjust the blue slide access panel latches or the access panel pawl latch knobs (see “Adjustment” on page 4-29).

3. Slide the two mattress tilt bars (E) into the main deck (F) (see figure 4-12 on page 4-27).

4. Install the mattress, the mattress tray, and the x-ray tray on the unit.

5. Close and latch the access panel (C).
6. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Adjustment

1. Loosen, but do not remove, the four screws (J) that secure the two hinge plates (K) to the hood assembly (A) (see figure 4-13 on page 4-28).

2. Perform the following at each side of the hood assembly (A):
   a. Close the access panel (C) on the access panel gauge (L). Ensure that the access panel (C) securely latches.
   b. Push the end of the access panel (C) firmly against the access panel gauge (N).
   c. Tighten the rear screw (J) of the hinge plate (K).

3. Hold the access panel gauge (L), and open the access panel (C).

4. At each hinge plate (K), simultaneously press down on the tab and tighten the front screw (J).

5. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-11 on page 4-26).
   or
   On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

6. Pivot the access panel (C) to the full-open position so it hangs straight down.

7. Close and latch the access panel (C). Ensure that the access panel (C) latches properly. If the access panel (C) does not latch properly, readjust the blue slide access panel latches (B) or the access panel pawl latch knobs (D).

8. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.11 Iris Entry Port Sleeve

Tools required: None

Removal

Pull the iris entry port sleeve (A) off the port housing (B) (see figure 4-14 on page 4-30).

Replacement

1. Install the smaller diameter elastic band (C) of a new iris entry port sleeve (A) over the inner ring (D) of the port housing (B).

2. Fold the iris entry port sleeve (A) back upon itself, and slip the larger elastic band (E) over the outer ring (F) of the port housing (B).

3. Rotate the outer ring (F) to close.
4. Rotate the outer ring (F) in the other direction:
   - If the iris entry port sleeve (A) is properly installed, it opens with the rotation of the outer ring (F).
   - If the iris entry port sleeve (A) does not open with the rotation of the outer ring (F), remove and re-install it (see “Removal” on page 4-30).

5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.12 Access Door Latch

Tools required:  Phillips head screwdriver

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-15 on page 4-32).
   or
   On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

   Figure 4-15. Hood Assembly

2. Pivot the access panel (C) to the full-open position so it hangs straight down.
3. Remove the two Nylok® screws (G) that secure the access door latch mount (E) and access door latch (F) to the access panel (C) (see figure 4-16 on page 4-33). **Discard** the two Nylok® screws (G).

**Figure 4-16. Access Door Latch**

4. Remove the access door latch mount (E) and access door latch (F) from the access panel (C).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Replacement

⚠️ **CAUTION:**
Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Install two new Nylok® screws (G) to secure the access door latch mount (E) and the access door latch (F) to the access panel (C).
2. Close and latch the access panel (C).
3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.13 Access Door and Access Door Pivot Hinges

Tools required: Phillips head screwdriver

Removal

1. Release the access door latch (A) (see figure 4-17 on page 4-35).

2. On a unit with a Series 00 hood assembly (B), slide the blue slide access panel latches (C), and open the access panel (D).
   or
   On a unit with a hood assembly (B) later than Series 00, rotate the access panel pawl latch knobs (E), and open the access panel (D).

3. Pivot the access panel (D) to the full-open position so it hangs straight down.
4. Remove the four Nylok® screws (F) that secure the two access door pivot hinges (G) to the access panel (D) (see figure 4-18 on page 4-36). **Discard** the four Nylok® screws (F).

![Figure 4-18. Access Door Pivot Hinge](image)

5. Remove the two access door pivot hinges (G), the torsion spring (H), and the access door (I) from the access panel (D).

**Replacement**

1. Perform one of the following:
   - On a left-hand access door (I), install the torsion spring (H) on the **lower** access door pivot hinge (G).
   - On a right-hand access door (I), install the torsion spring (H) on the **upper** access door pivot hinge (G).

2. Install the two access door pivot hinges (G) on the access door (I).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

3. Install the four new Nylok® screws (F) to secure the access door pivot hinges (G) to the access panel (D).

4. Close and latch the access panel (D).

5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.14 Electroluminescent (EL) Display Front Panel

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).

2. Remove the four screws (A) that secure the electroluminescent (EL) display front panel assembly (B) to the controller assembly (C) (see figure 4-19 on page 4-38).

Figure 4-19. Electroluminescent Display Front Panel

3. Slide the EL display front panel assembly (B) out of the controller assembly (C), and disconnect it from the central processing unit (CPU) interface ribbon cable assembly (D).

4. Remove the EL display front panel assembly (B) from the controller assembly (C).
Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.15 Electroluminescent (EL) Central Processing Unit (CPU) P.C. Board, EL Display Faceplate, and EL Display

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).

2. Remove the electroluminescent (EL) display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).

3. Remove the four screws (A) that secure the EL central processing unit (CPU) P.C. board (B) to the EL display faceplate (C) (see figure 4-20 on page 4-40).

Figure 4-20. EL CPU P.C. Board and EL Display

4. Remove the EL CPU P.C. board (B) from the EL display faceplate (C) (see “Component Handling” on page 6-8).

5. Remove the eight screws (D) that secure the EL display (E) to the EL CPU P.C. board (B).
6. Remove the EL display (E) and the four aluminum standoffs (F) from the EL CPU P.C. board (B) (see “Component Handling” on page 6-8).

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.16 Controller Fan Assembly

Tools required:  7/32" socket wrench

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).

2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).

3. Using a 7/32" socket wrench, remove the four hex nuts (A) and the four o-rings (B) that secure the fan assembly (C) to the controller assembly (D) (see figure 4-21 on page 4-42).

4. Disconnect the fan assembly cable (E) from the interface/power supply module (F).

5. Remove the fan assembly (C) from the controller assembly (D).
Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.17 Interface/Power Supply Module

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).

2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).

3. Remove the six screws (A) that secure the interface/power supply module (B) to the controller assembly (C) (see figure 4-22 on page 4-44).

4. Disconnect the fan assembly (D) from the interface/power supply module (B).

5. Remove the interface/power supply module (B) from the controller assembly (C).

6. Disconnect the central processing unit (CPU) interface ribbon cable assembly (E) from the interface/power supply module (B).
Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.18 Power Supply P.C. Board Assembly and Interface P.C. Board Assembly

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).

2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).

3. Remove the interface/power supply module from the controller assembly (refer to procedure 4.17 on page 4-44).

4. Remove the 13 screws (A) and the 13 cup washers (B) that secure the power supply P.C. board assembly (C) to the interface P.C. board assembly (D) (see figure 4-23 on page 4-46).

Figure 4-23. Interface/Power Supply Module

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5. Remove the power supply P.C. board (C) and the seven nylon standoffs (E) from the interface P.C. board assembly (D) (see “Component Handling” on page 6-8).

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.19 Air Intake Microfilter

Tools required: None

Removal

1. Loosen the two thumbscrews (A) that secure the air intake microfilter cover (B) to the unit (see figure 4-24 on page 4-48).

![Air Intake Microfilter](image)

Figure 4-24. Air Intake Microfilter

2. Remove the air intake microfilter cover (B) from the unit.

3. Remove the air intake microfilter (C) from the air intake microfilter cover (B).

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.20 Heater Assembly

Tools required: Phillips head screwdriver

Removal

⚠️ SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.

2. Lift the hood assembly, and carefully tilt it back to its open position.

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

4. Pull the two mattress tilt bars (A) up through the main deck (B), and remove them from the unit (see figure 4-25 on page 4-50).

5. Remove the main deck (B) from the unit.

6. Remove the heater/impeller cover (C) from the unit.

⚠️ WARNING:
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

7. Allow 45 minutes for the heater assembly (D) to cool.

8. Unscrew the heater radiator (E) from the heater assembly (D).

9. Remove the three Nylok® screws (F) that secure the heater assembly (D) to the shell assembly (G). Discard the three Nylok® screws (F).

10. Pull up on the heater assembly (D), and disconnect it from the AC wiring assembly (H).

11. Remove the heater assembly (D) from the shell assembly (G).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Replacement

1. Connect the heater assembly (D) to the AC wiring assembly (H), and route the cables down into the shell assembly (G).

![CAUTION:]
Always replace Nylok®' screws; do not reuse them. Equipment damage could occur.

2. Install the three new Nylok® screws (F) to secure the heater assembly (D) to the shell assembly (G).

3. Screw the heater radiator (E) onto the heater assembly (D).

4. Install the heater/impeller cover (C) on the shell assembly (G).

5. Install the main deck (B) on the shell assembly (G).

6. Slide the two mattress tilt bars (A) through their openings in the main deck (B).

7. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

8. Carefully lower the hood assembly to its closed position.

9. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.21 Impeller Movement Detection Sensor

Tools required: Phillips head screwdriver
Small screwdriver
Long-nose pliers

Removal

⚠️ SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.
2. Lift the hood assembly, and carefully tilt it back to its open position.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Pull the two mattress tilt bars (A) up through the main deck (B), and remove them from the unit (see figure 4-26 on page 4-53).
5. Remove the main deck (B) from the unit.
6. Remove the heater/impeller cover (C) from the unit.

⚠️ WARNING:
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

7. Allow 45 minutes for the heater assembly (D) to cool.
8. Unscrew the heater radiator (E) from the heater assembly (D).
9. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).
10. Using a small screwdriver, carefully loosen the screw (F) in the middle of the impeller movement detection sensor (G). Do not remove the screw (F).
11. Remove the Nylok® screw (H) that secures the impeller movement detection sensor (G) to the unit.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.21 Impeller Movement Detection Sensor

Chapter 4: Removal, Replacement, and Adjustment Procedures

Figure 4-26. Shell Assembly
12. Remove the impeller movement detection sensor (G) from the unit enough to access its connector (I).

13. Disconnect the connector (I) from the cable assembly (J). Do not allow the cable assembly (J) to slide back into the shell assembly (K).

14. Remove the impeller movement detection sensor (G) from the unit.

Replacement

1. Connect the impeller movement detection sensor (G) to the cable assembly (J).

2. Install the impeller movement detection sensor (G) so its flat edge is parallel with the front of the unit.

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

3. Install a new Nylok® screw (H) to secure the impeller movement detection sensor (G) to the unit.

4. Using a small screwdriver, tighten the screw (F).

5. Install the impeller assembly (refer to procedure 4.8 on page 4-19).

6. Screw the heater radiator (E) onto the heater assembly (D).

7. Install the heater/impeller cover (C) on the unit.

8. Install the main deck (B) on the unit.

9. Slide the two mattress tilt bars (A) through their openings in the main deck (B).

10. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

11. Carefully lower the hood assembly to its closed position.

12. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Check” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.22 AC Wiring Harness Assembly

Tools required: Pliers
Flat padded surface

Removal

1. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

4. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).

5. Remove the heater assembly from the unit (refer to procedure 4.20 on page 4-49).

6. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).

7. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).

8. Remove the four Nylok® screws (A) that secure the shell bottom (B) to the shell assembly (C) (see figure 4-27 on page 4-56). Discard the four Nylok® screws (A).

9. Remove the extrusion bumper (D) from between the shell assembly (C) and the shell bottom (B).

10. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following:
   a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (C) enough to access the corrugated hose (H) at the check valve assembly (I).
   b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (C) and the shell bottom (B).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 4-27. Shell Assembly
c. Carefully remove the shell assembly (C) from the shell bottom (B), and place it upside down on a flat, padded surface.

11. Remove the AC wiring harness assembly (J) from the cord retaining clips (K) inside the shell assembly (C) (see figure 4-28 on page 4-57).

12. Remove the AC wiring harness assembly (J) from the shell assembly (C).

**Replacement**

1. Route the AC wiring harness assembly (J) through the cord retaining clips (K) inside the shell assembly (C).

2. Connect the corrugated hose (H) to the shell assembly (C).

⚠️ **CAUTION:**

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.
3. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following (see figure 4-27 on page 4-56):
   a. Connect the corrugated hose (H) to the check valve assembly (I).
   b. Carefully lower the shell assembly (C) in place on the shell bottom (B).
   c. Ensure that no cables are pinched between the shell assembly (C) and the shell bottom (B).
   d. Ensure that the extrusion bumper (D) fits properly between the shell assembly (C) and the shell bottom (B).

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

4. Install the four new Nylok® screws (A) to secure the shell bottom (B) to the shell assembly (C).

5. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).

6. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).

7. Install the heater assembly on the unit (refer to procedure 4.20 on page 4-49).

8. Install the impeller assembly on the unit (refer to procedure 4.8 on page 4-19).

9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).

11. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).

12. Plug the power cord into the controller assembly (A).

13. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.23 Sensor Module-To-Controller Cable Assembly

Tools required:  
- Nut driver  
- Pliers  
- Flat padded surface

Removal

1. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

4. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).

5. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).

6. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).

7. Remove the four Nyllok® screws (A) that secure the shell bottom (B) to the shell assembly (C) (see figure 4-29 on page 4-60). **Discard** the four Nyllok® screws (A).

8. Remove the extrusion bumper (D) from between the shell assembly (C) and the shell bottom (B).

9. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following:
   a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (C) enough to access the corrugated hose (H) at the check valve assembly (I).
   b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (C) and the shell bottom (D).
   c. Carefully remove the shell assembly (C) from the shell bottom (B), and place it upside down on a flat, padded surface.

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1. Nyllok® is a registered trademark of Nyllok Fastener Corporation.
Figure 4-29. Shell Assembly
10. Remove the two hex nuts (J) that secure the sensor module-to-controller cable assembly (K) to the shell assembly (C) (see figure 4-30 on page 4-61).

**Figure 4-30. Sensor Module-to-Controller Cable Assembly**

11. Carefully remove the sensor module-to-controller cable assembly (K) from the shell assembly (C).

**Replacement**

1. Route the sensor module-to-controller cable assembly (K) through the slots in the shell assembly (C).

2. Install the two hex nuts (J) to secure the sensor module-to-controller cable assembly (K) to the shell assembly (C).

3. Connect the corrugated hose (H) to the shell assembly (C).
CAUTION:
Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

4. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following (see figure 4-29 on page 4-60):
   a. Connect the corrugated hose (H) to the check valve assembly (I).
   b. Carefully lower the shell assembly (C) in place on the shell bottom (B).
   c. Ensure that no cables are pinched between the shell assembly (C) and the shell bottom (B).
   d. Ensure that the extrusion bumper (D) fits properly between the shell assembly (C) and the shell bottom (B).

CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

5. Install the four new Nylok® screws (A) to secure the shell bottom (B) to the shell assembly (C).

6. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).

7. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).

8. Install the impeller assembly (refer to procedure 4.8 on page 4-19).

9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).

11. Install the controller assembly (refer to procedure 4.4 on page 4-10).

12. Plug the power cord into the controller assembly (E).

13. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.24 Access Panel Pawl Latch and Knob Assembly

Tools required: Pliers (two pair)
Clean cloth

Removal

1. Release the access door latch (A) (see figure 4-31 on page 4-63).

2. On a unit with a Series 00 hood assembly (B), slide the blue slide access panel latches (C), and open the access panel (D).
   or
   On a unit with a hood assembly (B) later than Series 00, rotate the pawl latch knobs (E), and open the access panel (D).

3. Pivot the access panel (D) to the full-open position so it hangs straight down.
4. Using two pair of pliers, grasp the pawl latch (F) and the pawl latch knob (E) (see figure 4-32 on page 4-64).

**Figure 4-32. Access Panel Knob and Latch Assembly**

5. Twist and pull the pawl latch (F) and the pawl latch knob (E) in opposite directions until they separate.

6. Remove the pawl latch (F), the pawl latch knob (E), the two spacers (G), the compression spring (H), and the spring pin (I) from the access panel (D).

**Replacement**

1. From the inside of the access panel (D), slide the stem of the pawl latch (F) into the access panel (D).

2. From the outside of the access panel (D), perform the following:
   a. Install the two spacers (G) and the compression spring (H) onto the stem of the pawl latch (F).
   b. Install the pawl latch knob (E) onto the stem of the pawl latch (F).
c. Insert the spring pin (I) into its opening in the pawl latch knob (E) and the pawl latch (F).

d. Place a clean cloth over the spring pin (I), and use pliers to press the spring pin (I) firmly into the pawl latch knob (E) to secure it to the pawl latch (F). Ensure that the spring pin (I) is flush with the pawl latch knob (E).

3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.25 Iris Entry Port Retaining Rings

Tools required: None

Removal

1. Remove the iris entry port sleeve (A) from the iris entry port ring assembly (B) (see figure 4-33 on page 4-66) (refer to procedure 4.11 on page 4-30).

Figure 4-33. Iris Entry Port Retaining Rings

2. Remove the iris entry port retaining ring (C) from the iris entry port ring assembly (B).

3. If necessary, turn the iris entry port ring assembly (B) counterclockwise to remove it from the hood assembly (D).

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
### 4.26 Access Door Cuff

**Tools required:** None

#### Removal

1. Press the access door latch (A), and open the access door (B) (see figure 4-34 on page 4-67).

**Figure 4-34. Access Door Gasket**

**NOTE:**
Access door gasket shown removed for clarity.

2. Gently pull the access door cuff (C) from the access door gasket (D).

#### Replacement

1. Stretch the larger diameter elastic band of the access door cuff (C) into the groove in the access door gasket (D).

2. Ensure proper installation of the access door cuff (C) by checking the following:
   - The access door cuff (C) has a small opening at its center.
   - The access door (D) latches with slight pressure and opens when the access door latch (A) is pressed.
3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.27 Access Door Gasket

Tools required: None

Removal

1. Press the access door release (A), and open the access door (B) (see figure 4-35 on page 4-69).

   Figure 4-35. Access Door Gasket

2. Remove the access door cuff from the access door gasket (refer to procedure 4.26 on page 4-67).

3. Carefully separate the access door gasket (C) from its opening in the access panel (D), and remove it from the unit.

Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 26.
4.28 Pivot/Hook Lock Assembly Bracket

Tools required:  
- Phillips head screwdriver
- Ruler
- Pencil
- Small hack saw
- Emery board
- ¼-pint can of touch-up putty paint (P/N 83 900 69)

Removal

⚠️ SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-36 on page 4-70).

2. Remove the hood assembly from the shell assembly (refer to procedure 4.5 on page 4-12).
3. Remove the one or two Nylok® screws (C) that secure the pivot/hook lock assembly bracket (D) to the shell assembly (B). **Discard** the two Nylok® screws (C).

4. Remove the pivot/hook lock assembly bracket (D) from the shell assembly (B).

**Replacement**

1. Refer to the data tag (E) on the back of the shell assembly (B) to check the series number (see figure 4-37 on page 4-71):

   ![Figure 4-37. Series 00 or 01 Model Shell Assembly](image)

   - If the shell assembly (B) is a **Series 02 or later** model, go to step 2.
   - If the shell assembly (B) is a **Series 00 or 01** model, perform the following:
     a. Using a ruler and pencil, measure and mark a 7/16" (11.113 mm) x 1½" (3.81 cm) notch at the rear corner of the shell assembly (B).
     b. Using a small hack saw, remove the marked notch (F) from the shell assembly (B).

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
c. Using an emery board, smooth any rough edges of the notch (F).

d. Apply touch-up paint as required.

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

2. Install one or two new Nylok® screws (C) to secure the pivot/hook lock assembly bracket (D) to the shell assembly (B) (see figure 4-36 on page 4-70).

3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.29 Heat Shield Latch

Tools required: Phillips head screwdriver

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-38 on page 4-73).

or

On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

![Figure 4-38. Hood Assembly](image)

Series 00 model

2. Pivot the access panel (C) to the full-open position so it hangs straight down.
3. Release the heat shield (E) from the access panel (C) by pressing on the two heat shield latches (F) (see figure 4-39 on page 4-74).

**Figure 4-39. Heat Shield Latch**

NOTE: Heat shield shown removed for clarity.

4. Remove the Nylok® screw (G) that secures the heat shield latch (F) to the access panel (C). **Discard** the Nylok® screw (G).

5. Remove the heat shield latch (F) from the access panel (C).

**Replacement**

⚠️ **CAUTION:**
Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Replace the Nylok® screw (G), and perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
**4.30 Heat Shield**

Tools required: Phillips head screwdriver

**Removal**

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-40 on page 4-75).

   or

   On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

   **Figure 4-40. Hood Assembly**

2. Pivot the access panel (C) to the full-open position so it hangs straight down.
3. Remove the four self-tapping screws (E) that secure the heat shield (F) to the access panel (C) (see figure 4-41 on page 4-76).

![Figure 4-41. Heat Shield](m223g180)

4. Release the heat shield (F) from the access panel (C) by pressing on the two heat shield latches (G).

**Replacement**

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.31 Mattress Tilt Knob

Tools required: Small screwdriver
Phillips head screwdriver
9/64" Allen™ wrench
Flat padded surface
Needle-nose pliers
Pliers

Removal

⚠️ SHOCK HAZARD: Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-42 on page 4-77).

Figure 4-42. Shell Assembly

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1. Allen™ is a trademark of Industrial Fasteners, Inc.
2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

5. Pull the two mattress tilt bars (C) up through the main deck (D), and remove them from the unit.

6. Remove the main deck (D) from the unit.

7. Remove the heater/impeller cover (E) from the unit.

8. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).

9. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).

10. Remove the four Nylok® screws (F) that secure the shell bottom (G) to the shell assembly (B) (see figure 4-43 on page 4-79). **Discard** the four Nylok® screws (F).

11. Remove the extrusion bumper (H) from between the shell assembly (B) and the shell bottom (G).

12. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
   a. Using the mattress tilt knob (I) and the rear hood hinge (J), lift the shell assembly (B) enough to access the corrugated hose (K) at the check valve assembly (L).
   
   b. Using pliers, disconnect and remove the corrugated hose (K) from the shell assembly (B) and the shell bottom (G).
   
   c. Carefully remove the shell assembly (B) from the shell bottom (G), and place it upside down on a flat padded surface.

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 4-43. Shell Bottom
13. Using needle-nose pliers, remove the e-ring (M) and flat washer (N) that secure the knob shaft (O) to the tilt mechanism (P) (see figure 4-44 on page 4-80).

![Figure 4-44. Mattress Tilt Knob](image)

14. Remove the knob shaft (O) from the shell assembly (B).

**Replacement**

1. Install the flat washer (N) on the knob shaft (O).

2. Insert the notched end of the knob shaft (O) into the shell assembly (B) until it engages the tilt mechanism (P).

3. Using needle-nose pliers, install the e-ring (M) to secure the knob shaft (O) to the tilt mechanism (P).
4. Using a 9/64" Allen™ wrench, install the Nylok® cap screw (Q) to secure the mattress tilt knob (I) to the knob shaft (O) (see figure 4-45 on page 4-81).

**Figure 4-45. Mattress Tilt Knob Assembly**

5. Connect the corrugated hose (K) to the shell assembly (B) (see figure 4-44 on page 4-80).

⚠️ **CAUTION:**
Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

6. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following (see figure 4-43 on page 4-79):
   a. Connect the corrugated hose (K) to the check valve assembly (L).
   b. Carefully lower the shell assembly (B) in place on the shell bottom (G).

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1. Allen™ is a trademark of Industrial Fasteners, Inc.
2. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.31 Mattress Tilt Knob

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c. Ensure that no cables are pinched between the shell assembly (B) and the shell bottom (G).

d. Ensure that the extrusion bumper (H) fits properly between the shell assembly (B) and the shell bottom (G).

⚠️ CAUTION:
Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

7. Install four new Nylok® screws (F) to secure the shell bottom (G) to the shell assembly (B).

8. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).

9. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).

10. Install the heater/impeller cover (E) on the unit (see figure 4-42 on page 4-77).

11. Install the main deck (D) on the unit.

12. Slide the two mattress tilt bars (C) through their slots in the main deck (D).

13. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).

14. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).

15. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).

16. Plug the power cord into the controller assembly (A).

17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.32 Mattress Tilt Mechanism

Tools required:  Phillips head screwdriver
                Pliers
                Flat padded surface

Removal

⚠️ SHOCK HAZARD:
Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-46 on page 4-83).

   Figure 4-46. Shell Assembly

2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).

3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

5. Pull the two mattress tilt bars (C) up through the main deck (D), and remove them from the unit.

6. Remove the main deck (D) from the unit.

7. Remove the heater/impeller cover (E) from the unit.

8. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).

9. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).

10. Remove the four Nylok® screws (F) that secure the shell bottom (G) to the shell assembly (B) (see figure 4-47 on page 4-85). **Discard** the four Nylok® screws (F).

11. Remove the extrusion bumper (H) from between the shell assembly (B) and the shell bottom (G).

12. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
   a. Using the mattress tilt knob (I) and the rear hood hinge (J), lift the shell assembly (B) enough to access the corrugated hose (K) at the check valve assembly (L).
   b. Using pliers, disconnect and remove the corrugated hose (K) from the shell assembly (B) and the shell bottom (G).
   c. Carefully remove the shell assembly (B) from the shell bottom (G), and place it upside down on a flat padded surface.

13. Remove the mattress tilt knob from the tilt mechanism (refer to procedure 4.31 on page 4-77).

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 4-47. Shell Bottom
14. Remove the three Nylok® screws (M) that secure the tilt mechanism (N) to the shell assembly (B) (see figure 4-48 on page 4-86). **Discard** the three Nylok® screws (M).

![Figure 4-48. Mattress Tilt Mechanism](image)

15. Remove the tilt mechanism (N) from the shell assembly (B).

**Replacement**

⚠️ **CAUTION:**
Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Replace the Nylok® screws (F (see figure 4-47 on page 4-85) and M (see figure 4-48 on page 4-86)), and perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.33 Sensor Module Lock (Models with Sensor Module Lock Only)

Tools required: Phillips head screwdriver

Removal

1. Remove the sensor module assembly from the hood assembly (refer to procedure 4.2 on page 4-6).

2. From inside the hood assembly (A), remove the two Nylok® screws (B) that secure the slide fixture cover plate (C) to the hood assembly (A) (see figure 4-49 on page 4-87).

![Figure 4-49. Sensor Module Lock](image)

3. Remove the slide fixture cover plate (C), the curved spring washer (D), and the slide lock (E) from the hood assembly (A).

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Replacement

1. Install the curved spring washer (D) in the slide fixture cover plate (C).

2. Install the slide lock (E) over the curved spring washer (D).

⚠️ CAUTION:
Always replace Nylok® screws; do not reuse them. Equipment damage could occur.

3. From inside the hood assembly (A), install two new Nylok® screws (B) to secure the slide fixture cover plate (C) to the hood assembly (A).

4. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
4.34 Access Grommet

Tools required: None

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches, and open the access panel (B) (see figure 4-17 on page 4-35).

or

On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (C), and open the access panel (B).

Figure 4-50. Access Grommet

NOTE:
Access panel shown removed for clarity.

2. Pivot the access panel (B) to the full-open position so it hangs straight down.

3. Remove any wiring or cables from the access grommet (D).

4. Remove the access grommet (D) from the hood assembly (A).
Replacement

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
4.35 Upper Transition Plate

Tools required: 5 mm hex key or 3/16" hex key

Removal

⚠️ SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.

2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

3. Remove the shell assembly from the unit.

4. On a variable-height adjustable stand, use a 5 mm hex key to remove the four screws (A) and the four lockwashers (B) that secure the upper transition plate (C) to the upper column (D) (see figure 4-51 on page 4-92). Retain the four screws (A) and the four lockwashers (B).

   or

   On a fixed-height pedestal stand, use a 3/16" hex key to remove the four screws (A) and the four lockwashers (B) that secure the upper transition plate (C) to the upper column (D) (see figure 4-51 on page 4-92). Retain the four screws (A) and the four lockwashers (B).

5. Remove the upper transition plate (C) from the upper column (D).

Replacement

NOTE:
The upper transition plate has two sets of mounting holes: One set is for the Series 00 model fixed height pedestal stand, the other is for the Series 01 model fixed height pedestal stand and all variable-height adjustable stands.

1. Perform the removal procedure in reverse order.

2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
NOTE:
Variable height adjustable stand shown.
4.35 Upper Transition Plate

Chapter 4: Removal, Replacement, and Adjustment Procedures
Chapter 5
Parts List

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Chapter 5: Parts List

NOTES:
Service Parts Ordering

Using the parts lists in this manual, identify the part number(s) you require. Find the product number and serial number on the product identification label (A) (see figure 5-1 on page 5-7).

Figure 5-1. Product Identification Label Location

Call Technical Support at (800) 437-2437 with the following information:

- Customer account number
- Purchase order number
- Product number
- Serial number
- Part number(s)

To promptly order parts, request part prices and availability, or follow up on a service order, use the following fax number:

(215) 675-1859
Recommended Spare Parts

For a recommended spare parts list to service five or more units, see table 5-1 on page 5-10.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>83 900 15</td>
<td>1</td>
<td>Replacement motor kit, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 900 09</td>
<td>1</td>
<td>Replacement kit, access door latch</td>
</tr>
<tr>
<td>83 300 15</td>
<td>1</td>
<td>Latch mount, access door</td>
</tr>
<tr>
<td>83 200 20</td>
<td>1</td>
<td>Grommet, access</td>
</tr>
<tr>
<td>83 300 05</td>
<td>1</td>
<td>Door, access</td>
</tr>
<tr>
<td>78 293 10</td>
<td>1</td>
<td>Bumper, clear polyurethane, self-adhesive</td>
</tr>
<tr>
<td>83 300 08</td>
<td>1</td>
<td>Pivot hinge, access door</td>
</tr>
<tr>
<td>68 510 10</td>
<td>1</td>
<td>Spring, torsion, 0.27&quot; outside diameter, 0.03&quot; wide, 0.365&quot; long</td>
</tr>
<tr>
<td>83 300 09</td>
<td>1</td>
<td>Latch, heat shield</td>
</tr>
<tr>
<td>83 300 07</td>
<td>1</td>
<td>Gasket, access door</td>
</tr>
<tr>
<td>83 005 48</td>
<td>1</td>
<td>Sensor module assembly</td>
</tr>
<tr>
<td>83 102 85</td>
<td>1</td>
<td>Impeller assembly</td>
</tr>
<tr>
<td>83 300 25</td>
<td>1</td>
<td>Upper body, access panel latch</td>
</tr>
<tr>
<td>83 300 26</td>
<td>1</td>
<td>Lower body, access panel latch</td>
</tr>
<tr>
<td>83 900 08</td>
<td>1</td>
<td>Replacement kit, access panel latch</td>
</tr>
<tr>
<td>83 300 29</td>
<td>1</td>
<td>Spring, compression, 0.18&quot; outside diameter, 0.014&quot; wide, 1½&quot; long</td>
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<tr>
<td>83 900 69</td>
<td>1</td>
<td>Paint, touch-up, putty, ¼-pint can</td>
</tr>
<tr>
<td>83 600 50</td>
<td>1</td>
<td>Scale assembly, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 102 10</td>
<td>1</td>
<td>Probe 4, baby temperature, reusable, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 101 30</td>
<td>1</td>
<td>Filter, replaceable, pack of four, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>68 120 71</td>
<td>1</td>
<td>Iris port cuffs, disposable, soft, 100</td>
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<tr>
<td>83 300 11</td>
<td>1</td>
<td>Access door cuff, disposable, replacement, carton of 100</td>
</tr>
<tr>
<td>Part Number</td>
<td>Quantity</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>-------------</td>
</tr>
<tr>
<td>83 900 11</td>
<td>1</td>
<td>Lift bar kit, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 900 12</td>
<td>1</td>
<td>Replacement kit, scroll cover, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 102 18</td>
<td>1</td>
<td>Probe 4, skin temperature, disposable, box of 10, CE, 48&quot; long</td>
</tr>
<tr>
<td>83 300 40</td>
<td>1</td>
<td>Cuff, access door, reusable, carton of 10, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 001 00</td>
<td>1</td>
<td>Mattress, foam</td>
</tr>
<tr>
<td>81 502 02</td>
<td>1</td>
<td>Washer, sealing, oxygen/air</td>
</tr>
<tr>
<td>68 209 46</td>
<td>1</td>
<td>Critter Covers® Probe Covers, box of 100</td>
</tr>
<tr>
<td>68 209 45</td>
<td>1</td>
<td>Critter Covers® Probe Covers, carton of 600</td>
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<tr>
<td>79 251 74</td>
<td>1</td>
<td>Kleenaseptic® B, trigger-spray, twelve, each 24 oz</td>
</tr>
<tr>
<td>68 209 47</td>
<td>1</td>
<td>Cover, probe, Care-For-Me, large, 100</td>
</tr>
<tr>
<td>68 209 48</td>
<td>1</td>
<td>Cover, probe, Care-For-Me, standard, 100</td>
</tr>
<tr>
<td>83 102 21</td>
<td>1</td>
<td>Probe 4, skin temperature, disposable, box of 10, CE, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>83 102 05</td>
<td>1</td>
<td>Adapter cable, probe 4, baby temperature</td>
</tr>
<tr>
<td>83 900 14</td>
<td>1</td>
<td>Access panel gauge</td>
</tr>
<tr>
<td>83 901 22</td>
<td>1</td>
<td>Kit, software distribution assembly</td>
</tr>
</tbody>
</table>

a. Kleenaseptic® is a registered trademark of Predicted Environments, Inc.
Figure 5-2. Incubator Hood and Shell Assembly
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 442 01</td>
<td>1</td>
<td>Support arm, monitor/IV pole</td>
</tr>
<tr>
<td>2</td>
<td>83 444 04</td>
<td>1</td>
<td>Adapter, IV pole base</td>
</tr>
<tr>
<td>3</td>
<td>83 444 05</td>
<td>1</td>
<td>Base, IV pole</td>
</tr>
<tr>
<td>4</td>
<td>26 821 00</td>
<td>1</td>
<td>Nut, locking, 7/8&quot;-20, special fabrication</td>
</tr>
<tr>
<td>5</td>
<td>26 822 00</td>
<td>1</td>
<td>Cross arm (IV)</td>
</tr>
<tr>
<td>6</td>
<td>99 064 50</td>
<td>1</td>
<td>Screw, 5/16&quot;-18 x 3/4&quot;, cap, hex, steel, zinc-plated</td>
</tr>
<tr>
<td>7</td>
<td>99 126 32</td>
<td>2</td>
<td>Washer, lock, split, 5/6&quot;, steel, cadmium-plated</td>
</tr>
<tr>
<td>8</td>
<td>99 901 31</td>
<td>As required</td>
<td>Loctite® adhesive #271-05 (0.50 cc tube)</td>
</tr>
<tr>
<td>9</td>
<td>99 044 66</td>
<td>2</td>
<td>Screw, #10-32 x 1 1/4&quot;, cap, hex, stainless steel, Nylok®</td>
</tr>
<tr>
<td>10</td>
<td>83 444 10</td>
<td>1</td>
<td>Upper extension, IV pole, 11.38&quot; long</td>
</tr>
<tr>
<td>11</td>
<td>99 123 94</td>
<td>2</td>
<td>Washer, lock, external, #10, stainless steel</td>
</tr>
<tr>
<td>12</td>
<td>83 500 03</td>
<td>1</td>
<td>Label, weight limit, 11 lb</td>
</tr>
<tr>
<td>13</td>
<td>99 900 69</td>
<td>As required</td>
<td>Lubricant, Dow Corning® #111</td>
</tr>
<tr>
<td>14</td>
<td>99 064 93</td>
<td>1</td>
<td>Screw, 5/16&quot;-18 x 1.38&quot;, cap, hex, steel, zinc-plated</td>
</tr>
</tbody>
</table>

a. Loctite® is a registered trademark of Loctite Corporation.
b. Nylok® is a registered trademark of Nylok Fastener Corporation.
c. Dow Corning® is a registered trademark of Dow Corning Corporation.
High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)

Figure 5-34. High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)
### Table 5-34. High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 442 01</td>
<td>1</td>
<td>Support arm, monitor/TV pole</td>
</tr>
<tr>
<td>2</td>
<td>83 442 04</td>
<td>1</td>
<td>Pole, monitor shelf, 26.32&quot;</td>
</tr>
<tr>
<td>3</td>
<td>83 442 05</td>
<td>1</td>
<td>Pole, monitor shelf, 8.63&quot;</td>
</tr>
<tr>
<td>4</td>
<td>83 442 20</td>
<td>1</td>
<td>Monitor shelf subassembly, Isolette® Infant Incubator</td>
</tr>
<tr>
<td>5</td>
<td>99 901 31</td>
<td>As required</td>
<td>Loctite® adhesive #271-05 (0.50 cc tube)</td>
</tr>
<tr>
<td>6</td>
<td>99 044 66</td>
<td>2</td>
<td>Screw, #10-32 x 1¼&quot;, cap, hex, stainless steel, Nylok®</td>
</tr>
<tr>
<td>7</td>
<td>99 123 94</td>
<td>2</td>
<td>Washer, lock, external, #10, stainless steel</td>
</tr>
<tr>
<td>8</td>
<td>99 064 93</td>
<td>1</td>
<td>Screw, 5/16&quot;-18 x 1.38&quot;, cap, hex, steel, zinc-plated</td>
</tr>
<tr>
<td>9</td>
<td>99 126 32</td>
<td>1</td>
<td>Washer, lock, split, 5/16&quot;, steel, cadmium-plated</td>
</tr>
<tr>
<td>10</td>
<td>99 059 43</td>
<td>1</td>
<td>Screw, ¼&quot;-20 x 2.00&quot;, flat, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>11</td>
<td>83 442 21</td>
<td>1</td>
<td>Washer, 6.5&quot; x ¾&quot; x 0.09&quot;, polyurethane</td>
</tr>
</tbody>
</table>

a. Loctite® is a registered trademark of Loctite Corporation.

b. Nylok® is a registered trademark of Nylok Fastener Corporation.
Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)

Figure 5-35. Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)
### Table 5-35. Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 440 01</td>
<td>1</td>
<td>Swivel drawer, large (for use with large swivel drawer assembly only)</td>
</tr>
<tr>
<td>2</td>
<td>83 441 01</td>
<td>2</td>
<td>Swivel drawer, small (for use with small swivel drawer assembly only)</td>
</tr>
<tr>
<td>3</td>
<td>83 440 06</td>
<td>1</td>
<td>Support arm, swivel drawers</td>
</tr>
<tr>
<td>4</td>
<td>83 440 05</td>
<td>1</td>
<td>Shaft, swivel drawers</td>
</tr>
<tr>
<td>5</td>
<td>83 440 02</td>
<td>1</td>
<td>Tray writing surface</td>
</tr>
<tr>
<td>6</td>
<td>83 440 08</td>
<td>1 or 2</td>
<td>Ring, bottom, swivel drawers</td>
</tr>
<tr>
<td>7</td>
<td>83 440 07</td>
<td>2 or 3</td>
<td>Ring, top, swivel drawers</td>
</tr>
<tr>
<td>8</td>
<td>83 440 09</td>
<td>6 or 10</td>
<td>Spring plunger, 3/8&quot;-16</td>
</tr>
<tr>
<td>9</td>
<td>99 057 32</td>
<td>2</td>
<td>Screw, ½&quot;-20 x 7/8&quot;, cap, socket, stainless steel, Nylok®</td>
</tr>
<tr>
<td>10</td>
<td>83 440 03</td>
<td>1</td>
<td>Spacer, 1¼&quot; inside diameter, 2.00&quot; outside diameter, 0.49&quot; thick, acrylonitrile butadiene styrene (ABS) (for use with small swivel drawer assembly only)</td>
</tr>
<tr>
<td>11</td>
<td>99 127 78</td>
<td>1</td>
<td>Washer, flat, 0.536&quot; inside diameter, 1½&quot; outside diameter, 0.05&quot; thick, stainless steel</td>
</tr>
<tr>
<td>12</td>
<td>99 113 66</td>
<td>1</td>
<td>Nut, hex, castle, ½&quot;-20, stainless steel, 0.56&quot; thick</td>
</tr>
<tr>
<td>13</td>
<td>99 141 71</td>
<td>1</td>
<td>Pin, cotter, 0.060&quot; diameter, 1.00&quot; long, stainless steel</td>
</tr>
<tr>
<td>14</td>
<td>99 055 06</td>
<td>1</td>
<td>Screw, ¼&quot;-20 x 3/8&quot;, cap, socket, stainless steel, Nylok®</td>
</tr>
<tr>
<td>15</td>
<td>99 125 71</td>
<td>2</td>
<td>Washer, lock, external, ¼&quot;, stainless steel</td>
</tr>
<tr>
<td>16</td>
<td>99 901 38</td>
<td>As required</td>
<td>Loctite® screwlock #222</td>
</tr>
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<td>17</td>
<td>99 900 69</td>
<td>As required</td>
<td>Lubricant, Dow Corning® #111</td>
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<tr>
<td>18</td>
<td>83 500 60</td>
<td>1</td>
<td>Label, load limit, 2 lb/0.91 kg</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.
b. Loctite® is a registered trademark of Loctite Corporation.
c. Dow Corning® is a registered trademark of Dow Corning Corporation.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>83 500 62</td>
<td>1</td>
<td>Label, load limit, 10 lb/4½ kg (for use with <strong>large</strong> swivel drawer assembly only)</td>
</tr>
<tr>
<td>20</td>
<td>83 500 61</td>
<td>2</td>
<td>Label, load limit, 5 lb/2.2 kg (for use with <strong>small</strong> swivel drawer assembly only)</td>
</tr>
<tr>
<td>21</td>
<td>83 440 04</td>
<td>2 or 3</td>
<td>Washer, 1¼&quot; inside diameter, 2½&quot; outside diameter, 0.15 thick</td>
</tr>
</tbody>
</table>
Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)

Figure 5-36. Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)
Table 5-36. Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 900 10</td>
<td>1</td>
<td>Replacement kit, humidity reservoir</td>
</tr>
<tr>
<td>2</td>
<td>83 610 03</td>
<td>1</td>
<td>Door, humidity</td>
</tr>
<tr>
<td>3</td>
<td>83 612 04</td>
<td>1</td>
<td>Tubing, with ends, ¼&quot; inside diameter, 24.00&quot; long</td>
</tr>
<tr>
<td>4</td>
<td>83 611 70-R</td>
<td>1</td>
<td>Replacement housing/float assembly</td>
</tr>
<tr>
<td>5</td>
<td>83 612 50-R</td>
<td>1</td>
<td>Evaporator reservoir assembly, 120V (for use with 120V model only)</td>
</tr>
<tr>
<td>6</td>
<td>83 612 51</td>
<td>1</td>
<td>Evaporator reservoir assembly, 240V (for use with 240V model only)</td>
</tr>
<tr>
<td>7</td>
<td>83 612 52</td>
<td>1</td>
<td>Evaporator reservoir assembly, 100V (for use with 100V model only)</td>
</tr>
<tr>
<td>8</td>
<td>83 612 37</td>
<td>1</td>
<td>Cap, evaporator</td>
</tr>
<tr>
<td>9</td>
<td>83 610 17</td>
<td>1</td>
<td>Washer, flat, 1.29&quot; outside diameter, 0.88&quot; inside diameter, 0.015&quot; thick, stainless steel</td>
</tr>
<tr>
<td>10</td>
<td>83 610 18</td>
<td>1</td>
<td>Washer, flat, 2.0&quot; outside diameter, 0.99&quot; inside diameter, 0.06&quot;, polypropylene</td>
</tr>
<tr>
<td>11</td>
<td>83 500 06</td>
<td>1</td>
<td>Overlay, humidity drawer, English/Spanish/French/German/Italian</td>
</tr>
<tr>
<td>12</td>
<td>83 612 03</td>
<td>1</td>
<td>Elbow, street, 1/8&quot; National Pipe Thread (NPT), brass, nickel-plated</td>
</tr>
<tr>
<td>13</td>
<td>83 610 04</td>
<td>1</td>
<td>Trim, humidity tray</td>
</tr>
<tr>
<td>14</td>
<td>99 023 03</td>
<td>2</td>
<td>Screw, #6-32 x 5/16&quot;, truss, phillips, stainless steel, Nylok®’</td>
</tr>
<tr>
<td>15</td>
<td>83 500 34</td>
<td>2</td>
<td>Label, manual reference symbol</td>
</tr>
<tr>
<td>16</td>
<td>26 605 00</td>
<td>1</td>
<td>Bumper, rubber, recessed (with washer)</td>
</tr>
<tr>
<td>17</td>
<td>99 023 05</td>
<td>2</td>
<td>Screw, #6-32 x 5/16&quot;, pan, phillips, stainless steel, sans external</td>
</tr>
<tr>
<td>18</td>
<td>83 995 06</td>
<td>1</td>
<td>Model/series number log, humidity system, C2000</td>
</tr>
<tr>
<td>19</td>
<td>99 010 67</td>
<td>1</td>
<td>Screw, #4-40 x ¼&quot;, truss, phillips, stainless steel, Nylok®</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>83 612 02</td>
<td>1</td>
<td>Connector, 1/8&quot; NPT, male—½&quot; hose, brass, nickel-plated</td>
</tr>
<tr>
<td>21</td>
<td>99 901 23</td>
<td>As required</td>
<td>Pipe sealant with Teflon® (Loctite® adhesive #592)</td>
</tr>
<tr>
<td>22</td>
<td>99 160 32</td>
<td>1</td>
<td>O-ring, 0.208&quot; x 0.348&quot; x 0.70&quot;</td>
</tr>
</tbody>
</table>

a. Teflon® is a registered trademark of E. I. du Pont and de Nemours and Company.
b. Loctite® is a registered trademark of Loctite Corporation.
Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory) (Series 02 Model Only)

Figure 5-37. Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory) (Series 02 Model Only)
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 613 65-R</td>
<td>1</td>
<td>Reservoir assembly, humidity</td>
</tr>
<tr>
<td>2</td>
<td>83 613 01</td>
<td>1</td>
<td>Reservoir, humidity</td>
</tr>
<tr>
<td>3</td>
<td>83 613 00</td>
<td>1</td>
<td>Cover, humidity reservoir</td>
</tr>
<tr>
<td>4</td>
<td>83 900 58</td>
<td>1</td>
<td>Replacement kit, seals and springs</td>
</tr>
<tr>
<td>5</td>
<td>83 613 06</td>
<td>1</td>
<td>Seal, silicone sponge, ¾&quot; outside diameter</td>
</tr>
<tr>
<td>6</td>
<td>83 613 10</td>
<td>1</td>
<td>Spring, compression, 0.360&quot;, 0.035&quot; wide, 0.812&quot; long</td>
</tr>
<tr>
<td>7</td>
<td>83 613 21</td>
<td>1</td>
<td>Seal, silicone sponge, 1.380&quot; outside diameter</td>
</tr>
<tr>
<td>8</td>
<td>83 613 68-R</td>
<td>1</td>
<td>Tray assembly, humidity, English/French/German/Italian</td>
</tr>
<tr>
<td>9</td>
<td>83 613 02</td>
<td>1</td>
<td>Tray, humidity reservoir</td>
</tr>
<tr>
<td>10</td>
<td>83 613 13</td>
<td>1</td>
<td>Door, humidity</td>
</tr>
<tr>
<td>11</td>
<td>83 500 06</td>
<td>1</td>
<td>Overlay, humidity drawer, English/French/German/Italian</td>
</tr>
<tr>
<td>12</td>
<td>83 500 09</td>
<td>1</td>
<td>Overlay, humidity drawer, Swedish/Greek</td>
</tr>
<tr>
<td>13</td>
<td>99 023 46</td>
<td>2</td>
<td>Screw, #6-32 x 3/8&quot;, flat, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>14</td>
<td>83 500 34</td>
<td>2</td>
<td>Label, manual reference symbol</td>
</tr>
<tr>
<td>15</td>
<td>83 613 23</td>
<td>1</td>
<td>Handle, humidity</td>
</tr>
<tr>
<td>16</td>
<td>83 613 24</td>
<td>1</td>
<td>Pin, 3/32&quot; diameter, 2.968&quot; long, stainless steel</td>
</tr>
<tr>
<td>17</td>
<td>83 613 55</td>
<td>1</td>
<td>Replacement kit, evaporator reservoir, 120V (for use with 120V model only)</td>
</tr>
<tr>
<td>18</td>
<td>83 613 56</td>
<td>1</td>
<td>Replacement kit, evaporator reservoir, 240V (for use with 240V model only)</td>
</tr>
<tr>
<td>19</td>
<td>83 613 57</td>
<td>1</td>
<td>Replacement kit, evaporator reservoir, 100V (for use with 100V model only)</td>
</tr>
<tr>
<td>20</td>
<td>83 613 60-R</td>
<td>1</td>
<td>Manifold assembly, humidity</td>
</tr>
<tr>
<td>21</td>
<td>81 001 01</td>
<td>1</td>
<td>Label, data tag, 1.63&quot; x 3.00&quot;</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 5-38. Evaporator Reservoir Assembly (Accessory) (Series 02 Model Only)
Table 5-38. Evaporator Reservoir Assembly (Accessory)  
(Series 02 Model Only)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 613 25</td>
<td>1</td>
<td>Reservoir, evaporator</td>
</tr>
<tr>
<td>2</td>
<td>83 612 35</td>
<td>1</td>
<td>Heater, cartridge, 120V, 100W</td>
</tr>
<tr>
<td>3</td>
<td>83 613 27</td>
<td>1</td>
<td>Plate, mounting, evaporator and float housing</td>
</tr>
<tr>
<td>4</td>
<td>83 612 47</td>
<td>1</td>
<td>Cap, evaporator, stainless steel</td>
</tr>
<tr>
<td>5</td>
<td>83 612 39</td>
<td>1</td>
<td>Plate, mounting, insulation</td>
</tr>
<tr>
<td>6</td>
<td>83 613 32</td>
<td>1</td>
<td>Insulation, evaporator reservoir</td>
</tr>
<tr>
<td>7</td>
<td>83 613 40</td>
<td>1</td>
<td>Washer, flat, 2.00&quot; outside diameter, 0.06&quot; thick, polypropylene</td>
</tr>
<tr>
<td>8</td>
<td>83 612 42</td>
<td>1</td>
<td>Thermostat, automatic, 125°C open/75°C closed</td>
</tr>
<tr>
<td>9</td>
<td>83 612 43</td>
<td>1</td>
<td>Thermostat, manual reset limiter (150°C)</td>
</tr>
<tr>
<td>10</td>
<td>83 612 38</td>
<td>1</td>
<td>Elbow, 3/8&quot; barb, ¼&quot; National Pipe Thread (NPT), male, brass</td>
</tr>
<tr>
<td>11</td>
<td>83 613 28</td>
<td>1</td>
<td>Gasket, evaporator reservoir</td>
</tr>
<tr>
<td>12</td>
<td>99 122 20</td>
<td>1</td>
<td>Washer, lock, external, #6, stainless steel</td>
</tr>
<tr>
<td>13</td>
<td>83 612 30</td>
<td>1</td>
<td>Cable assembly, humidity heater to AC</td>
</tr>
<tr>
<td>14</td>
<td>99 022 17</td>
<td>1</td>
<td>Screw, #6-32 x 1/8&quot;, sems external, socket, stainless steel, cap</td>
</tr>
<tr>
<td>15</td>
<td>99 023 03</td>
<td>4</td>
<td>Screw, #6-32 x 5/16&quot;, truss, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>16</td>
<td>83 613 33</td>
<td>1</td>
<td>Washer, flat, 1.38&quot; outside diameter x 0.88&quot; inside diameter x 0.12&quot; thick, silicone</td>
</tr>
<tr>
<td>17</td>
<td>83 610 17</td>
<td>1</td>
<td>Washer, flat, 1.29&quot; outside diameter, 0.88 inside diameter, 0.15&quot; thick, stainless steel</td>
</tr>
<tr>
<td>18</td>
<td>99 901 23</td>
<td>As required</td>
<td>Pipe sealant with Teflon® (Loctite® adhesive #592)</td>
</tr>
<tr>
<td>19</td>
<td>99 901 98</td>
<td>As required</td>
<td>Sealant, pneumatic/hydraulic, Loctite® #54505</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.  
b. Teflon® is a registered trademark of E. I. du Pont de Nemours and Company.  
c. Loctite® is a registered trademark of Loctite Corporation.
## Parts List

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>99 901 38</td>
<td>As required</td>
<td>Loctite® screwlock #222</td>
</tr>
<tr>
<td>21</td>
<td>83 611 71-R</td>
<td>1</td>
<td>Replacement housing/float assembly</td>
</tr>
<tr>
<td>22</td>
<td>99 023 31</td>
<td>8</td>
<td>Screw, #6-32 x 3/8&quot;, truss, phillips, stainless steel</td>
</tr>
</tbody>
</table>

a. Loctite® is a registered trademark of Loctite Corporation.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83 620 30</td>
<td>2</td>
<td>Cell, oxygen</td>
</tr>
<tr>
<td>2</td>
<td>83 620 71</td>
<td>1</td>
<td>Oxygen calibration fixture assembly, locking</td>
</tr>
<tr>
<td>3</td>
<td>99 031 99</td>
<td>2</td>
<td>Screw, #8-32 x ½&quot;, truss, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>4</td>
<td>83 620 45</td>
<td>1</td>
<td>Plate, oxygen cell mounting</td>
</tr>
<tr>
<td>5</td>
<td>17 751 37</td>
<td>1</td>
<td>Valve, solenoid, 12V DC, 70 psi, oxygen</td>
</tr>
<tr>
<td>6</td>
<td>83 620 60</td>
<td>1</td>
<td>Oxygen control valve assembly, green, Diameter Indexed Safety System (DISS)</td>
</tr>
<tr>
<td>7</td>
<td>83 621 20</td>
<td>1</td>
<td>Oxygen control valve assembly, green</td>
</tr>
<tr>
<td>8</td>
<td>83 621 21</td>
<td>1</td>
<td>Oxygen control valve assembly, white</td>
</tr>
<tr>
<td>9</td>
<td>83 621 22</td>
<td>1</td>
<td>Oxygen control valve assembly, blue</td>
</tr>
<tr>
<td>10</td>
<td>83 100 11</td>
<td>1</td>
<td>Door, access, pneumatic module</td>
</tr>
<tr>
<td>11</td>
<td>83 620 61</td>
<td>1</td>
<td>Regulator, pressure, 40 psi</td>
</tr>
<tr>
<td>12</td>
<td>83 620 62</td>
<td>1</td>
<td>Bracket, regulator</td>
</tr>
<tr>
<td>13</td>
<td>83 620 63</td>
<td>1</td>
<td>Plate, mounting</td>
</tr>
<tr>
<td>14</td>
<td>20 102 10</td>
<td>3</td>
<td>Elbow, 90°, ¼&quot; hose, 1/8&quot; National Pipe Thread (NPT) (male)</td>
</tr>
<tr>
<td>15</td>
<td>83 620 67</td>
<td>1</td>
<td>Block, solenoid mount</td>
</tr>
<tr>
<td>16</td>
<td>83 620 69</td>
<td>6&quot; (15 cm)</td>
<td>Hose, braided, polyvinyl chloride (PVC), clear, ¼&quot; inside diameter</td>
</tr>
<tr>
<td>17</td>
<td>83 620 64</td>
<td>6</td>
<td>Clamp, hose, 0.460&quot;, 0.545&quot; inside diameter</td>
</tr>
<tr>
<td>18</td>
<td>99 900 26</td>
<td>As required</td>
<td>Tape, pipe joint seal, Teflon®, ½&quot;</td>
</tr>
<tr>
<td>19</td>
<td>68 230 24</td>
<td>6</td>
<td>Isolator, vibration, 0.44&quot; outside diameter, 0.44&quot; long, 4 lb</td>
</tr>
<tr>
<td>20</td>
<td>83 620 40</td>
<td>1</td>
<td>Oxygen hose, green, DISS</td>
</tr>
<tr>
<td>21</td>
<td>83 620 41</td>
<td>1</td>
<td>Oxygen hose, green</td>
</tr>
<tr>
<td>22</td>
<td>83 620 42</td>
<td>1</td>
<td>Oxygen hose, white</td>
</tr>
<tr>
<td>23</td>
<td>83 620 43</td>
<td>1</td>
<td>Oxygen hose, blue</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.
b. Teflon® is a registered trademark of E. I. du Pont and de Nemours and Company.
<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>83 900 22</td>
<td>1</td>
<td>Retrofit kit, dual filter, oxygen control valve</td>
</tr>
<tr>
<td>25</td>
<td>83 612 41</td>
<td>17&quot; (43 cm)</td>
<td>Tubing, ¼&quot; inside diameter, 7/16&quot; outside diameter, silicone</td>
</tr>
<tr>
<td>26</td>
<td>83 620 57</td>
<td>2</td>
<td>Filter, suction, disposable, rectangular</td>
</tr>
<tr>
<td>27</td>
<td>83 620 66</td>
<td>1</td>
<td>Sound coat, solenoid mounting block</td>
</tr>
<tr>
<td>28</td>
<td>83 620 68</td>
<td>1</td>
<td>Sound coat, mounting plate</td>
</tr>
<tr>
<td>29</td>
<td>99 031 52</td>
<td>4</td>
<td>Screw, #8-32 x 3/8&quot;, truss, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>30</td>
<td>99 031 05</td>
<td>2</td>
<td>Screw, #8-32 x 5/16&quot;, truss, phillips, stainless steel</td>
</tr>
<tr>
<td>31</td>
<td>99 030 76</td>
<td>2</td>
<td>Screw, #8-32 x ¼&quot;, truss, phillips, stainless steel, Nylok®</td>
</tr>
<tr>
<td>32</td>
<td>99 106 32</td>
<td>4</td>
<td>Nut, hex, #8-32, keps, steel, zinc-plated</td>
</tr>
<tr>
<td>33</td>
<td>99 122 92</td>
<td>2</td>
<td>Washer, lock, internal, #8, stainless steel</td>
</tr>
<tr>
<td>34</td>
<td>83 620 56*</td>
<td>1</td>
<td>Hook, oxygen hose</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

* Item not shown.
# Ventilator Tube Support (P/N 83 001 05) (Accessory)

**Figure 5-40. Ventilator Tube Support (P/N 83 001 05) (Accessory)**

![Diagram of Ventilator Tube Support](image)

## Table 5-40. Ventilator Tube Support (P/N 83 001 05) (Accessory)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>68 200 67</td>
<td>1</td>
<td>Pin, ball detent with slot</td>
</tr>
<tr>
<td>2</td>
<td>83 001 06</td>
<td>1</td>
<td>Tubing, flexible</td>
</tr>
<tr>
<td>3</td>
<td>68 252 04</td>
<td>1</td>
<td>Tubing, hanger</td>
</tr>
<tr>
<td>4</td>
<td>99 031 99</td>
<td>1</td>
<td>Screw, #8-32 x ½”, truss, phillips, stainless steel, Nylok®’</td>
</tr>
<tr>
<td>5</td>
<td>99 901 77</td>
<td>As required</td>
<td>Loctite®’ adhesive #242</td>
</tr>
<tr>
<td>6</td>
<td>68 252 00</td>
<td>1</td>
<td>Ferrule, flexible tubing</td>
</tr>
</tbody>
</table>

a. Nylok® is a registered trademark of Nylok Fastener Corporation.
b. Loctite® is a registered trademark of Loctite Corporation.
Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

Figure 5-41. Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

Table 5-41. Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Part Number</th>
<th>Quantity</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>83 443 03</td>
<td>1</td>
<td>Support, tank, variable height adjustable (VIIA)</td>
</tr>
<tr>
<td>2</td>
<td>83 443 04</td>
<td>1</td>
<td>Clamp assembly, tank</td>
</tr>
<tr>
<td>3</td>
<td>99 022 83</td>
<td>6</td>
<td>Screw, #6-32 x ¼&quot;, pan, phillips, stainless steel, same external</td>
</tr>
<tr>
<td>4</td>
<td>24 144 01</td>
<td>1</td>
<td>Hook, latch, modified</td>
</tr>
<tr>
<td>5</td>
<td>99 042 03</td>
<td>12</td>
<td>Screw, #10-32 x ⅜&quot;, cap, hex, stainless steel</td>
</tr>
<tr>
<td>6</td>
<td>99 123 92</td>
<td>12</td>
<td>Washer, lock, internal, #10, stainless steel</td>
</tr>
</tbody>
</table>
Chapter 6
General Procedures

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Cleaning

⚠️ WARNING:
Follow the product manufacturer's instructions. Failure to do so could result in personal injury or equipment damage.

⚠️ WARNING:
Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing cleaning procedures. A fire and explosion hazard exists when cleaning in an oxygen-enriched environment.

⚡️ SHOCK HAZARD:
Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

⚡️ SHOCK HAZARD:
Do not expose the unit to excessive moisture. Personal injury or equipment damage could occur.

⚠️ CAUTION:
Do not use harsh cleansers, such as scouring pads or heavy-duty grease removers or solvents, such as acetone. Equipment damage could occur.

If there is no visible soilage with possible body fluids, we recommend that you clean the unit with a mild detergent and warm water. If disinfection is desired, you may use a combination cleanser/disinfectant as explained in “Disinfecting” on page 6-4.

At a minimum, thoroughly clean and disinfect the incubator upon discharge of an infant. However, depending on individual facility policy, perform this as often as daily, if desired. The most effective way to clean is to first disassemble, and then group the parts and/or assemblies in categories according to the method of cleaning required.
Steam Cleaning

Do not use any steam cleaning device on the unit. Excessive moisture can damage mechanisms in this unit.

Cleaning Hard to Clean Spots

To remove difficult spots or stains, we recommend that you use standard household cleansers and a soft-bristled brush. To loosen heavy, dried-on soil, you may first need to saturate the spot.

Disinfecting

When there is visible soilage and between patients, we recommend that you disinfect the unit with a tuberculocidal disinfectant. (For customers in the US, the disinfectant should be registered with the Environmental Protection Agency.)

Dilute and use the disinfectant according to the manufacturer’s instructions.

Do not spray the disinfectant onto power cord terminals or control switches.

Using Cleaning Agents

Use a tuberculocidal cleanser/disinfectant registered by the US Environmental Protection Agency (EPA) (US only), but only after the incubator is empty and disassembled (see “Disassembly and Assembly for Cleaning” on page 6-27). After removing all solid wastes and contaminants from the disassembled parts, clean them as follows:

Skin Temperature Probe

Using an appropriate cleanser/disinfectant, thoroughly clean the skin temperature probe, and then wipe with a clean cloth or paper towel.

Access Door Gaskets and Tubing Access Ports

Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces, and then wipe with a clean cloth or paper towel.
Controller, Shell, and Pedestal Stand

⚠️ **CAUTION:**
Some chemical cleaning agents may be conductive and/or leave a residue that may enable a build-up of conductive dust or dirt. Do **not** permit cleaning agents to contact electrical components. Do **not** spray cleaning solutions onto any of these surfaces.

Use an EPA-registered cleanser/disinfectant to clean all surfaces thoroughly; then dry with a clean cloth or paper towel.

⚠️ **CAUTION:**
When cleaning the interior of the incubator shell, prevent liquids from entering the motor shaft opening. Equipment damage could occur.

In addition, check for fluids that may have dripped onto the bottom surface of the humidity tray opening. If fluids are present, use a clean paper towel dampened with a cleanser/disinfectant to wipe the surface dry.

Hood, Sensor Module, and Heat Shields

⚠️ **CAUTION:**
Alcohol can cause crazing of the clear acrylic hood. Do not use alcohol for cleaning.

⚠️ **CAUTION:**
Do not expose the hood assembly to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gaskets, fading of paint, and crazing of the clear acrylic hood.

**NOTE:**
The heat shields are hinged on the access panels or the rear wall of the incubator.
Cleaning
Chapter 6: General Procedures

Release the heat shield (A) from the access panel (B) or the rear wall by pressing on the latches (C) located along its top (see figure 6-1 on page 6-6).

**Figure 6-1. Releasing the Inner Wall**

![Diagram of heat shield with latches labeled A, B, C, D]

**NOTE:**
Heat shield shown removed for clarity.

Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces of the hood, including the sensor module, the heat shields (A), and the access doors (D). Clean all holes and indentations, and then dry with a clean cloth or paper towel.

**Heater Radiator and Fan Impeller**

⚠️ **WARNING:**
Failure to clean the heater radiator and fan impeller could result in sufficient lint build-up to reduce airflow, which will affect temperature control and cause high oxygen concentrations. Infant injury could occur.

Remove any lint build-up on the heater radiator and fan impeller.
Mattress Tray, Main Deck, Heater/Impeller Cover, and Mattress Tilt Bars

Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces, and then dry with a clean cloth or paper towel.

Air Intake Microfilter

⚠️ WARNING:
A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

NOTE:
If the incubator is used in an unusually dusty environment, more frequent replacement of the microfilter may be necessary.

Do not attempt to clean or reverse the microfilter. If the air intake microfilter is visibly dirty or older than 3 months, replace it (refer to procedure 4.19 on page 4-49). Before installing a new filter, clean the microfilter chamber and its cover with a cleanser/disinfectant.

Humidity Reservoir

To clean the humidity reservoir using an appropriate cleanser/disinfectant, perform the following:

1. Place the humidity reservoir and its lid in a suitable container filled with an appropriate cleanser/disinfectant.

2. Allow the humidity reservoir and its lid to soak as recommended by the cleaning solution's manufacturer.

3. Remove the humidity reservoir and its lid from the cleanser/disinfectant, and rinse them with sterile water.

4. Allow the humidity reservoir and its lid to dry.

NOTE:
Sterilization of the humidity reservoir is generally not considered necessary and may reduce the useful life of the humidity reservoir. However, if desired, the humidity reservoir withstands steam under pressure.
Component Handling

⚠️ CAUTION:
To prevent component damage, ensure that your hands are clean, and only handle the P.C. board by its edges.

⚠️ CAUTION:
When handling electronic components, wear an antistatic strap. Failure to do so could result in component damage.

⚠️ CAUTION:
For shipping and storage, place the removed P.C. board in an antistatic protective bag. Failure to do so could result in equipment damage.

P.C. Board

When servicing the P.C. board, follow good handling practices. Mishandling a P.C. board can cause the following:

- P.C. board damage
- Shortened P.C. board life
- Unit malfunctions

Observe the following P.C. board handling rules:

- Ensure that hands are clean and free of moisture, oily liquids, etc.
- Only handle the P.C. board by its outer edges.
- Do not touch the P.C. board components. Finger contact with the board surface and/or with its components can leave a deposit that will result in board (and component) deterioration.
- When working with electronics, wear an appropriate antistatic strap, and ensure that it is properly grounded.
- Service the removed P.C. board at a static-free workstation that is properly grounded.
- For shipping and storage, place the removed P.C. board in an antistatic protective bag.
Lubrication Requirements

⚠️ WARNING:
Follow the product manufacturer’s instructions. Failure to do so could result in personal injury or equipment damage.

⚠️ CAUTION:
Do not use silicone-based lubricants. Equipment damage could occur.

Oilite® bearings and bushings are utilized in several places on the system. By retaining oil, the pores give a self-lubricating quality to the bearings and bushings. If any silicone-based lubricant is applied to the bearings and bushings or anywhere else on the system, this self-lubricating quality is neutralized.

It is safe to apply the following lubricants to the system (see table 6-1 on page 6-9):

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8252 (100)</td>
<td>2 oz m-1 oil (apply to Oilite® bearings and bushings)</td>
</tr>
<tr>
<td>SA3351 (100)</td>
<td>4 oz lithium grease</td>
</tr>
</tbody>
</table>

1. Oilite® is a registered trademark of Beemer Precision, Incorporated.
Preventive Maintenance

⚠️ WARNING:
Only facility-authorized personnel should perform preventive maintenance on the Isolette® Infant Incubator. Preventive maintenance performed by unauthorized personnel could result in personal injury or equipment damage.

⚠️ WARNING:
Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing maintenance procedures. A fire and explosion hazard exists when performing maintenance procedures in an oxygen-enriched environment.

The Isolette® Infant Incubator requires an effective maintenance program. We recommend that you perform annual preventive maintenance (PM) and testing for Joint Commission on Accreditation of Healthcare Organizations (JCAHO) to help ensure a long, operative life for the Isolette® Infant Incubator. PM will minimize downtime due to excessive wear.

The following PM process guides you through a normal PM procedure on the Isolette® Infant Incubator. During this PM process, check each item on the schedule, and make the necessary adjustments.

Follow the PM schedule with the corresponding PM checklist. This checklist is designed to keep a running maintenance history and subsequent repair costs for one Isolette® Infant Incubator. However, your facility can modify this checklist or design another to fit your needs. Two effective ways to reduce downtime and ensure the patient remains comfortable are keeping close records and maintaining the Isolette® Infant Incubator.
# Preventive Maintenance Schedule

## Table 6-2. Preventive Maintenance Schedule

<table>
<thead>
<tr>
<th>Function</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall performance</td>
<td>To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.</td>
</tr>
<tr>
<td>Patient compartment</td>
<td>Inspect the patient compartment for signs of breakage. Replace assemblies as necessary before placing the incubator into service.</td>
</tr>
<tr>
<td>Oxygen sensor cells</td>
<td>Replace both oxygen sensor cells annually (refer to procedure 4.3 on page 4-8).</td>
</tr>
<tr>
<td>Current leakage</td>
<td>Perform the leakage current test (refer to procedure 6.5 on page 6-26).</td>
</tr>
</tbody>
</table>
**Preventive Maintenance Checklist**

Table 6-3. Preventive Maintenance Checklist

<table>
<thead>
<tr>
<th>Date</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Overall performance</td>
</tr>
<tr>
<td></td>
<td>Patient compartment</td>
</tr>
<tr>
<td></td>
<td>Oxygen sensor cells</td>
</tr>
<tr>
<td></td>
<td>Current leakage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number</td>
<td></td>
</tr>
<tr>
<td>Serial Number</td>
<td></td>
</tr>
<tr>
<td>Total Cost for this Page</td>
<td></td>
</tr>
<tr>
<td>Labor Time:</td>
<td></td>
</tr>
<tr>
<td>Repair Cost:</td>
<td></td>
</tr>
<tr>
<td>Inspected by:</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- C: Clean
- R: Replace
- O: Okay
- N: Not
- L: Lube
- A: Adjust
- Remarks:
  - Applicable
  - Remarks
6.1 Installation and Set-up

Tools required: 7/16" socket wrench

Unpacking

NOTE:
Typically, the fixed-height pedestal stand or the optional variable height adjustable (VHA) pedestal stand and the hood/shell assembly ship in separate cartons.

CAUTION:
When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.

1. When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.

2. Remove all packing materials from the hood/shell assembly (A) (see figure 6-2 on page 6-14).

Assembling

NOTE:
The hood/shell and the pedestal stand are keyed such that the hood/shell can mount on the pedestal only when the hood/shell power cord receptacle is located on the same side as the line cord coming out of the pedestal/stand.

1. Position the hood/shell assembly (A) on the pedestal stand (B) so that its power cord receptacle is on the same side as the adapter power cord (C) of the pedestal stand (B).

WARNING:
The hood/shell assembly must attach to the pedestal/stand using the screws provided. Failure to do so could result in the hood/shell assembly separating from the pedestal stand when sufficiently tilted, particularly with the hood open. Personal injury or equipment damage could occur.

2. Install the four ¼"-20 x 1½" Nylok® screws (D) to secure the hood/shell assembly (A) on the pedestal stand (B).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
Figure 6-2. Assembling the Hood/Shell on the Pedestal/Stand
3. Plug the adapter power cord (C) into the power cord receptacle beneath the controller (E) on the hood/shell assembly (A).

4. Remove the wing nut (F) and flatwasher (G) from the stud next to the power cord receptacle.

5. Place the ring lug of the controller’s ground lead (H) on the stud.

6. Replace the wing nut (F) and flatwasher (G).

7. Plug the power cord (I) into an appropriate power source.

⚠️ **WARNING:**
To keep the incubator from sliding when parked on an incline, face the pedestal stand front locking casters down the incline and locked.

8. If the unit is parked on an incline, face the pedestal/stand’s front locking casters (J) down the incline, and lock them in position.

### Setting Up

**NOTE:**
The System Configuration menu activates or deactivates the humidity system, oxygen system, and Skin Mode. The Skin Temperature alarm limit may be set to either ±0.5°C or ±1°C, and the oxygen calibration level may be set to either 100% or 21%.

Perform the following to enter the System Configuration menu:

1. Turn the controller (E) off.

2. Press and hold the Silence/Reset key (K) (see figure 6-3 on page 6-16) while simultaneously turning on the Power switch on the controller (E) (see figure 6-2 on page 6-14).
NOTE:
The controller can select the following languages: English, French, German, Spanish, Italian, Flemish, Dutch, Norwegian, Danish, Japanese, Polish, Finnish, Portuguese, Swedish, and Greek.

3. Press the Display Selection key (L) to highlight the desired option, parameter, or mode of operation (see table 6-4 on page 6-17) (see figure 6-3 on page 6-16)
### Table 6-4. Set-up Options, Parameters, and Modes

<table>
<thead>
<tr>
<th>Display Selection key selections</th>
<th>Up Arrow key selections</th>
<th>Down Arrow key selections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humidity option</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Oxygen option</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Oxygen calibration level</td>
<td>100%</td>
<td>21%</td>
</tr>
<tr>
<td>Skin temperature alarm limit</td>
<td>1.0°C</td>
<td>0.5°C</td>
</tr>
<tr>
<td>Skin Mode</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
<td>Italian</td>
</tr>
<tr>
<td></td>
<td>French</td>
<td>Spanish</td>
</tr>
<tr>
<td></td>
<td>German</td>
<td>German</td>
</tr>
<tr>
<td></td>
<td>Spanish</td>
<td>French</td>
</tr>
<tr>
<td></td>
<td>Italian</td>
<td>English</td>
</tr>
<tr>
<td>Weight unit</td>
<td>lb</td>
<td>kg</td>
</tr>
<tr>
<td>Air set temperature</td>
<td>30°C to 37°C</td>
<td>37°C to 30°C</td>
</tr>
<tr>
<td>Altitude</td>
<td>&lt; 10000' (3048 m)</td>
<td>&gt; 10000' (3048 m)</td>
</tr>
</tbody>
</table>

4. Press the Up arrow key (M) to scroll to a language, raise the air set temperature, or select the following:
   - YES (activate)
   - 100%
   - 1.0°C
   - lb (pounds)

5. Press the Down arrow key (N) to scroll to a language, lower the air set temperature, or select the following:
   - NO (deactivate)
   - 21%
   - 0.5°C
   - kg (kilograms)

6. To exit, press the **Silence/Reset** key (K).
6.1 Installation and Set-up

Chapter 6: General Procedures

7. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.2 *Oxygen Sensor Calibration*

Tools required: None

If the message **Cal Required** appears, perform this procedure to calibrate the oxygen control system. Daily calibrations are recommended. To maintain system accuracy, a seven-day calibration cycle is required.

**Room Air—21% Oxygen Calibration**

⚠️ **WARNING:**

For the 21% oxygen calibration, the unit **must** be equipped with a standard sensor module lock. Failure to use a standard sensor module could result in incorrect calibration. Infant injury could occur.

1. Ensure that the unit is equipped with a standard sensor module lock (A) (see figure 6-4 on page 6-19).

   **Figure 6-4. Sensor Module Assembly**

   ![Diagram of sensor module assembly](image)

   **NOTE:**

   Oxygen input connector shown removed for clarity.

2. On Display 1, perform the following:
   a. Press the **Oxygen** key.
6.2 Oxygen Sensor Calibration

Chapter 6: General Procedures

b. Press the On key.

c. Press the Cal softkey.

NOTE:
To prevent a Cal Fail message, withdraw the sensor module from the hood within 5 seconds of pressing the Cal Softkey.

3. Within 5 seconds, perform the following:
   a. Pull down on the sensor module lock (A).
   b. Withdraw the sensor module assembly (B) from the hood assembly (C) until it stops.

4. Allow the calibration to complete. Perform one of the following:
   • If the message Cal Pass appears in the Oxygen display, go to step 5.
   • If the message Cal Fail appears, go to step 1, and repeat the procedure.
   • If the message Cal Fail appears and the calibration procedure is unsuccessful a second time, call Technical Support at (800) 437-2437 for assistance.

5. Slide the sensor module assembly (B) into the hood assembly (C), and push up on the sensor module lock (A).

6. Press the On softkey.

7. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

100% Oxygen Calibration

⚠️ WARNING:
For the 100% oxygen calibration procedure, the incubator hood must be equipped with the 100% calibration fixture. Failure to use the 100% calibration fixture could result in incorrect calibration. Infant injury could occur.

1. Ensure that the incubator hood is equipped with the 100% calibration fixture.

2. Connect an oxygen hose to a 100% medical grade oxygen source at 3 lpm to 5 lpm and to the barbed oxygen input connector (D).
3. Turn on the oxygen.

4. On Display 1, perform the following:
   a. Press the Oxygen key.
   b. Press the On key.
   c. Press the Cal softkey.

NOTE:
To prevent a Cal Fail message, withdraw the sensor module from the hood within 5 seconds of pressing the Cal softkey.

5. Within 5 seconds, perform the following:
   a. Pull down on the sensor module lock (A).
   b. Withdraw the sensor module assembly (B) from the hood assembly (C) until it stops.

6. Allow the calibration to complete. Perform one of the following:
   • If the message Cal Pass appears in the Oxygen display, go to step 7.
   • If the message Cal Fail appears, go to step 1, and repeat the procedure.
   • If the message Cal Fail appears and the calibration procedure is unsuccessful a second time, call Technical Support at (800) 437-2437 for assistance.

7. Slide the sensor module assembly (B) into the hood assembly (C), and push up on the sensor module lock (A).

8. Press the On softkey.

9. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.3 Oxygen Concentration Test

Tools required: Calibrated oxygen analyzer
                Oxygen flowmeter
                3/16” inner diameter surgical tubing

NOTE:
This test only applies to units that are not equipped with an oxygen servo-control system.

1. Using 3/16” inner diameter surgical tubing, connect the output of the oxygen flowmeter to the nipple of the oxygen input connector (A) (see figure 6-5 on page 6-22).

![Figure 6-5. Oxygen Concentration Test](image)

NOTE:
Oxygen input connector shown removed for clarity.

2. Allow the oxygen concentrations to stabilize.

3. Place a calibrated oxygen analyzer on the center of the mattress (B).
**WARNING:**
Oxygen flow rates cannot be used as an accurate indication of oxygen concentration in an incubator. Continuously monitor the oxygen concentrations with a calibrated oxygen analyzer. Failure to do so could result in personal injury or equipment damage.

**NOTE:**
An oxygen concentration guide is provided in table 6-5 on page 6-23. This guide also appears on the back of the incubator.

4. Apply oxygen at the flow rates described in the oxygen concentration guide (see table 6-5 on page 6-23).

<table>
<thead>
<tr>
<th>Oxygen Supply</th>
<th>Approximate Oxygen %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 lpm</td>
<td>30%-45%</td>
</tr>
<tr>
<td>6 lpm</td>
<td>40%-60%</td>
</tr>
<tr>
<td>9 lpm</td>
<td>45%-75%</td>
</tr>
<tr>
<td>12 lpm</td>
<td>50%-85%</td>
</tr>
<tr>
<td>15 lpm</td>
<td>60%-90%</td>
</tr>
</tbody>
</table>

5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.4 Weighing Scale Calibration

Tools required: Weight, 11 lb (5 kg) (P/N 03 310 16)

Using a calibrated weigh, perform the following procedure to calibrate the scale upon installation and every 6 months thereafter:

1. Ensure that the mattress tray (A) is level and not in the Trendelenburg or Reverse Trendelenburg position (see figure 6-6 on page 6-24).

Figure 6-6. Scale Calibration

2. Select Display 2, and press the Weigh softkey.

3. If objects are on the mattress (B), remove them.

4. At Display 2, perform the following:
   a. Press the Zero softkey two times.
   b. Press the Cal softkey.

5. Wait for a weight reading and the 5 kg symbol to appear.

NOTE:
Hood assembly removed for clarity.
NOTE:
If a calibrated 11 lb (5 kg) weight is not placed on the mattress within 12 seconds after the 5 kg symbol appears, the Zeroing Failed system prompt message appears.

6. Within 12 seconds after the weight reading, place a calibrated 11 lb (5 kg) weight (C) on the mattress (B).

7. Wait for a weight reading. Perform one of the following:
   • If a reading of 5.000 kg appears, go to step 8.
   • If a reading of 5.000 kg does not appear, go to RAP 2.47 on page 2-114.

8. Remove the weight (C).


10. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.5 Current Leakage Test

Tools required: Calibrated leakage tester

Set-Up

1. Connect the controller to the primary power source through an ungrounded adapter plug so that the unit is ungrounded.

2. Turn the Power switch on.

NOTE:
The current leakage test standards, provided in the test procedures below, assume leakage through a resistance of 1000 ohms.

3. If the leakage tester being used does not provide a resistance of 1000 ohms, adjust the test set-up to provide it.

4. Turn the Power switch off.

NOTE:
The current leakage test standards, provided in the test procedures below, assume leakage through a resistance of 1000 ohms.

5. If the leakage tester being used does not provide a resistance of 1000 ohms, adjust the test set-up to provide it.

Procedure

1. Use the leakage tester to measure between the chassis of the unit and a known ground, such as the ground connection of a wall receptacle.

NOTE:
The leakage current must not exceed 300 uA for 100V AC/120V AC units or 500 uA for 220V AC/240V AC units.

2. Reverse the plug, and repeat step 1.

3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.6 Disassembly and Assembly for Cleaning

Tools required: None

Disassembly

NOTE:
For routine cleaning, do not separate the hood/base assembly from the pedestal stand. If separation is necessary, refer to “Installation and Set-up” on page 6-13, and perform the “Assembling” procedure in reverse order.

1. Disconnect the sensor module assembly (A) from the unit (see figure 6-7 on page 6-27).

![Figure 6-7. Hood Assembly](image)

CAUTION:
Before lifting the incubator hood for cleaning, ensure that all mounted accessories have been removed to prevent possible interference with the raised hood.

2. Remove all mounted accessories from the unit.
3. Slowly tilt the hood assembly (B) back until it is fully open.

4. Slide the x-ray tray (C) out of the mattress tray (D) (see figure 6-8 on page 6-29).

5. If the incubator is equipped with a weighing scale, remove it (refer to procedure 7.1 on page 7-5).

6. Remove the mattress (E) and the mattress tray (D) (refer to procedure 4.7 on page 4-18).

7. Pull the mattress tilt bars (F) up through the main deck (G).

8. Remove the main deck (G).

9. Remove the heater/impeller cover (H).

⚠️ **WARNING:**
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

10. Switch off the unit, and allow 45 minutes for the heater assembly to cool.

11. Remove the heater radiator and the heater assembly from the unit (refer to procedure 4.20 on page 4-50).

12. Remove the impeller assembly (refer to procedure 4.8 on page 4-20).
Figure 6-8. Mattress Platform Assembly
13. If the unit is equipped with a humidity system, perform the following:
   a. Remove the humidity reservoir (I) from the unit (refer to procedure 7.3 on page 7-14) (see figure 6-9 on page 6-30):

   **Figure 6-9. Humidity Reservoir**

   b. Remove the reservoir valve (J) by compressing its ends and lifting it up on the rear end.

   c. Remove the spring (K) and the seal (L) from the reservoir valve (J), and place the spring (K), the seal (L), and the reservoir valve (J) in the humidity reservoir (I).

14. Remove and **discard** the disposable access door cuffs from each access door (refer to procedure 4.26 on page 4-71).

15. Remove the access door gaskets from each access door (refer to procedure 4.27 on page 4-73).

16. Remove the tubing access grommets from each side of the hood assembly (refer to procedure 4.34 on page 4-93).

17. Remove the disposable iris entry port sleeves (refer to procedure 4.11 on page 4-31). Wipe clean.
18. Remove the air intake microfilter cover and the air intake microfilter from the unit (refer to procedure 4.19 on page 4-49).

**Cleaning**

For details on component cleaning, refer to “Cleaning” on page 6-3.

**Assembly**

**NOTE:**
Before assembling cleaned components into the incubator, inspect them for any breakage or cracks. Harsh cleaning agents may harm some of the plastics used in the patient compartment.

1. Install the impeller assembly (refer to procedure 4.8 on page 4-20).

2. Install the heater assembly and the heater radiator (refer to procedure 4.20 on page 4-50)

3. Install the heater/impeller cover (H) (see figure 6-8 on page 6-29).

4. Install the main deck (G).

5. Slide the mattress tilt bars (F) through their openings in the main deck (G).

6. Install the mattress tray (D) and the x-ray tray (C) (refer to procedure 4.7 on page 4-18).

7. If the unit is equipped with a weighing scale, install it (refer to procedure 7.1 on page 7-5).

8. Place a new disposable mattress cover over the mattress (E).

9. Install the mattress (E) on the mattress tray (D).

10. Install disposable iris entry port sleeves (refer to procedure 4.11 on page 4-31).
11. If the unit is equipped with a humidity system, perform the following:
   a. Install the reservoir valve (J), the spring (K), and the seal (L) in the humidity reservoir (I) (see figure 6-9 on page 6-30).
   b. Install the lid (M) on the humidity reservoir (I).
   c. Install the humidity reservoir (I) on the humidity tray (N).
   d. Slide the humidity tray (N) and the humidity reservoir (I) into the unit.

12. Inspect the tubing access grommets, and perform one of the following:
   • If a tubing access grommet is distorted or torn, replace it (refer to procedure 4.34 on page 4-93).
   • If a tubing access grommet is not distorted or torn, install it on the hood assembly (refer to procedure 4.34 on page 4-93).

13. Install an access door gasket on each access door (refer to procedure 4.27 on page 4-73).

14. If the incubator is to be gas sterilized, sterilize it.

15. Install a new access door cuff onto each access door gasket (refer to procedure 4.26 on page 4-71).

16. Inspect the air intake microfilter, and perform one of the following:
   • If the air intake microfilter is discolored or dirty, replace it (refer to procedure 4.19 on page 4-49).
   • Install the air intake microfilter and the air intake microfilter cover onto the unit (refer to procedure 4.19 on page 4-49).

17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.7 Filling the Humidity Reservoir

Tools required: Distilled water

1. Release the latch (A) that secures the humidity tray (B) in the shell assembly (C), and withdraw the humidity reservoir (D) until it stops at the fill position (see figure 6-10 on page 6-33).

Figure 6-10. Humidity Reservoir

⚠️ CAUTION:
To avoid equipment damage, use only distilled or sterile distilled water. Sterile water alone is not an acceptable substitute for distilled water.

2. Fill the humidity reservoir (D) with distilled water.

3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
6.8 Updating the Software

Tools required: Computer equipped with a CD-ROM drive, an available RS-232 communications port, and Microsoft Windows® 95 or later version operating system.

Parts required: 
- (1) 83901 22
- (1) reference only
- (1) 83930 70

Software Update Kit includes the following items:
- Programmed CD-ROM in case
- Cable assembly, programming

Procedure

1. Remove the incubator from service.
2. Install the CD-ROM labeled Software Update C2000 Isolette® Infant Incubator into the CD-ROM drive of the computer.
3. Run setup.exe to install the program on the computer.
4. Turn the incubator’s Power switch to the Off position.

⚠️ CAUTION: Use only the programming cable assembly (P/N 83930 70) to install the software update. Using a standard RS-232 cable assembly could result in equipment damage.

5. Connect the male end of the programming cable assembly to the RS-232 port on the back of the controller.
6. Connect the female end of the programming cable assembly to the RS-232 port of the computer.
7. Turn the incubator’s power switch to the On position.
8. Run download.exe, and follow the displayed directions to install the software upgrade on the computer.
9. Follow the directions displayed on the computer.
10. Retain the programming cable assembly (83 930 70) for future upgrades.

1. Microsoft Windows® is a registered trademark of Microsoft Corporation.
11. Perform the operational check; refer to the Isolette® Infant Incubator User Manual.

12. Return the incubator to service.

**NOTE:**
Total installation time is approximately 5 minutes per unit.
6.9 Installing the VueLink™ Software Monitor Connection

Tools required: Straight-through RS-232 DB-9 male to DB-25 female adapter cable

VueLink™ software enables the user to view patient parameters from the Isolette® Infant Incubator on a bedside patient monitor or a central monitoring system.

Procedure

1. Set the Isolette® Infant Incubator power switch to **Off**.

2. Connect the DB-9 male end of the RS-232 cable into the RS232 port on the bottom of the Isolette® Infant Incubator controller module.

3. Connect the DB-25 female end of the RS-232 cable to the bedside patient monitor or central monitoring system.

4. While pressing the **Silence/Reset** key, set the Isolette® Infant Incubator power switch to **On** to enter the set-up menu.

5. Using the Display selection button, scroll down to the VueLink™ software option.

6. Press the **Up** arrow to select **Yes**.

7. Press the **Silence/Reset** key to exit the set-up menu.

8. On the bedside patient monitor, press the **Module Setup** key. The **Module Setup** window appears on the VueLink™ software screen.

9. Press the gray button beneath the **HRAS C2000** caption. Values for the Isolette® Infant Incubator will appear on the VueLink™ software screen of the bedside patient monitor. Alarm messages resulting from alarm conditions will appear automatically.

**NOTE:**
VueLink™ system software does not have touch-screen capability.

**NOTE:**
Values from the bedside patient monitor can be archived using a central monitoring system. For details on this function, contact your local Phillips representative.

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1. VueLink™ is a trademark of Phillips Medical Systems.
Tool and Supply Requirements

To service the Isolette® Infant Incubator, the following tools and supplies are required:

- Phillips head screwdriver
- Small screwdriver
- 7/16" socket wrench
- 7/32" socket wrench
- 1/8" hex head wrench
- 9/64" Allen™ wrench
- 5 mm hex key or 3/16" hex key
- Pliers (two pair)
- Long-nose pliers
- Needle-nose pliers
- Nut driver
- Calibrated oxygen analyzer
- Oxygen flowmeter
- Calibrated leakage tester
- 3/16" inner diameter surgical tubing
- 12" long wooden prop
- Flat padded surface
- Distilled water
- Clean cloth
- Ruler
- Pencil
- Small hack saw
- Emery board
- Computer equipped with a CD-ROM drive, an available RS-232 communications port, and Microsoft Windows® 95 or later version operating system

1. Allen™ is a trademark of Industrial Fasteners, Inc.
2. Microsoft Windows® is a registered trademark of Microsoft Corporation.
Tool and Supply Requirements

Chapter 6: General Procedures

- ¼-pint can of touch-up putty paint (P/N 83 900 69)
- Controller firmware (P/N 83 006 36)
- Programming cable assembly (P/N 83 930 70)
- Access panel gauge (P/N 83 900 14)
- Weight, 11 lb (5 kg) (P/N 03 310 16)
- Straight-through RS-232 DB-9 male to DB-25 female adapter cable
Chapter 7
Accessories

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Accessories

For Isolette® Infant Incubator accessories, see table 7-1 on page 7-3.

<table>
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<tr>
<th>Part Number</th>
<th>Description</th>
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</thead>
<tbody>
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<td>83 444 00</td>
<td>IV pole assembly</td>
</tr>
<tr>
<td>83 442 00</td>
<td>Monitor shelf assembly, high</td>
</tr>
<tr>
<td>83 441 00</td>
<td>Swivel drawer assembly, small</td>
</tr>
<tr>
<td>83 440 00</td>
<td>Swivel drawer assembly, large</td>
</tr>
<tr>
<td>83 443 00</td>
<td>Oxygen tank bracket assembly</td>
</tr>
<tr>
<td>83 001 05</td>
<td>Ventilator tube support</td>
</tr>
<tr>
<td>83 610 70</td>
<td>Humidity system assembly, 120V (120V model only)</td>
</tr>
<tr>
<td>83 610 80</td>
<td>Humidity system assembly, 240V, English/Spanish/French/German/Italian (240V model only)</td>
</tr>
<tr>
<td>83 610 90</td>
<td>Humidity system assembly, 100V (100V model only)</td>
</tr>
<tr>
<td>83 613 70</td>
<td>Humidity system, 120V (120V model only) (“02” series model only)</td>
</tr>
<tr>
<td>83 613 80</td>
<td>Humidity system, 240V, English/Spanish/French/German/Italian (240V model only) (“02” series model only)</td>
</tr>
<tr>
<td>83 613 81</td>
<td>Humidity system, 240V, Swedish/Greek (240V model only) (“02” series model only)</td>
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<td>83 613 90</td>
<td>Humidity system, 100V (100V model only) (“02” series model only)</td>
</tr>
<tr>
<td>83 620 50</td>
<td>Oxygen assembly, green, Diameter Index Safety System (DISS)</td>
</tr>
<tr>
<td>83 620 51</td>
<td>Oxygen assembly, green</td>
</tr>
<tr>
<td>83 620 52</td>
<td>Oxygen assembly, white</td>
</tr>
<tr>
<td>83 620 53</td>
<td>Oxygen assembly, blue</td>
</tr>
<tr>
<td>83 600 50</td>
<td>Scale assembly, Isolette® Infant Incubator</td>
</tr>
</tbody>
</table>
Chapter 7: Accessories

NOTES:
7.1 Weighing Scale

Tools required: None

Installation

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 7-1 on page 7-5).

or

On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

2. Pivot the access panel (C) to the full-open position so it hangs straight down.

3. Remove the mattress (E) from the mattress tray (F) (see figure 7-2 on page 7-6).

4. Position the scale platform (G) so that its cable assembly (H) is to the right-hand side of the hood assembly (A), and place the scale platform (G) on the mattress tray (F).
NOTE:
Hood assembly and sensor module assembly shown removed for clarity.  m223g083
5. Install the mattress (E) in the scale platform (G).

6. Connect the scale platform cable assembly (H) to the **Weight** connector on the sensor module assembly (I).

7. Ensure that there is sufficient slack in the scale platform cable assembly (H) between the edge of the hood assembly (A) and the scale platform (G):
   a. Raise the hood assembly (A) to its full open position.
   b. Fully withdraw the mattress tray (F) from the hood assembly (A).

⚠️ **WARNING:**
Ensure all sensor leads are properly routed. Use cable management clips to avoid entanglement and possible infant injury.

8. Using the cable clips (J) provided, secure the scale platform cable assembly (H) to the inside wall of the hood assembly (A).

9. Calibrate the weighing scale (refer to procedure 6.4 on page 6-24).

10. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

**Removal**

Perform the installation procedure in reverse order.
7.2 Oxygen System

Tools required: Phillips head screwdriver
Pliers
Flashlight

Installation

1. Remove the sensor module assembly (A) from the unit (refer to procedure 4.2 on page 4-6) (see figure 7-3 on page 7-8).

2. Remove the two screws (B) that secure the oxygen sensor cover (C) to the sensor module assembly (A). Retain the two screws (B).

3. Remove the oxygen sensor cover (C) from the sensor module assembly (A).

4. Withdraw the sensor cell connectors (D) from the sensor module assembly (A).

5. Screw the oxygen sensor cells (E) into the oxygen cell mounting plate (F) provided.
6. Connect the oxygen sensor cells (E) to the sensor cell connectors (D).

7. Install the two screws (B) to secure the oxygen cell mounting plate (F) and the oxygen sensor cover (C) to the sensor module assembly (A).

8. Install the sensor module assembly (A) in the hood (refer to procedure 4.2 on page 4-6).

9. Remove the two Nylok® screws (G) that secure the pneumatic module access door (H) to the shell assembly (I) (see figure 7-4 on page 7-9). **Discard** the two Nylok® screws (G).

**Figure 7-4. Pneumatic Module Access Door**

10. Reach into the opening in the shell assembly (I), and perform the following (see figure 7-5 on page 7-10):
   
   a. Using a flashlight, locate the oxygen hose (J).
   
   b. Using a flashlight, locate the leads from the AC wiring harness assembly (K), and release them from the cord retaining clip (L) on the inside wall of the shell assembly (I).

---

1. Nylok® is a registered trademark of Nylok Fastener Corporation.
NOTE:
Shell bottom shown removed for clarity.
c. Using pliers, squeeze the retaining clamp (M) to release the plug (N) from the end of the oxygen hose (J).

d. Slide the retaining clamp (M) up the oxygen hose (J).

e. Remove and discard the plug (N).

11 Route the leads of the AC wiring harness assembly (K) down through the opening in the shell assembly (I), and connect them to the control valve assembly solenoid (O) (see figure 7-6 on page 7-11).

**Figure 7-6. Control Valve Assembly**

12. Connect the oxygen hose (J) to the barb fitting (P) on the filter assembly (Q), and lock it in place with the retaining clip (R).

13. Install the two #8-32 screws (S) provided to secure the control valve assembly (T) and the hose hanger on the shell assembly (I).

14. On an oxygen system other than 83 620 50 (Oxygen assembly, green, Diameter Index Safety System (DISS)), install the oxygen fitting at the end of the hose on the control valve assembly (T).

15. Turn the unit’s Power switch to the On position.
16. Calibrate the oxygen system at 21% (refer to procedure 6.2 on page 6-19).

17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

**100% Calibration Fixture Installation**

1. Remove the sensor module assembly (A) from the unit (see figure 7-3 on page 7-8) (refer to procedure 4.2 on page 4-6).

**NOTE:**
The 21% fixture is located under the sensor module opening.

2. Remove the two screws (U) that secure the 21% calibration fixture to the hood assembly (V) (see figure 7-7 on page 7-12). **Retain** the two screws (U).

3. Install the two screws (U) to secure the slide lock (W) and the 100% calibration fixture (X) directly under the opening in the hood assembly (V).

4. Install the sensor module assembly (A) (see figure 7-3 on page 7-8) (refer to procedure 4.2 on page 4-6).
5. Activate the oxygen system, and select the 100% calibration level.

6. Calibrate the oxygen system at 100% (refer to procedure 6.2 on page 6-19).

7. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

**Removal**

Perform the installation procedure in reverse order.
7.3 Humidity System

Tools required: Small screwdriver or similar device

Preparing the Shell Assembly

⚠️ SHOCK HAZARD:
Unplug the power cord from the unit. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the back of the controller (A) (see figure 7-8 on page 7-14).

**Figure 7-8. Shell Assembly**

NOTE:
Hood assembly removed for clarity.

2. Lift the hood assembly, and carefully tilt it back to its open position.

3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-18).

4. Pull the two mattress tilt bars (B) up through the main deck (C), and remove them from the unit.

5. Remove the main deck (C) from the unit.
WARNING:
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

6. Allow 45 minutes for the unit to cool.

7. Remove the heater/impeller cover (D) from the unit.

8. Remove the heater radiator (E) by unscrewing it from the heater assembly (F).

9. Insert and turn the end of a small screwdriver or similar device into the slot at the bottom center of the humidity cover (G), and remove the humidity cover (G) from the unit.

10. Reach into the humidity cavity, and perform the following:
    a. Locate and remove the wingnut (H) and the flatwasher (I) that secure the hole plug (J) to the inside of the shell assembly (K).
    b. Locate and remove the humidity connector of the AC wiring harness assembly (L), and pull it through the opening to the humidity cavity.

11. Remove the hole plug (J) from the shell assembly (K).

12. Install the humidity system:
    • For Series 00 and 01 models, refer to “Installing the Humidity System (Series 00 and 01 Models)” on page 7-16.
    • For Series 02 models, refer to “Installing the Humidity System (Series 02 Models)” on page 7-18.
Installing the Humidity System (Series 00 and 01 Models)

1. Connect the AC wiring harness assembly (L) to the connector of the evaporator assembly (M) (see figure 7-9 on page 7-16).

**Figure 7-9. Humidity System (Series 00 and 01 Models)**

2. Remove the humidity cap (N), the metal washer (O), and the O-ring (P) from the top of the evaporator assembly (M). Leave the polypropylene washer (Q) in place.

3. Thread the humidity hose (R) through the round hole in the humidity tray (S), and connect it to the barb fitting on the side of the evaporator assembly (M).

4. Place the evaporator assembly (M) into the shell assembly (K), and insert its collar (T) through the hole in the top of the shell assembly (K).

5. Install the O-ring (P), the metal washer (O), and the humidity cap (N) to secure the evaporator assembly (M) to the shell assembly (K).

6. Secure the humidity hose (R) in the retaining clip located on the bottom of the opening in the humidity tray (S).
7. Slide the end of the humidity tray (S) into the shell assembly (K).

8. Connect the humidity hose (R) to the humidity reservoir (U).

9. Install the humidity reservoir (U) in the humidity tray (S).

10. Screw the heater radiator (E) onto the heater assembly (F) (see figure 7-8 on page 7-14).

11. Install the heater/impeller cover (D) and the main deck (C) on the unit.

12. Slide the two mattress tilt bars (B) through their slots in the main deck (C).

13. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-18).

14. Carefully lower the hood assembly to its closed position.

⚠️ CAUTION:
To prolong the useful life of the humidity system, use only distilled water. Sterile water is not an acceptable substitute for distilled water. Equipment damage could occur.

15. Fill the humidity reservoir (U) with distilled water (refer to procedure 6.7 on page 6-33) (see figure 7-9 on page 7-16).

16. Slide the humidity tray (S) completely into the shell assembly (K).

17. Activate the humidity system.

18. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
Installing the Humidity System (Series 02 Models)

1. Connect the AC wiring harness assembly (L) to the connector of the evaporator assembly (V) (see figure 7-10 on page 7-18).

Figure 7-10. Humidity System (Series 02 Models)

2. Remove the evaporator cap (W), the stainless steel flat washer (X), and the silicone flat washer (Y) from the top of the evaporator assembly (V). Leave the polypropylene flatwasher (Z) in place.

3. Place the evaporator assembly (V) into the shell assembly (K), and insert its collar (AA) through the hole in the top of the shell assembly (K).

4. Install the evaporator cap (W), the stainless steel flatwasher (X), and the silicone flatwasher (Y) to secure the evaporator assembly (V) to the shell assembly (K).

5. Orient the humidity manifold assembly (AB) provided so that its mounting tabs (AC) are horizontal and to the front, and slide the humidity manifold assembly (AB) to the rear of the humidity cavity.
6. Reach into the humidity cavity, and turn the thumbscrews (AD) on the humidity manifold assembly (AB) two counterclockwise turns to secure the humidity manifold assembly (AB). Ensure that the humidity manifold assembly (AB) is secured.

⚠️ **CAUTION:**
To prevent damage to the collar that secures the evaporator assembly to the shell assembly, be careful not to twist the evaporator assembly around the horizontal axis when installing its tubing.

7. Connect the tubing (AE) from the evaporator assembly (V) to the barb fitting (AF) on the humidity manifold assembly (AB). Do **not** twist the evaporator assembly (V) around the horizontal axis.

8. Mount the humidity reservoir (AG) and its lid (AH) provided on the humidity tray (AI) provided.

9. Slide the end of the humidity tray (AI) into the shell assembly (K).

⚠️ **CAUTION:**
To prolong the useful life of the humidity system, use **only** distilled water. Sterile water is **not** an acceptable substitute for distilled water. Equipment damage could occur.

10. Fill the humidity reservoir (AG) with distilled water (refer to procedure 6.7 on page 6-33).

11. Slide the humidity tray (AI) completely into the shell assembly (K), and lock the handle (AJ).

12. Screw the heater radiator (E) onto the heater assembly (F) (see figure 7-8 on page 7-14).

13. Install the heater/impeller cover (D) and the main deck (C) on the unit.

14. Slide the two mattress tilt bars (B) through their slots in the main deck (C).

15. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-18).

16. Carefully lower the hood assembly to its closed position.

17. Activate the humidity system.
18. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

**Removing the Humidity System**

Perform the installation procedure in reverse order.
WARNING: DANGEROUS AND LETHAL POTENTIALS ARE PRESENT IN THIS CIRCUIT.

BEFORE PROCEEDING ANY FURTHER, THE READER IS WARNED THAT HIGH VOLTAGE, AC AND DC POTENTIALS ARE PRESENT IN THESE CIRCUITS. EXTREME CAUTION MUST BE USED WHEN MAKING CONNECTIONS TO THESE CIRCUITS.

REPEAT: THESE CIRCUITS CONTAIN DANGEROUS, AC AND DC VOLTS, USE CAUTION!

ALL TESTING PERFORMED ON THIS CIRCUIT MUST BE DONE ON THE ISOLATION TRANSFORMER. THE ISOLATION TRANSFORMER MUST BE CONNECTED BETWEEN THE CIRCUIT'S INPUT AND THE TEST EQUIPMENT.

OBSERVE THIS PRECAUTION TO AVOID ELECTRIC SHOCK.

REPEAT: AN ISOLATION TRANSFORMER MUST BE CONNECTED TO THE INPUT AND THE AC LINE IF ANY TEST EQUIPMENT IS TO BE CONNECTED.
WARNING: DANGEROUS AND LETHAL POTENTIALS ARE PRESENT IN THIS CIRCUIT!

BEFORE PROCEEDING ANY FURTHER, THE READER IS WARNED THAT CAUTION MUST BE USED IN THE TESTING OR USE OF THIS CIRCUIT. HIGH VOLTAGE POTENTIALS ARE PRESENT IN THESE CIRCUITS. EXTREME CAUTION MUST BE USED IN WORKING WITH AND MAKING CONNECTIONS TO THESE CIRCUITS.

REPEAT: THESE CIRCUITS CONTAIN DANGEROUS AC LINE CONNECTED HIGH VOLTAGE POTENTIALS. USE CAUTION!

ALL TESTING PERFORMED ON THIS CIRCUIT MUST BE DONE WITH AN ISOLATION TRANSFORMER CONNECTED BETWEEN THE CIRCUIT'S INPUT AND THE AC LINE.

OBSERVE THIS PRECAUTION WHEN CONNECTING TEST EQUIPMENT TO THE CIRCUIT TO AVOID ELECTRIC SHOCK.

REPEAT: AN ISOLATION TRANSFORMER MUST BE CONNECTED BETWEEN THE CIRCUIT INPUT AND THE AC LINE IF ANY TEST EQUIPMENT IS TO BE CONNECTED.
Interface P.C. Board Schematic Diagram (Sheet 3 of 5)
Central Processing Unit P.C. Board Schematic Diagram (Sheet 1 of 8)

1. Unless otherwise noted, all resistors are 5% tolerance, 1/8 watt.
NOTE RIBBON CABLE TO HAVE FERRITE CLAMP INSTALLED NEAR CPU BOARD.
Sensor Module Functional Block Diagram

1. Baby skin temperature dual sensor probe 1
2. Baby skin temperature dual sensor probe 2
3. Sensor P.C. board (100% thru-hole)
4. Hood air temperature sensors (x3)
5. Humidity sensor
6. Humidity sensor CAL NVM
7. Sample flow fan
8. Fan blade movement detector (optical)
9. The P.C. board is a calibrated item with the humidity sensor installed.
10. In-hold scale platform (optional)

ControllerPIC16C73 and logic
RAMLITE
RAM driver and light
+12V DC
FANON Fan driver
FANDRV

Mux
Signal conditioning
Signal conditioning
Humidity oscillator
Humidity conditioning
(+6, ground)

Oxygen fuel cell 1
Oxygen fuel cell 2
Circuit calibration values
Sensor module hood (normal) position sensor (x2)
Sensor module calibration position sensor (x2)

(+12, -12, ground)
(+12, +5, ground)
A5
D5
DGND
AGND

SMCLK
SMDTA
(bidirectional)
+12V DC
(-12, ground)
-12V DC

Local power supply regulation
VREF
A5
D5
DGND
AGND

Main P.C. board assembly—C2000 sensor module
Sensor module—C2000 incubator
Sensor Module P.C. Board Schematic Diagram (Sheet 4 of 4)

MAIN PCB
- OXYGEN MEASUREMENT

OXYGEN SENSORS

NOTE:

1) Unless otherwise indicated, all resistors are +/- 1%. 1/8W.
System Connections

PAD1 (WHT) Solder Pad
PAD2 (BLK) Solder Pad
PAD3 (RED) Solder Pad
PAD4 (GRN) Solder Pad

In-Circuit Programming Pads

PPAD1 +5V
PPAD2 VPP
PPAD3 CLK
PPAD4 DTA
PPAD5 GND

U1 MC78L05ACD

R1 2.00 K
C1 1.0 uF

U2 PIC12C508A

R3 20 K

U3 AS240LLH

R4 1.33 K
Q1 BSS-138

m22016
FO 3-7
Shell Assembly Cable Routing
Scale Assembly Cable Routing

- Scale cable assembly
- Retaining clamp
- 5 kg load beam
- Scale subframe
- 5 kg load beam
- Scale P.C. board assembly
- Conductive copper tape