NuBORNe®

500 Infant Warmer

Infant Radiant Warmer

Service Manual

international BIOMEDICAL®

NuBORNe®

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Service Manual

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About This Manual

Instructions to ensure the safe operation of the device are found throughout this manual. Read the manual carefully before operating the device. Follow the instructions to operate safely.

Document Conventions

The following shows and describes how Warnings, Cautions, and Notes are used throughout this manual.

Warning

A warning indicates the possibility of injury to the infant or to the user.

Caution

A caution indicates the possibility of damage to the device.

Note

Emphasizes information of particular importance.

Basic Instructions

- Read the entire service manual before servicing the NuBorne 500.
- As with all medical equipment, attempting to service this device without a thorough understanding may result in injury to the infant or the service personnel.
- Only qualified service personnel (biomedical engineers or technicians) who are trained or have a general knowledge of repair and experience with devices of similar nature should open the device electrical enclosures/covers, remove and replace the components, or make adjustments. No repairs should ever be undertaken or attempted by anyone not having such qualifications. If your medical facility does not have qualified service personnel, contact your local International Biomedical representative.

Warning

- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.

- Annual inspections may be performed by qualified personnel.
- If any damage or malfunction of the device is noticed, stop using it immediately and contact your International Biomedical representative.
- To ensure patient safety, use only parts and accessories manufactured or recommended by International Biomedical.
- Electric equipment for medical use needs special precautions regarding Electromagnetic Compatibility (EMC). Install and place the electric equipment into service according to the EMC information provided in this manual, see Appendix A: EMC Information for details on EMC information.

Notice

European Regulatory Affiars Representative
The authorization regulatory affairs representative in Europe for the warmer is:

Emergo Europe
Prinsessegracht 20
2514 AP
The Hague, The Netherlands

For general assistance or for parts and accessories, contact:

International Biomedical
8206 Cross Park Drive
Austin, Texas 78754

(512) 873-0033

Warranty

Unless otherwise specified, International Biomedical warrants all products of its manufacture at the time of shipment to be free from defects of material and workmanship for a period of twelve months from the date of shipment when owned by the original purchaser. Any product which is believed to be defective, if returned within twelve months after date of shipment by the Company with freight prepaid and found by the Company's inspection to be defective within the terms of this warranty, will be repaired or replaced free of charge and shipped, freight prepaid, to any point in the United States. If inspection by the Company of any such product does not disclose any defect within the terms of this warranty, the Company's regular charges for repairs or replacement and freight shall apply. All consumable and disposable products are guaranteed to be free from defects upon shipment only. The warranty period for batteries is limited to 90 days from date of shipment.
This warranty specifically excludes and replaces all other express and implied warranties. The Company shall have no liability under any warranty in any amount greater than the Company receives for the sale of the product involved. The use and manner of use of the Company's products shall be the responsibility of the purchaser and the purchaser covenants and agrees to indemnify and save harmless the Company in respect to any loss and damage that may arise through the use by the purchaser, or others, of any of the Company's products.

This warranty is rendered void and International Biomedical cannot be held liable for conditions resultant therefrom if:
1. Damage to the unit is incurred as a result of mishandling.
2. The customer fails to maintain the unit in a proper manner.
3. The customer uses any parts, accessories, or fittings not specified or sold by International Biomedical.
4. Sale or Service is performed by a non-certified service / dealer agency or any other unauthorized agency.

All shipping claims must be made within 30 days from date of shipment from International Biomedical, otherwise factory will not be liable for claims of missing items. Any item ordered in error and returned to the factory for credit, will be subject to a minimum restocking charge of 15%. Requests for returning items must be made within 30 days of factory shipment date.

International Biomedical will accept no returned goods without a Returned Material Authorization number (RMA) obtained from Customer Service Department.

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Chapter 1. Introduction

Introduction

This service manual describes the system installation, maintenance, replacement parts, troubleshooting, and technical specifications for the NuBorne 500. Read the NuBorne 500 service manual thoroughly to understand all instructions, warnings, cautions, and notes before service of the device. International Biomedical is not responsible for any malfunction due to improper use or service by unauthorized International Biomedical personnel. For any technical problem contact your International Biomedical representative.

Intended Use

The NuBorne 500 is an open care environment used for providing controlled infrared heat to neonates who are physiologically unable to maintain their body temperature or may require external heat to ease the transition from the mother's womb to the external environment.

The device is intended to be used in a Labor & Delivery environment for warming the infants immediately after birth, or in a Neonatal Intensive Care Unit for providing premature infants long duration thermoregulation therapy, or in newborn care areas, for providing external heat to low-birth weight infants, and for cases where clinical indications require short/long duration warming therapy.

The device allows access to the infant for various procedures, tilting of the mattress, weighing the infant and x-ray diagnostics. The device provides three modes of warming: Manual, Skin, and Standby mode for varying care requirements. Also, allows attaching optional accessories on the rail for therapy and monitoring of the infant.

Warnings, Cautions, Notes, and Symbols

Warnings

General	Never use the device to transport the infant.
	Never use wet hands before connecting power cord, operating or accessing the control panel, or touching the probe cable. It may cause an electric shock. MR unsafe. Do not use the device during magnetic resonance imaging (MRI) scanning. Federal law (U.S.) restricts this device to sale or use by or on the order of a physician (or properly licensed practitioner).
Setup	Use only the power cord supplied with the device. Otherwise, a fire or an electric shock may result.
	Never install the device where it will be exposed to high temperature or excessive humidity (see Chapter 9: Technical Specifications for details on operating condition). It may cause a fire or an electric shock.
	Ensure that water does not drip into the vicinity of the radiant heater through the top air ventilation openings. It may cause an electric shock.
	The device is not intended to be used in an area where there is smoke.
	Never park the device on inclines more than 10° slope. Installing the device on inclines more than 10° may cause instability or toppling.
	Ensure that this device is connected only to a supply mains with protective earth. Never operate the device if you have a doubt about its protective earth connection. It may cause an electric shock.
	Electric equipment for medical use needs special precautions regarding Electromagnetic Compatibility (EMC). Install and place the electric equipment into service according to the EMC information provided in this manual, see Appendix A: EMC Information for details on EMC information.
	Use only International Biomedical temperature probe part # 108-4855 (reusable patient probe) with the NuBorne 500.
	Ensure use of a separate power outlet for each device. Also ensure the power outlet is located near the device to prevent accidental tripping over a trailing power cord.

Warnings

Operation	Never use the device in the presence of a flammable anesthetic gas. The device may cause an explosion or a fire if used in the presence of such a gas.
	Ensure the sidewalls are always locked. Stop using the device if the locking mechanism of the sidewall is found faulty. The infant may fall out and suffer serious injury.
	Ensure that the infant's clothing, probe lines, and IV lines are not caught in spaces between corner blocks and sidewalls during open/close operation. The infant may fall out and suffer serious injury.
	Never use a heated gel mattress in the NuBorne 500. Use of heated gel mattress in this device can increase the infant's temperature to dangerous levels.
	Ensure that the cords and tubes do not entangle the infant when managing the cords and tubes into or out of the device.
	Never leave the infant temperature unmonitored. The infant temperature may rise or fall unacceptably.
	Ensure that you monitor the infant's core temperature separately when using the device. You cannot differentiate the condition in which the infant's peripheral skin temperature is low, while its core temperature is high (fever), from the condition in which the infant's skin temperature is low, as well as core temperature is low (hypothermia).
	Never place an infant or an object weighing more than 10 kg on the mattress platform.
	Never use skin temperature probe to measure infant's rectal temperature.
	Ensure that the skin temperature probe is properly attached to the infant's abdominal wall for accurate skin temperature measurement.
	Ensure that the skin temperature probe is neither warmed by being covered with a blanket, diaper, or the infant's arm, nor is cooled by getting wet with the infant's urine, perspiration, or some medical fluid.
	Ensure that the skin temperature sensor is fixed without the possibility of being dislodged from infant's body. If the skin temperature probe is dislodged from infant's body it results in under heating or overheating of the infant.
	Ensure that your fingers are not pinched while inserting and removing under-surface phototherapy device.
	Ensure that you use caution when the heater hood is in swivel operation. It may cause collision of your head with the heater hood.
	Ensure that the cables attached to the infant are long enough when tilting the mattress platform.
	Ensure that free oxygen flow is at least 500 mm away from heater hood in a well-ventilated room. If the device is used in presence of oxygen sources the risk of explosion or fire will increase.
	Ensure that others' fingers are not pinched in the gaps during sidewall open/close operation.
	Ensure that others' fingers are not pinched in the space between heater hood and vertical pillar during hood swivel operation.

Warnings

Operation	Ensure that the device is not brought to a sudden stop from movement at speeds above 0.5 km/hr. You may injure your leg if the storage drawer slides open.
	Do not place the infant in the bed during warmup.
Alarms	Discontinue use of the equipment when the System and Power Failure Alarm displays. See Chapter 3: Alarms for details.
	Discontinue use of the device if the Graphic display or indicator fails. See Chapter 6: Troubleshooting for details.
Cleaning	Ensure that the device is disinfected before first use, between change of infants, and after maintenance.
	Ensure to turn the power OFF, remove the power plug from the power outlet, and allow the heater to cool down before cleaning and disinfecting the device.
Maintenance	Ensure that the infant is taken out of the device and the device is powered down before any servicing event.
	Always inspect the footswitch for any damage that may allow water ingress. This is to reduce the risk of electric shock.
	Never disassemble or modify the device. It may cause a fire, electric shock or injury.
	Ensure the power plug is disconnected from the power outlet before moving the device to another place or while not using the device for a long time.
	Never apply lubricants to joints or moving parts of the device except the caster wheel. Lubricants may be harmful to the infant.
EMC	When using the NuBorne 500 adjacent to or stacked with other equipment, observe the operation of the NuBorne 500 and the other equipment to ensure normal operation.
	Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm to any part of the NuBorne 500 and associated cables. Otherwise, degradation of the performance of this equipment could occur.
	Use only parts, accessories, transducers, and cables designated by International Biomedical for use with the NuBorne 500. Cables and accessories other than those supplied by International Biomedical may result in unacceptable operation of the NuBorne 500 and will void the equipment warranty.
	The use of devices which radiate high intensity electrical fields may affect the operation of the NuBorne 500. Constant assessment of the patient and all life support equipment is mandatory whenever interfering devices are operating on or near patient.
	Electrical shock, burns or electromagnetic interference are possible if high frequency surgical instruments or endocardial catheters are used in the area of this device.

Cautions

General	Always install the device in a location that is out of reach of small children.

Cautions

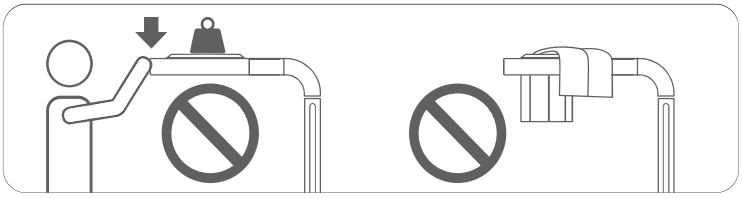
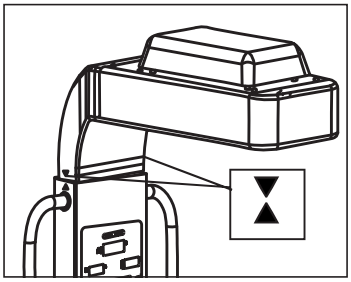
Setup	Ensure that the distance between heater and mattress is in the range of 790-830 mm.
	Never use unapproved mattress in NuBorne 500.
	Install the device at least 150 cm away from a room heater and in a location so that the device is not affected by external thermal conditions such as: • Direct sunlight • Heat emitted by a room heater • Airflow of an air conditioner • Cold wind from a window
	Install the device in such a way that the top surface of the hood is at least 50 cm below the ceiling as the heater hood radiates heat from the top surface of the hood.
	Install the device such that vertical pillar of the device is at least 40 cm away from the closest wall. Never block the air vents in the heater hood. This may lead to excessive heating of the heater hood.
Operation	Avoid excessive force to tilt the infant bed in the event of failure to the tilt actuation. For service contact International Biomedical representative.
	Avoid excessive force, if the device hood swivel ability is stuck or if the X-ray cassette is difficult to remove, place, or position on X-ray tray.
	Never hang anything heavy, place any heavy weight, or lean against the heater hood. It may cause a structural damage.
	Never use the tilt handle to move the device after installation. It may cause a structural damage.
	Never hang a cloth on the heater hood. It may catch a fire if the device is switched ON.
	Never stand, lean, or put full body weight on any part of device including base and footswitch. It may cause a structural damage or instability.
	Never get the power cord pinched or caught between the device and the wall, a shelf or the floor.
	Never place the power cord near a heating apparatus and never expose the power cord to heat.
	Never put anything heavy on the power cord.
	Never place weight beyond 7 kg on monitor stand mounted to accessory rail. It may cause instability.
	Never load more than 10 kg on one side of the accessory rail.
	Never overload the storage drawers beyond 5 kg of contents.
	Never store any heavy item in the space under the mattress.
	Ensure that the heater hood is adequately secured in the central position if the device requires to be transported in a road vehicle. It may cause unintended swivel of heater hood during transport.
	Infants should wear protective eyewear when observation light is being used.
	Always use a sheet or blanket to cover the mattress.
	Ensure the bed is level prior to initiating the weighing procedure.

Maintenance	Stop using the device and contact International Biomedical representative if you notice any unusual smell, unusual noise, unusual vibration, overheating, missing parts, or defective function in the inspection.
	Inspect the power cord for any damage. A damaged power cord may cause a fire or an electric shock.
	Inspect the device for damage if left unused in storage. If any damage is found, contact your International Biomedical representative.
	Always grasp the power plug with your hand to remove the power cord from the power outlet. A damaged power cord should be replaced with a new one.
	The device should be serviced only by qualified personnel.
	Never twist or pull the cords by force. If any defect is found, contact your International Biomedical representative.
	Clean and disinfect the device and its accessories before and after maintenance inspections and repairs, or before disposal.
Cleaning	After cleaning and disinfecting the device, dry completely before using the device.
	Never use unauthorized cleaning agents and do not scour or allow excess cleaning solutions to drip on to heater or electronics.
	Use only the approved disinfectants for NuBorne 500. See Recommended Disinfectant Solution in Chapter: 5 Cleaning and Maintenance of NuBorne 500 User Manual for recommended disinfectant solution, appropriate concentration, contact time, and handling.
	Reassemble the removed parts and check that the device operates normally after cleaning and disinfecting.
	Never immerse removable parts in disinfectant or soap solution.
	Ensure that water or cleaning agents do not enter near electronics through vents on back of vertical pillar.

Notes

Setup	All materials used on continuous contact surfaces with infant are designed using biocompatible materials.
	Cover the mattress with a mattress sheet.
	The electrical rating of the device is: AC 230 V and 115 V, peak power consumption 750 VA (inclusive of height adjustment operation), frequency 50/60 Hz, and operating voltage range AC 230 V ± 10% AC and 115V ± 10%. Never connect the device to any other power source.
Cleaning	Clean and disinfect the device, as per the maintenance instructions in Chapter: 5, or whenever you notice any dirt or stain that may cause infection.
Maintenance	Medical institutions are responsible for performing routine maintenance as detailed in the user manual.

Symbols: Product Labels	
 (blue background)	Refer Accompanying Instructions For Use (User Manual)
	Ensure this device is disposed safely at end of life. (For guidance on safe disposal contact International Biomedical representative).
	Date of Manufacture
CB	Circuit Breaker Rating IEC 60127-1, T 10A, 240V
	Warnings: • Do not Place the Infant on x-ray tray • Maximum Weight 3 kg
	High voltage
	Warning: Hot Surface
	Potential Equalization Terminal
	Protective Earth Terminal
	Warning: Maximum Weight 1 kg
	Warning: Maximum Weight 5 kg
	Warning: Maximum Weight 7 kg
	Warning: Maximum Weight 10 kg
	Warning: Maximum Weight 15 kg

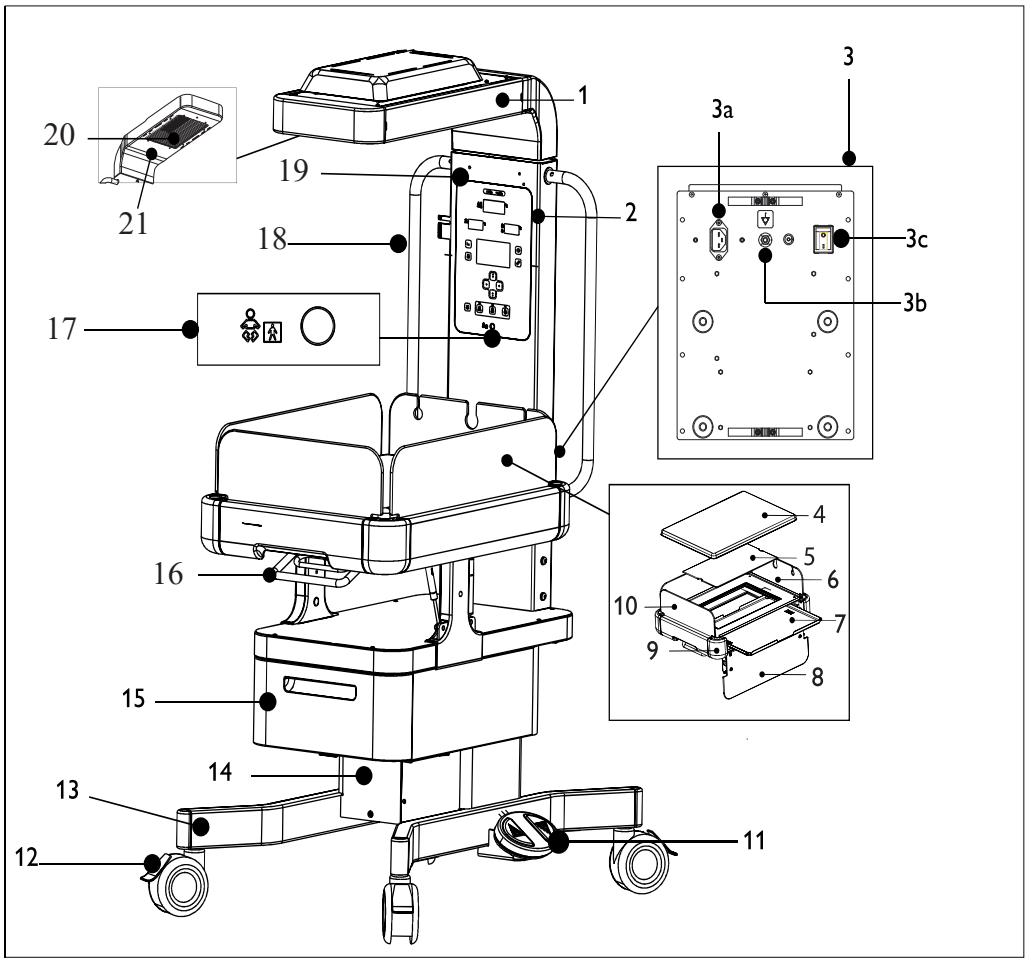
Symbols: Product Labels	
	Warning: • Maximum height 80 mm • Maximum weight capacity 5 kg on open shelf.
	Warning: • Do not attempt to touch heater
	Warning: • Do not Place Heavy Weight on Heater Hood • Do not Press Down on Heater Hood • Do not Hang Cloth on Heater Hood
	Caution: • Heater hood central alignment indication
 (blue background)	• Cover Infant's eyes
	• Observation light

Symbols: **User Interface**	
	Power Failure
	System Failure
	Skin Temperature
	Manual Temperature Mode
	Skin Temperature Control Mode
	Standby Mode
	View Temperature Trend
	Erase Trend
	APGAR Timer
	Settings
	Scale
	Increase Button
	Decrease Button
	Forward Selection Button
	Backward Selection Button

Symbols: **User Interface**	
	Type BF Applied Part
	Observation Light
	Bed Motion
	Scale Warm-up Time
	Min Weight not Achieved
	Max Weight Exceeded
	Bubble Level Indicator
	Scale not Available
	Lift Baby
	Place Baby
	Scale Gravity Error
	Scale Communication Error
	Scale Zeroing Error

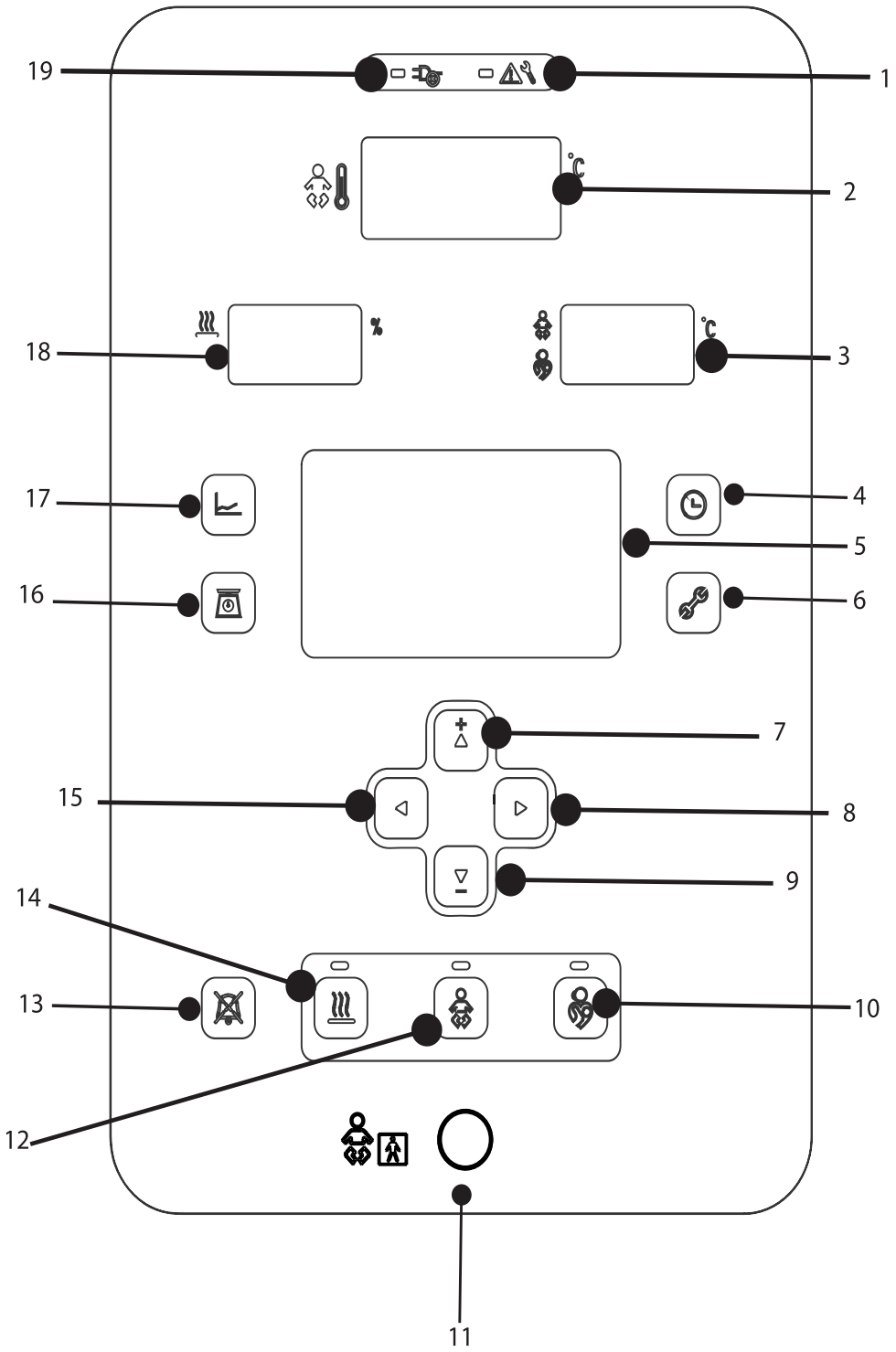
Chapter 2. System Description

Main Parts



#	Name
(1)	Heater hood
(2)	Display panel
(3)	Power panel
(3a)	Power socket for power cord connection
(3b)	Potential equalization terminal
(3c)	Power switch
(4)	Mattress
(5)	Bed acrylic tray
(6)	Short sidewall with tubing slots
(7)	X-ray cassette tray (optional)
(8)	Long sidewall
(9)	Corner block

#	Name
(10)	Short sidewall
(11)	Footswitch
(12)	Caster wheel
(13)	Pedestal
(14)	VHA cover
(15)	Storage drawer
(16)	Bed tilt handle
(17)	Skin temperature probe socket
(18)	Accessory rail
(19)	Vertical pillar
(20)	Heater grill
(21)	Observation light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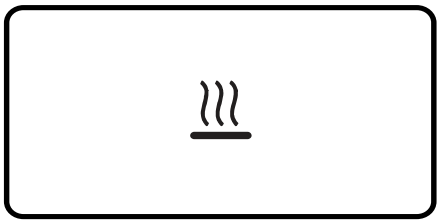
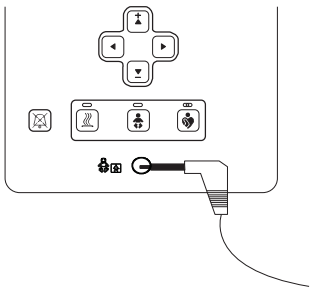
The following summarizes the menu item functions:

No.	Menu Item	Symbol/Display Screen/Connecting Port	Function
(1)	System failure indicator		A red color indicator illuminates when the system failure alarm condition occurs.
(2)	Measured skin temperature numeric display		Displays measured skin temperature. It also blinks in case of some alarm conditions.
(3)	Set skin temperature numeric display		Displays the set skin temperature. It also blinks in case of some alarm conditions.
(4)	APGAR		Press the APGAR button to start the count-up timer that gives an audible alert at 1, 5, 10, and 20 minutes. The timer is seen in the Graphic display. Press the APGAR button again to stop the count-up timer.
(5)	Graphic display		Displays system information such as temperature, APGAR timer, settings, system messages, alarms and selected mode. It also displays error code in case of System Failure.
(6)	Settings		Press the Settings button to loop through the settings option to control the alarm volume, erase trend data, set date and time that is used during trending.
(7)	Increase button		Press the Increase button to increase, change or scroll a value of a parameter.
(8)	Forward selection button		Press the Forward selection button to select the next selection or to set a value.

No.	Menu Item	Symbol/Display Screen/Connecting Port	Function
(9)	Decrease button		Press the Decrease button to decrease, change or scroll a value of a parameter.
(10)	Standby mode		Press the Standby mode button to select this mode of operation of the device. This mode maintains the device in standby and relaxes alarm limits or turns OFF alarms. This mode facilitates supplementary care that requires the infant to be moved out of the device for varying durations. Note: Successful activation of this mode is indicated by illuminated indicator above mode button.
(11)	Skin temperature probe socket		Attach one end of the skin temperature probe to the infant and connect the other end to the probe socket. For details on attaching the skin temperature probe refer to Chapter Setup in user manual.
(12)	Skin temperature mode		Press the Skin temperature mode button to select this mode of operation of the device. This mode provides warming therapy to the infant based on measured skin temperature. Note: Successful activation of this mode is indicated by illuminated indicator above mode button.
(13)	Alarm silence button		Press the Alarm silence button to mute the alarm sounds. See Chapter Alarms in user manual for details on Alarm silence time.

No.	Menu Item	Symbol/Display Screen/Connecting Port	Function
(14)	Manual temperature mode		Press the Manual temperature mode button to select this mode of operation of the device. This mode directly controls the heater output. This mode generates a 'Check baby alarm' 12 minutes after selection. See Chapter Alarms in user manual for details on Check baby alarm. Note: Successful activation of this mode is indicated by illuminated indicator above mode button.
(15)	Backward selection button		Press the Backward selection button to select the previous selection or to set a value.
(16)	Scale		Press the button to activate the in bed weighing scale that can be used to measure the weight of the infant.
(17)	View trend		Press this button to view temperature trend as a graph or weight trend (applicable only if the scale option is installed) as a table. Temperature trend data is stored for a maximum of 96 hours with each screen showing 24 hours of data. Last 30 weight measurements are stored with date and time stamp and displayed as a table with 5 entries in one screen.
(18)	Heater output numeric display		Displays the power output of the heater as percentage of full power. It also displays error code in case of System Failure.
(19)	Power failure indication		A red color indicator illuminates when the power failure alarm condition occurs.

Alarms

For details on Alarms refer to Alarms Chapter in user manual.

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Chapter 3. Theory of Operation

This chapter describes the electronics of the basic theory of operation of NuBorne 500.

System/Subsystem Major Components

A breakdown of NuBorne 500 system into subsystem and High Level Assemblies (HLAs) constituting those subsystems is shown in the following figure.

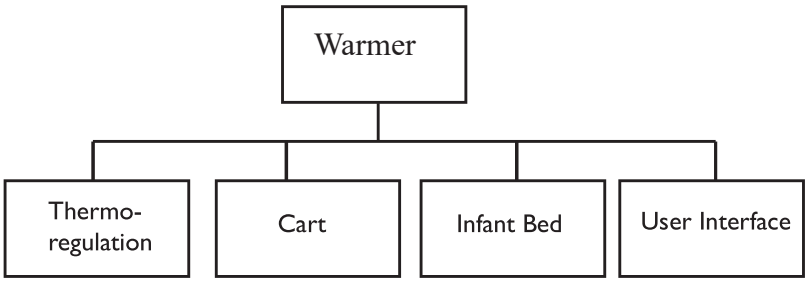


Figure 1. NuBorne 500 Subsystem HLAs

Thermoregulation

The Thermoregulation subsystem has the following modules:

- A power module that modulates power to the radiant heater
- A control module that measures skin temperature and executes control algorithm that commands the radiant heater power
- A heater hood module that directs the radiant heat on the infant bed

The HLAs of the thermoregulation subsystem is shown in the following figure.

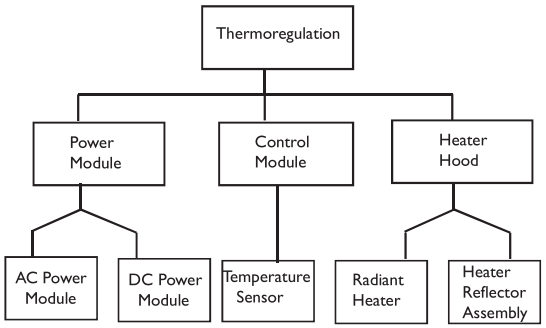


Figure 2. Thermoregulation Subsystem HLAs

Cart

The cart subsystem enables height adjustment of the mattress for your convenience and provides storage space. The cart subsystem provides a sturdy stable structure for the infant bed and accessory rail. The HLAs of the cart subsystem is shown in the following figure.

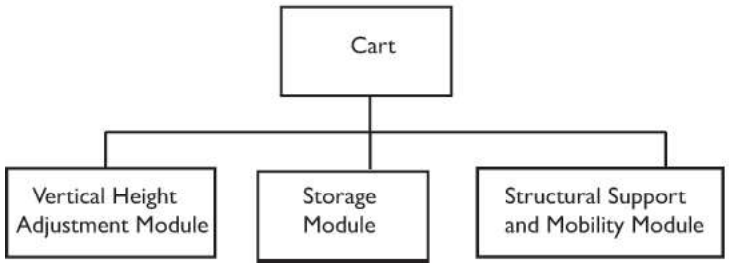


Figure 3. Cart Subsystem HLAs

Infant Bed

The infant bed subsystem provides secure support for the infant receiving thermoregulation therapy. The infant bed subsystem enables tilted orientation of the mattress, integrates weighing and provides retractable sidewalls for access during supplementary therapy. The HLAs of the infant bed subsystem is shown in the following figure.

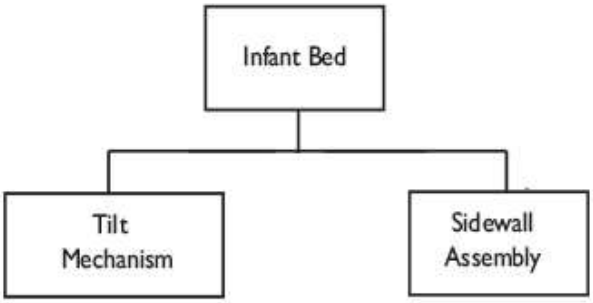


Figure 4. Infant Bed Subsystem HLAs

User Interface

The user interface subsystem provides user interactions with the device. The keypad module allows you to input values and to communicate with the system state. The display module shows system state, measured parameters to alarm conditions, trend graphs, service mode and weighing process. Display module displays the system and infant parameters and feedback on key presses. The HLAs of the user interface subsystem is shown in the following figure.

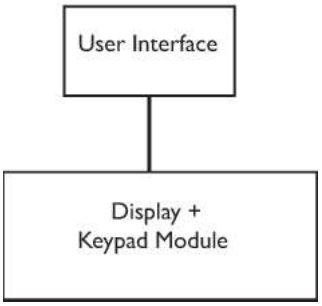


Figure 5. User Interface Subsystem HLAs

Mechanical Assembly

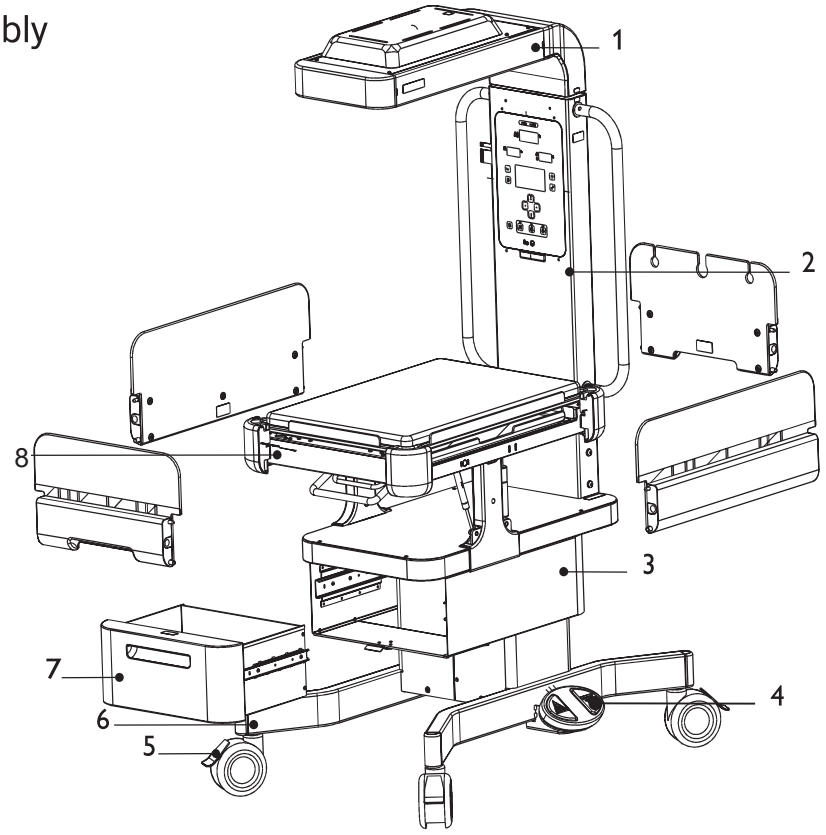


Figure 6. Mechanical Assembly

1. Heater hood assembly
2. Vertical pillar assembly
3. Elevating base
4. Footswitch
5. Caster wheels
6. Base assembly
7. Storage drawer assembly
8. Bed assembly

Heater Hood Assembly

The heater hood assembly contains radiant heater, observation light, reflector assembly, and hood assembly. The radiant heat emanates from the heater located in the heater hood and reflector is used to redirect the heat generated on the top surface of heater to the bed surface. The observation light is adjustable to provide extra lighting to the bed.

Vertical Pillar Assembly

The vertical pillar assembly contains structural channel, display board housing, membrane keypad, rear cover, and accessory holder. The structural channel contains Printed Circuit Boards (PCBs): Display board, controller board, AC circuit board, mains power supply board, VHA controller board, and power input panel. It also contains user interfaces: TFT graphic display, indicators, membrane keypad, and skin temperature probe socket.

Elevating Base and Footswitch

The Vertical Height Adjustment (VHA) mechanism provides the function of adjusting the height of the mattress to suit your convenience. The device has capability to structurally withstand the forces and moment loads. When the VHA is electrically powered, the effected linear motion provides smooth operation, without sudden starts and stops and minimal vibration at the mattress. The VHA uses a footswitch to actuate the motor control.

Base Assembly and Casters Wheels

The base assembly supports the elevating base and bed assembly. It supports four locking casters so that the device can be moved to any location within a hospital. A column separates mounting location for the elevating base and bed assembly from the caster support. This column can be adjusted in height.

Storage Drawer Assembly

The storage drawer assembly consists of a slide-out storage drawer. The storage drawer assembly provides convenient and easy storage of items such as sheet, blankets, and diapers. Storage drawer cabinet is provided to support the storage drawer and mount the slide rail.

Bed Assembly

The bed assembly includes bed frame assembly, tilting mechanism, optional x-ray tray, sidewalls and optional scale. The bed frame assembly includes several parts including support bed frame, corner blocks, acrylic tray, and mattress.

The tilt mechanism enables the bed to be tilted and locked at any angle up to 12° in either direction with tolerance of 0° to +3° from horizontal to facilitate head-up and feet-up orientation of the infant.

Functional Blocks

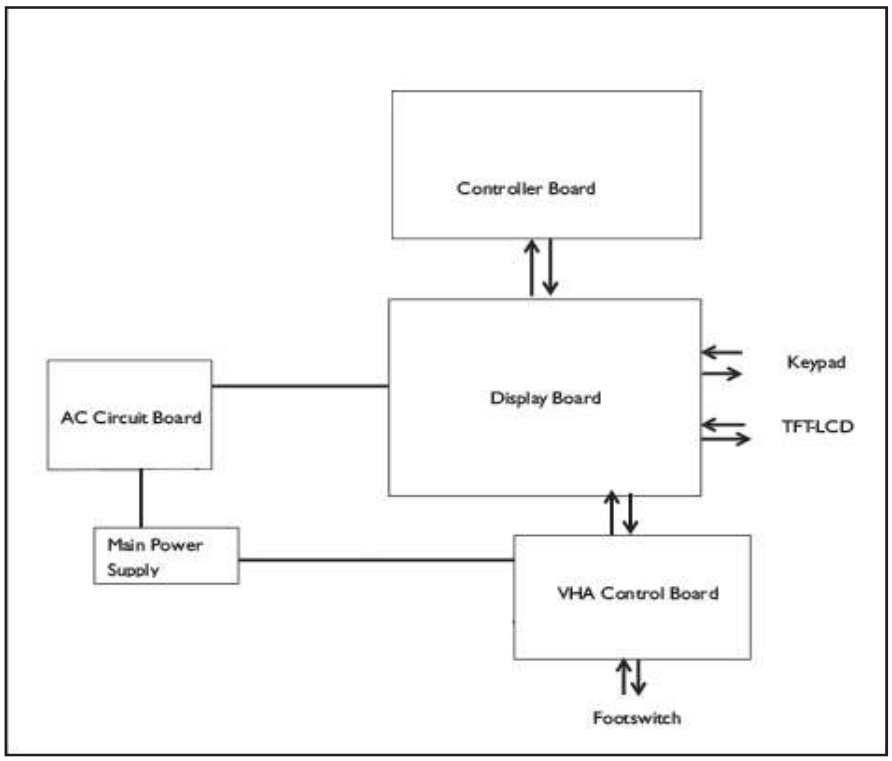


Figure 7. Functional Block Diagram

Controller Board

The controller board is responsible for:

- Skin temperature measurement
- Heater control

The set values are obtained from display board over Universal Asynchronous Receiver/ Transmitter(UART) and the measured values are communicated to display board.

The block diagram for controller board is displayed in the following figure.

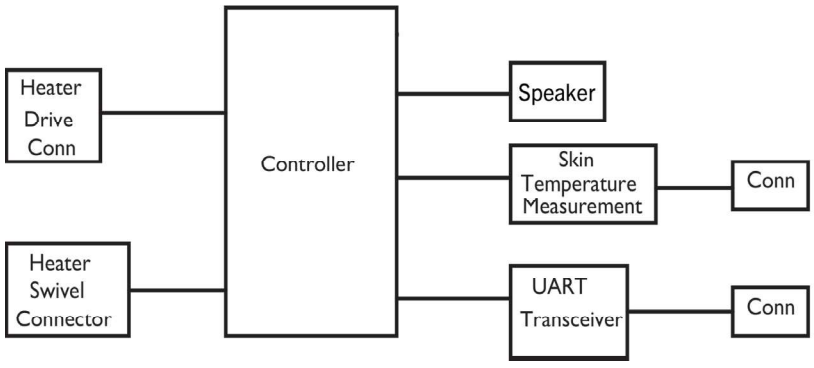


Figure 8. Controller Board Block Diagram

Display Board

Display board is responsible for:

- Interfacing with keypad
- Displaying system and infant parameters
- Displaying alarm conditions
- Supplying power for generating different digital voltage levels
- Controlling the overall system mode and its transitions
- Interfacing with LCD controller for updating LCD screens

The block diagram of Display board is shown in the following figure.

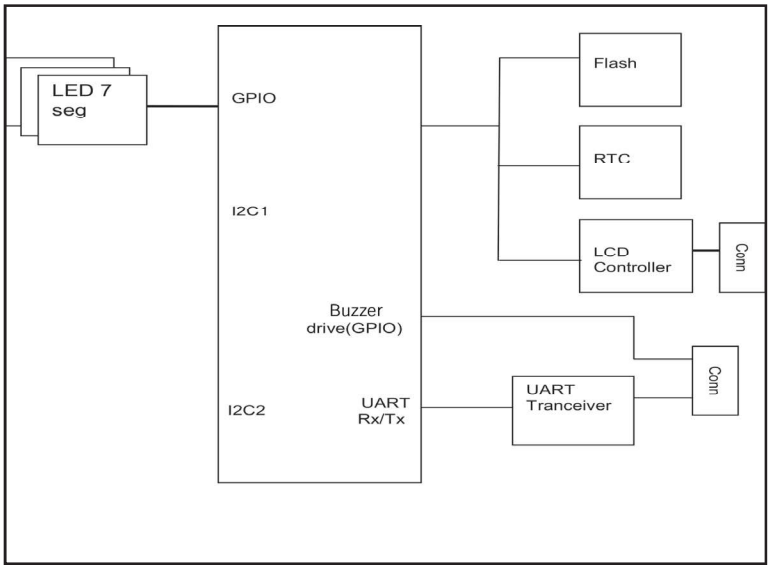


Figure 9. Display Board Block Diagram

VHA Control

The Vertical Height Assembly (VHA) controller board controls the movement of VHA. The VHA controller board is interfaced with:

- Display board (To get 5 V power)
- Footswitch (up/down pedal press)
- 24 V VHA power supply
- VHA unit

Movement of VHA unit has dependency on the following two factors:

- Display board (enable signal is always active)
- Footswitch (VHA moves up and down depending on the footswitch press)

Power Supply Modules

The 24 V main power supply turns ON the complete digital circuit and VHA. The maximum current for the VHA is 4.5 A at full load and output power of power supply is 120 W or more. Power domain requirement in different boards is shown in the following figure.

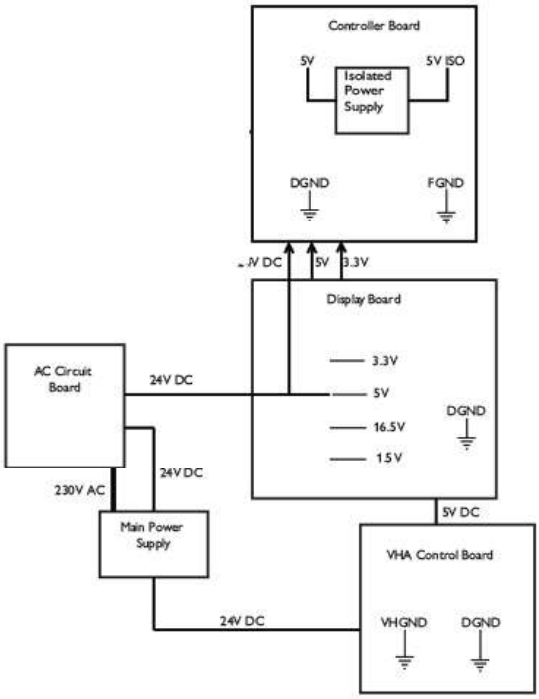


Figure 10. Power Supply Modules

AC Circuit Board

The AC Circuit Board (ACB) handles all the AC interfaces of the device. Its functionality is two-fold, first, it distributes AC power to the components that directly operate on AC supply and second it provides power for the control of AC actuators (IR heater).

The ACB is divided into two modules:

1. External Interface and Safety Module: The external interface and safety module provides the power and control interfaces to the other Printed Circuit Board Assemblies (PCBAs).
2. IR Heater Control Module: The IR heater control module provides control mechanism for the IR heater.

User Interface

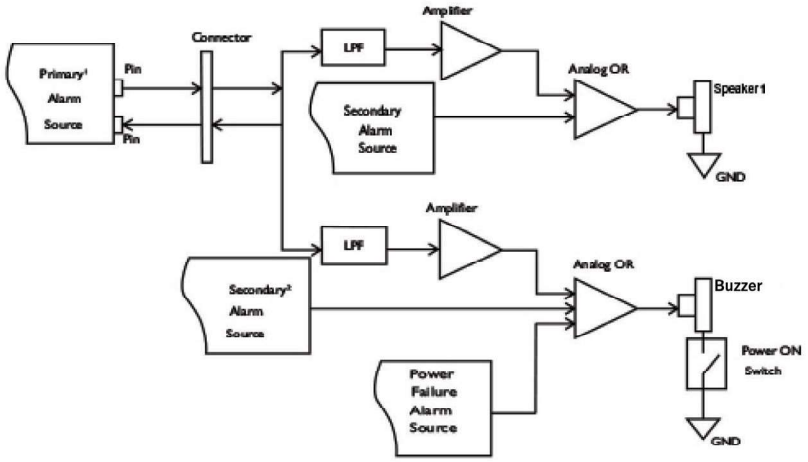
The NuBorne 500 system user interface can be classified into three parts, Graphic Display (Display Panel), Numeric Display (7-segment LED) and keypad.

1. Display Panel: A TFT display with a resolution of 480 pixels x 272 pixels, LED backlight, 16 M color, and wide view angle. A dedicated graphics controller in display board drives the RGB lines of TFT.
2. Numeric Display: Common anode high brightness 7-segment LEDs are used to display different patient parameters. The segment LEDs are mounted on display board and sockets are used to match the size among different LEDs.
3. Keypad: The keys are used to modify parameters of the device. The keys are connected to the display board. There are few indicators in the keypad for indication of modes and failures.

Alarms

The NuBorne 500 system has both visual and audible alarms in the event of power failure and other alarm conditions. Visual alarms are provided in LCD. The LCD display is controlled by display board. Alarm audio is generated by speaker. The microcontroller on display board drives speaker 1. If speaker 1 fails, Controller board drives buzzer.

Notes:



[1] primary source-Display board microcontroller

[2] secondary source-Controller board microcontroller

Figure 11 Alarm Block Diagram

Power Alarm

The power failure alarm is activated on an interruption in the AC power input while the power switch is ON. A capacitor is used to energize the speaker. The speaker is connected to the capacitor through a normally ON transistor switch that is held in OFF state by the DC power supply. In case of a power failure, the DC power supply fails to maintain the transistor in OFF state and it returns to ON state, thus allowing the capacitor to activate the speaker. However, as the Double-Pole Double-Throw (DPDT) mains power switch bridges the speaker circuit to ground, the speaker beeps only when the switch is ON, thus avoiding annoyance during intentional power OFF.

Other Alarms

The alarm circuit consists of various redundant mechanisms as given below, in order to provide utmost reliability in raising fault alerts:

- Speaker and indicator
- Independent speaker and independent buzzer
- Two independent sources driving the speaker and buzzer
- Multiple ways to trap single point failures

Volume Control

The volume control of the alarms is achieved using Pulse-Width Modulation (PWM). The alarm source generates the signal at a constant ultrasonic frequency (~24 kHz) whose duty cycle is variable. The speakers used in NuBorne 500 have sound pressure level < 95 dB, can generate a sound of 65 dBA at a distance of 3 m from vertical pillar at maximum volume.

Start-Up

When the device powers ON, there are a number of self-tests that occur. If a failure is detected during self-test, the device displays a failure error and initiates an alarm. If no failure is detected, normal startup operation as defined in the NuBorne 500 user manual commences.

Heater Control

The heater control over various mode of operation of device are as follows.

Manual temperature mode

In Manual temperature mode, you can control the heater power to achieve a selected output power level (%). Actual heater output is proportional to set heater output taking into consideration maximum heater wattage.

Skin temperature control mode

In Skin mode, heater output is modulated to achieve set temperature so that the heater output is a function of measured temperature and set temperature.

Standby mode

The Standby mode facilitates supplementary care requirements when the infant is lifted away from the device such as feeding, weighing, kangaroo care. The skin temperature probe is used to monitor the infant's skin temperature. The heater power is maintained at 25%.

Service Mode

Power on the NuBorne 500. Once the splash screen disappears and speaker test is complete, press together Manual mode + Down Arrow keys together to initiate calibration mode.

A series of restricted service menu screens allow a technician to calibrate the power setting and view PCB software and hardware revision levels of device.

Equipment Grounding

Grounding and Isolation

The grounding and isolation design of the NuBorne 500 ensures all mains circuitry is separated from you and the infant. The infant probe has double isolation from rest of the circuit. The double isolation is achieved locally to the circuit. The main power supply has basic isolation with mains. Near the mains power inlet an equipotential terminal is provided. This terminal should be used for grounding when multiple devices are connected to same mains power supply.

Chapter 4. System Installation Procedures

Introduction

Installation must be carried out by qualified service personnel. The device is suitable for use in all medically used rooms which fulfill the requirements regarding electrical installation according to IEC60364-7-710-Requirements for special installations or locations-Medical locations or corresponding local regulations.

Notes

- For mechanical and electrical installation, you need technically qualified personnel with a knowledge of English.
- Assembly to be done as per Installation instructions.

As the first step in preparing the device for use, follow the installation instructions given in this chapter.

Install the device on a horizontal surface, away from a room heater or a window, and in a room temperature of 18°C to 30°C.

Warning

- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.

Cautions

- Always install the device at least 150 cm away from a room heater and in a location so that the device is not affected by external thermal conditions such as:
  - Direct sunlight
  - Heat emitted by a room heater
  - Airflow of an air-conditioner
  - Cold wind from a window
- Always install the device such that top surface of the hood is at least 50 cm below the ceiling as the heater hood radiates heat from the top surface of the hood.
- Always install the device such that the vertical pillar of the device is at least 40 cm away from the closest wall.

Tools Required

- Allen Wrench (Hex) key set (sizes-3 mm, 4 mm, 5 mm, 6 mm)
- T-type Allen Wrench (Hex) key (sizes-2.0 mm x 200 mm, 2.5 mm x 200 mm, 3.0 mm x 200 mm, 3.0 mm x 200 mm, 4.0 mm x 200 mm, 5.0 mm x 150 mm)
- Socket (Hex)/Nut Driver Kit (sizes -7 mm, 8 mm, 10 mm, 17 mm)
- Torx driver (size-T-30)
- Screw driver(size #1)
- Wire Stripper/Cutter
- Digital Multimeter

Warning

- Always use personal protection device when installing, dismantling, servicing, and conducting maintenance of the device.

Contents of Packaging

Notes

1. The NuBorne 500 is shipped in one box. After opening the box, check if all the contents are present. If any of the content is missing, contact your local International Biomedical medical representative.
2. If the NuBorne 500 is ordered with accessories, there may be additional boxes. For details on Accessories refer to Chapter 10: Accessories.

Verify the following are included in the main packaging box. Also refer to order list placed by the customer and to specific instructions before unpacking the box.

Warning

Always use personal protection equipment when unpacking the device.

Assembly of Power Cord

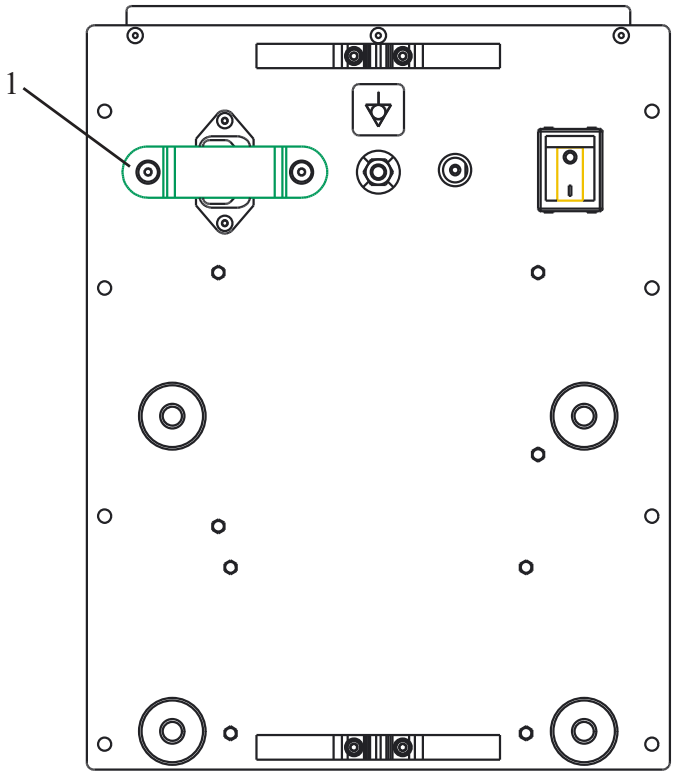
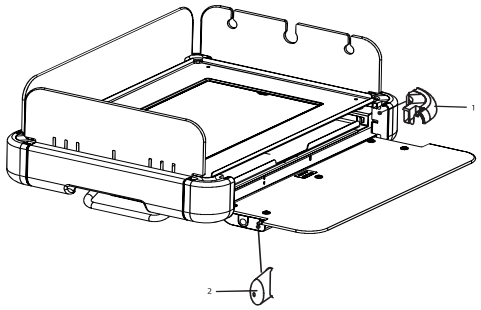
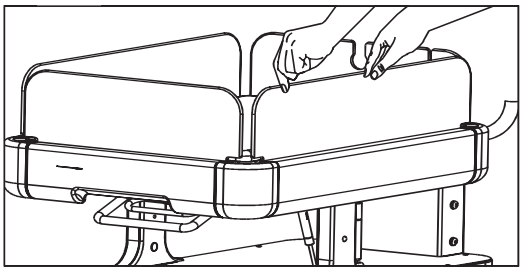
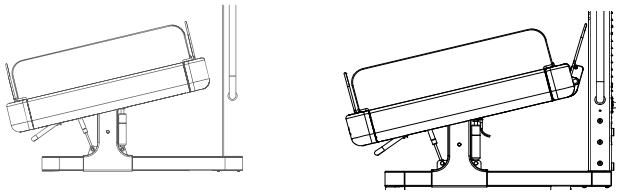
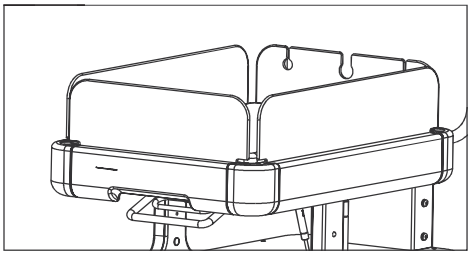
Illustration	Description
 View A  View B	**Instructions to Assemble Power Cord** 1. Loosen the M3X8 screws (x2), item #1 as shown in Figure 21 (View A), to release power inlet bracket located on backside of vertical pillar. 2. Plug in power cord into the power inlet connector. 3. Secure the power cord by fastening the inlet bracket with M3X8 screws (x2) as shown in Figure 21 (View B).

Figure 21. AC Power Cord Assembly

Assembly of Sidewalls

Illustration	Description
 1. Hinge pin slot 2. Hinge pin *Figure 22. Sidewall with Hinge Pin Slots*	**Instructions to Assemble the Sidewalls** 1. Lift the sidewall with both hands so that the sidewall becomes vertical and the hinge pin drops into the hinge pin slot on the sides. (see Figure 22). 2. Depress the other locking hinge to locate and assemble the wall. 3. Lock the sidewall firmly into the hinge pin slot on the sides (see Figure 23). *Note: Each sidewall can be assembled completely in this way except for the short sidewall beside vertical pillar.*
 *Figure 23. Sidewall Locked into Hinge Slot*	4. For assembling the short sidewall beside vertical pillar, tilt the bed until there is enough distance for the sidewall to open (see Figure 24). 5. Repeat steps 1 and 2 to assemble the sidewall beside vertical pillar and all three sidewalls (see Figure 25).
 *Figure 24. Sidewall Locked into Hinge Slot*	
 *Figure 25. Device with Sidewalls Assembled*	

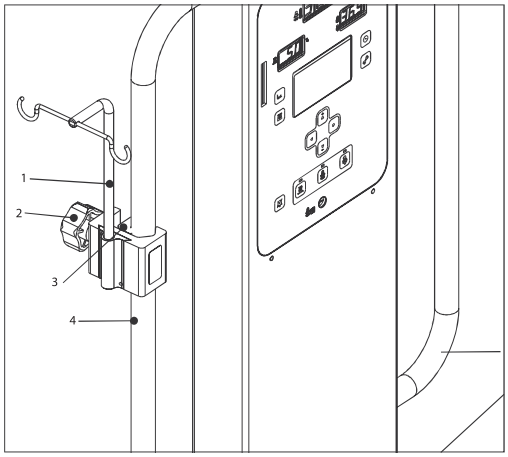
Note: After the NuBorne 500 is fully installed perform visual, power on, and operational check as listed in Test and Inspection Matrix of Chapter 5:Testing and Maintenance.

Assembly of Accessories

Warnings

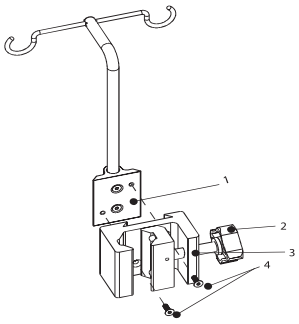
- **Always lock the caster wheels during installation of accessories.**
- **Never install an accessory when the infant is in the device.**

Assembly of IV Pole (with adjustable knob)



1. IV pole assembly
2. Adjustable knob
3. Movable mounting block
4. Accessory rail

Figure 26. View A



1. Dovetail part
2. Adjustable knob
3. Movable mounting block
4. Fasteners

Figure 27. View B

Instructions to Assemble IV Pole on Accessory Rail

The procedure for attaching the IV pole assembly on accessory rail is shown in View A and is described as follows:

1. Loosen the adjustable knob so that the movable mounting block on the IV pole assembly opens.
2. Orient and position the IV pole assembly at a desired height on the accessory rail.
3. Rotate the adjustable knob in clockwise direction to attach the IV pole assembly to the accessory rail.
4. Tighten the adjustable knob fully to ensure movable mounting block does not slide or move on the accessory rail.

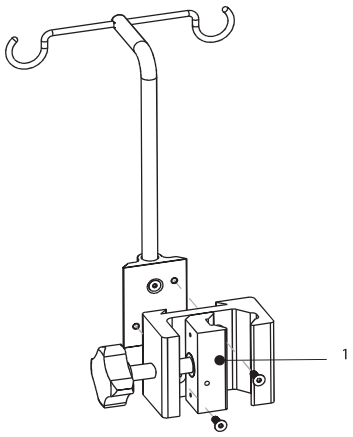
Warning

- **Ensure to position the adjustable knob facing away from the infant for infant's safety.**

Instructions to Assemble IV Pole on Other Side of Device

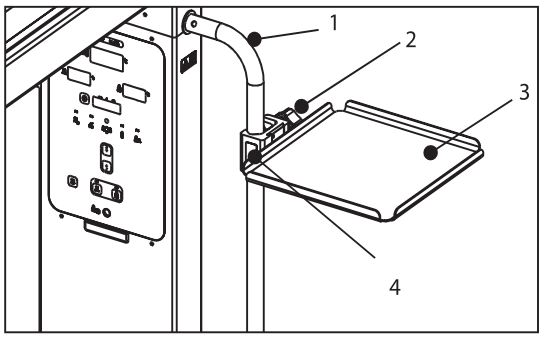
1. Unfasten the fasteners (M4 Hexagon Socket Countersunk Head Screws (x2)) from dovetail part using 2.5 mm Allen Wrench (Hex key) as shown in View B.

Note: The fasteners are fixed on the dovetail part that remains covered with movable mounting block. Rotate the adjustable knob to adjust the position of the movable mounting block for better access of the screws.

Illustration	Description
 1. Reversed orientation of movable mounting block *Figure 28. View C*	1. Reverse the orientation of movable mounting block as shown in the following figure and then reassemble the dovetail part using the same fasteners as shown in View C. *Note: Apply one drop of Loctite 242 on screws threading before fastening.* 2. Loosen the adjustable knob so that the mounting block on the IV pole assembly opens. 3. Orient and position the IV pole assembly at a desired height on the accessory rail. 4. Rotate the adjustable knob in clockwise direction to attach the IV pole assembly to the accessory rail. 5. Tighten the adjustable knob fully to ensure movable mounting block does not slide or move on the accessory rail. *Note: For repositioning the IV pole, loosen the adjustable knob and position at a desired height.* **Warning** • **Never slide or rotate the movable mounting block for repositioning the IV pole.** The block may come out and injure the infant.

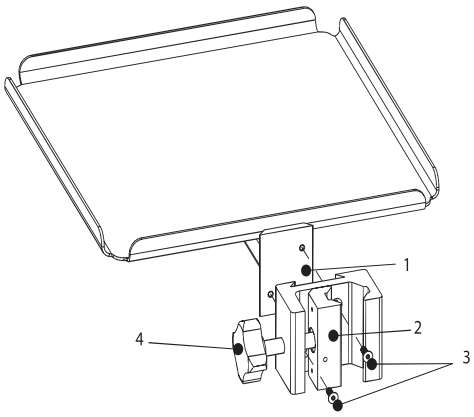
Assembly of Monitor Stand (with adjustable knob)

Illustration	Description



1. Accessory rail
2. Adjustable knob
3. Monitor stand
4. Movable mounting block

Figure 29. View A



1. Dovetail part
2. Movable mounting block
3. Fasteners
4. Adjustable knob

Figure 30. View B

Instructions to Assemble Monitor Stand on Accessory Rail

The procedure for attaching the monitor stand assembly on accessory rail is shown in View A and is described as follows:

1. Loosen the adjustable knob so that the movable mounting block on the monitor stand assembly opens.
2. Orient and position the monitor stand assembly at a desired height on the accessory rail.
3. Rotate the adjustable knob in clockwise direction to attach the monitor stand assembly to the accessory rail.
4. Tighten the adjustable knob fully to ensure mounting block does not slide or move on the accessory rail (see View A).

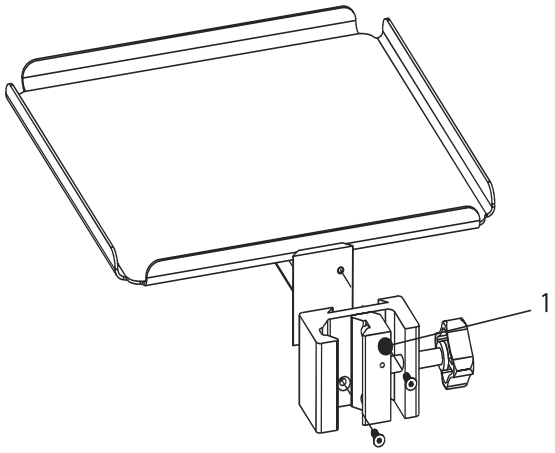
Warning

- **Ensure to position the adjustable knob facing away from the infant for infant's safety.**

Instructions to Assemble Monitor Stand on Other Side of Device

1. Unfasten the fasteners (M4 Hexagon Socket Countersunk Head Screws (x2)) from dovetail part using 2.5 mm Allen Wrench (Hex key) as shown in View B.

Note: The fasteners are fixed on the dovetail part that remains covered with movable mounting block. Rotate the adjustable knob to adjust the position of the movable mounting block for better access of the screws.

Illustration	Description
 1. Reversed orientation of mounting block **Figure 31.View C**	2. Reverse the orientation of movable mounting block as shown in View C and then reassemble the dovetail part using the same fasteners. *Note: Apply one drop of Loctite 242 on screws threading before fastening.* 3. Loosen the adjustable knob so that the movable mounting block on the monitor stand assembly opens. 4. Orient and position the monitor stand assembly at a desired height on the accessory rail. 5. Rotate the adjustable knob in clockwise direction to attach the monitor stand assembly to the accessory rail. 6. Tighten the adjustable knob fully to ensure movable mounting block does not slide or move on the accessory rail. *Note: For repositioning the monitor stand assembly, loosen the adjustable knob and position at a desired height.* **Warning** • **Never slide or rotate the movable mounting block for repositioning the monitor stand assembly.** The block may come out and injure the infant.

Assembly of Oxygen Cylinder Holder

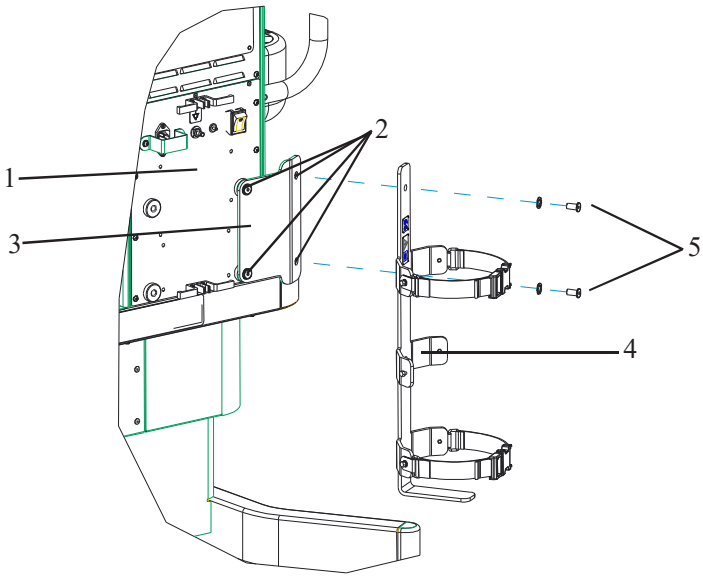
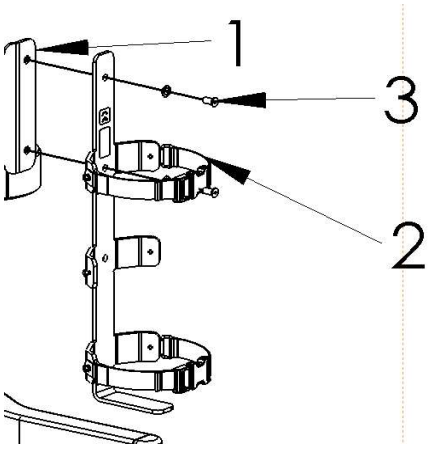
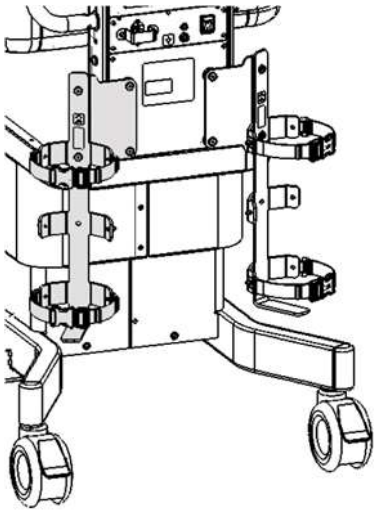
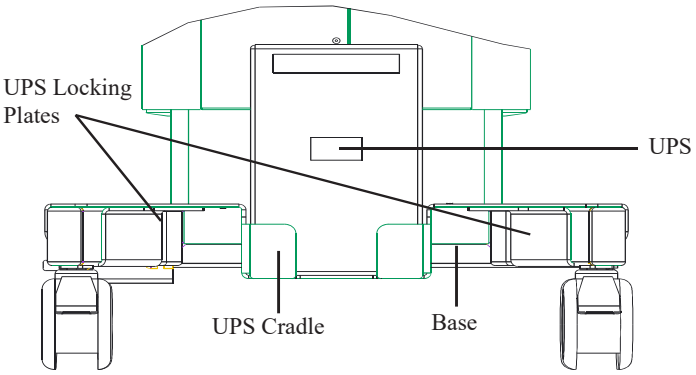
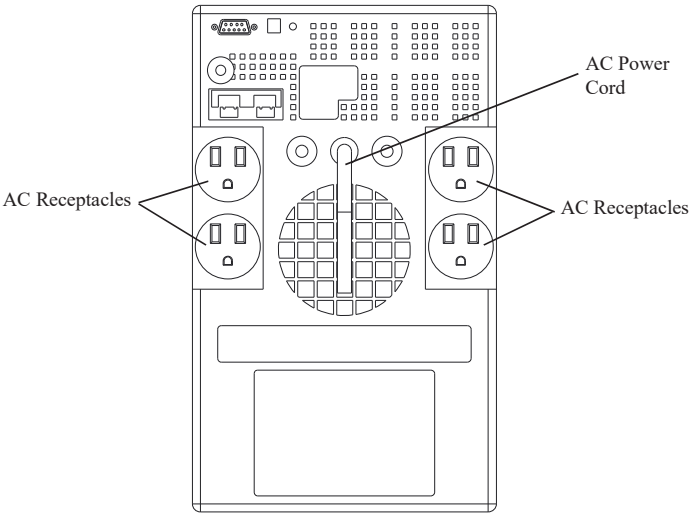
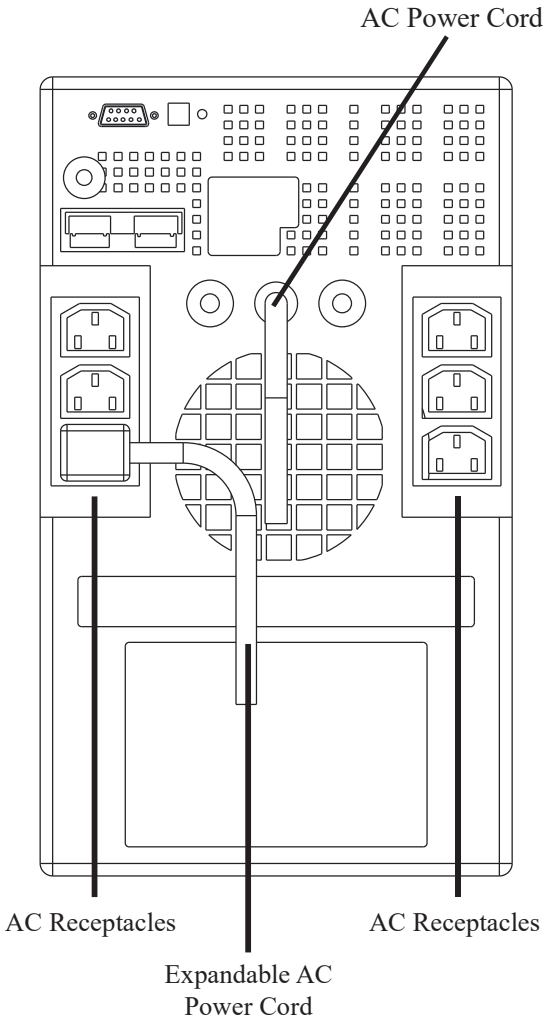
Illustration	Description
 1. Vertical pillar 2. Mounting holes 3. Cylinder holder bracket 4. Cylinder holder 5. Mounting hardware **Figure 32. View A**	**Instructions to Assemble the Oxygen Cylinder Holder on Device (Rear View)** The procedure for fixing the cylinder holders (Type A or Type B) to the rear side of the device is shown in View A and is described as follows: *Note: If both Type A and Type B cylinder holders are available mount one cylinder holder as described in following procedure and the other cylinder holder as described in Instructions to Assemble Oxygen Cylinder Holder on Other Side of Device (Rear View).* 1. Align the cylinder holder bracket on the mounting holes provided on the device in correct orientation. 2. Fix the cylinder holder bracket on the vertical pillar and fasten the fasteners (M8 Hexagon Socket Button Head Cap Screws (x2)) using 4 mm Allen Wrench (Hex key). *Note: Ensure while tightening the screw, the spring washer bottom out (the surface is flushed).* 3. Place the cylinder into the cylinder holder from top and fasten it with webbing belt. 4. Perform the following steps to fasten the webbing belt around the cylinder (see View B): i. Route the free end of belt through inner side of both rings of double ‘D’ buckle. ii. Route the free end of belt between the double ‘D’ buckle and pull to tighten.

Illustration	Description
 1. Cylinder holder bracket 2. Webbing belt 3. Fasteners **Figure 34. View C**  1. Reversed orientation of cylinder holder bracket **Figure 35. View D**	**Instructions to Assemble Oxygen Cylinder Holder on Other Side of Device (Rear View)** 1. Unfasten the fasteners from cylinder holder bracket as shown in the following figure. 2. Reverse the orientation of cylinder holder bracket as shown in the following figure and then reassemble the cylinder holder bracket using the same fasteners. *Note: Ensure while tightening the screw, the spring washer bottom out (the surface is flushed).* 3. Place the cylinder into the cylinder holder and fasten it with webbing belt. 4. To fasten the webbing around the cylinder repeat Step 4 of Instructions to Assemble the Oxygen Cylinder Holder on Device (Rear View).

Assembly of the UPS

Illustration	Description
	Instructions to Secure the UPS to the NuBorne 500 Infant Warmer The procedure for securing the UPS assembly on the NuBorne 500 Infant Warmer is shown in the following figures and is described as follows: 1. Place the UPS support bracket across the rear portion of the base assembly. 2. Carefully place the UPS in the cradle of the UPS support bracket with the power receptacles oriented towards the warmer.
	**For 115 VAC UPS Option:** 1. Remove and save the power inlet bracket and hardware which secures the AC power cord to the warmer. Remove and discard the AC power cord provided with the warmer. 2. Replace the power inlet bracket by only fastening 1X of the M3x8 screws. Position the inlet bracket 90° to the unlocked position to provide access to the AC input receptacle and tighten the hardware. Fasten the remaining M3x8 screw back in its original location for later use. 3. Connect the expandable AC power cord (supplied with the UPS option) from the warmer to one of the AC receptacles on the rear of the UPS. The expandable AC power cord has an integrated strain relief within the connector to the warmer. 4. Slide the two UPS locking plates outwards towards the base into the locked position. Tighten the four M5 lock nuts to secure the UPS cradle bracket. 5. Connect the power cord from the UPS to the wall outlet. 6. Power on the UPS and wait 10 seconds to initialize the UPS. Power on the warmer and confirm normal operation. The power switch is located on the front of the UPS.

Assembly of the UPS

Illustration	Description
	Instructions to Secure the UPS to the NuBorne 500 Infant Warmer **For 230 VAC UPS Option:** 1. Remove and save the power inlet bracket and hardware which secures the AC power cord to the warmer. Remove and save the AC power cord provided with the warmer. 2. Replace the power inlet bracket by only fastening 1X of the M3x8 screws. Position the inlet bracket 90° to the unlocked position to provide access to the AC input receptacle. Fasten the remaining M3x8 screw back in its original location. 3. Connect the expandable AC power cord (supplied with the UPS option) from the warmer to one of the AC receptacles on the rear of the UPS. The expandable AC power cord has an integrated strain relief within the connector. 4. Slide the two UPS locking plates outwards towards the base into the locked position. Tighten the four M5 lock nuts to secure the UPS cradle bracket. 5. Connect the original power cord provided with the warmer to the short AC inlet jumper located on the rear of the UPS. Connect the remaining end to the AC wall outlet. 6. Power on the UPS and wait 10 seconds to initialize the UPS. Power on the warmer and confirm normal operation. The power switch is located on the front of the UPS.

Assembly of Accessories-Mattress, Acrylic Tray, and X-Ray Cassette Tray

For details on instructions to assemble, disassemble, and replace an accessory (mattress, acrylic tray, and x-ray cassette tray) follow the instructions in Section Mattress, Acrylic Tray, and X-Ray Cassette Tray Replacement of Chapter 7-12: Disassembly/Reassembly of Parts.

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Chapter 5. Testing, Maintenance and Cleaning

This chapter provides a checklist of the testing and maintenance procedures to ensure the performance and safety of the device. The tables describe what tests need to be performed, when these tests should be performed, and expected test results.

These tests must be performed only by trained and authorized personnel before or after service, installation, and maintenance. Qualifications required are: training on the subject, knowledge, experience, and acquaintance with relevant technologies, standards, and local regulations. The personnel assessing safety must be able to anticipate consequences and risks arising from non-conformity.

All recurring safety and performance assurance tests must be performed under comparable environmental conditions. Regular maintenance, irrespective of usage, is essential to ensure that the device will always be functional when required. For detailed instructions on the user maintenance and cleaning of the device and its accessories, refer Cleaning & Maintenance and Troubleshooting in the NuBorne 500 Infant Warmer User Manual.

Warning

- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.

Note: The test procedures outlined here are to be used only for verifying safe installation or service of unit. The setups for these tests and the acceptable ranges of values are derived from local and international standards but may not be equivalent. These are not a substitute for local safety testing where it is required for an installation or service event.

Test Reporting

Group	Data to record
Visual (V)	V:P or V:F
Power On (PO)	PO:P or PO:F
Operational (O) • Heater Hood Swivel Mechanism Check (HS) • Height Adjustment Mechanism Check (HA) • Caster Wheel Check (CW) • Bed Tilt Mechanism Check (BT) • Keypad Check (KP) • Skin Temperature Probe Check (SP) • Skin Temperature Probe Disconnected Alarm Check (PD) • Power Failure Alarm Check (PF) • Skin Temperature Control Check (TC) • Max Temperature Limit Alarm Check (MT)	 HS:P or HS:F HA:P or HA:F CW:P or CW: F BT:P or BT:F KP:P or KP:F SP:P or SP:F PD:P or PD:F PF:P or PF:F TC:P or TC:F MT:P or MT:F
Performance Assurance (P) • Temperature Accuracy Check (PT) • Bed Tilt Performance Check (PB) • Scale Performance Check (SP)	 PT:P or PT:F PB:P or PB:F SP:P or SP:F
RTC Battery Test (B)	B:P or B:F
Line Voltage Calibration (LV)	LV:P or LV:F
Safety (S) • Protective Earth-S(1) • Earth Leakage Current-S(2) • Patient Leakage Current-S(3)	 S(1):P/a1 or S(1):F/a1 S(2):P/a1/a2 or S(2):F/a1/a2 S(3):P/a1/a2 or S(3):F/a1/a2

Note: where, P = Pass, F = Fail and a1/a2 are measured values as defined in the test described in the Test and Inspection Matrix in this chapter.

Recommended Frequency

This table describes the frequency of specific service events.

Tests	Frequency
Preventive Maintenance	
• RTC battery test[1]	Once every four years or if you suspect the system date and time are retained and recalled incorrectly or if system does not recall previous mode and settings when device is switched ON within 10 minutes from power OFF time.
• Line voltage calibration	Once every year and after repairs where the display board, RTC battery, AC circuit board and/or ceramic heater is replaced.
Performance Assurance	
• Temperature accuracy check • Bed tilting performance check • Scale calibration	Once every year or if you suspect the measurement is incorrect.
Safety Tests	
• Protective earth • Equipment leakage current • Patient leakage current	Once every year and after repairs where the power supply and/or controller board is replaced or the device has been damaged by impact.

Notes

- Ensure that the device is ready for patient use before handing the device over to the end-user.
- [1] The battery is used to provide power backup for RTC to display date and time.
- It is the responsibility of the facility operator or their designee to obtain reference values for recurring safety and system tests. These reference values are the results of the first test cycles after an installation.
- Ensure that the service technician receives the current revision of the device documentation.

When to Perform Tests

This table describes when to perform specific service events. The corresponding test procedures are described in Test and Inspection Matrix section. All tests listed as follows must be performed on the device.

Installation

Service Event (When performing)	Tests Required (Complete these tests)
Installation of device	Perform visual, power on, and operational check.

Preventive Maintenance

Service Event (When performing)	Tests Required (Complete these tests)
• Annual maintenance and if date and time are retained and recalled incorrectly or if device does not recall previous mode settings within 10 minutes from power OFF time.	Perform RTC battery check.
• Annual maintenance and if measured temperature is not reaching set temperature value.	Perform line voltage calibration.

Repairs/Replacement

Service Event (When performing)	Tests Required (Complete these tests)
• Repairs where the device has been damaged by impact.	Perform visual, power on, operational check, and safety test.
• Repairs where the power supply and/or controller board is replaced	Perform visual, power on, operational check, and safety test.
• Repairs where display board, RTC battery, AC circuit board and/or ceramic heater is replaced.	Perform visual, power on, operational check, and line voltage calibration.
• All other device repairs	Perform visual, power on, and operational check.

Performance Assurance

Service Event (When performing)	Tests Required (Complete these tests)
• Annually and if temperature measurement is inaccurate.	• Perform temperature accuracy check.
• Annually and if scale measurement is inaccurate.	• Perform scale calibration
• Annually and if mattress platform does not operate as	• Perform bed tilting performance check.

Test and Inspection Matrix

Visual (V)

Check for any mechanical damage of the device and accessories (if any). Also check secure attachment of sidewalls.

Expected Test Result: Pass, if no obvious damage or missing items and if the sidewalls are secure.

Power-On Test (PO)

1. Switch ON device power switch and connect the skin temperature probe.
2. Observe whether the device turns ON successfully with no errors and if measured temperature readings appear on the display.

Expected Test Result: Pass, the device turns ON successfully and displays a temperature reading.

Operational Check (O)

Heater Hood Swivel Mechanism Check (HS)

1. Switch ON device power switch.
2. Swivel the heater hood away to either side of the supporting column
3. Bring back the device to the central position.

Expected Test Result: Pass

- Heater cut off alarm  HEATER OFF is displayed on the LCD when the hood is swiveled away.
- The alarm goes OFF when the hood is brought back to central position.

Height Adjustment Mechanism Check (HA)

1. Switch ON device power switch.
2. Actuate the footswitch using foot.
3. Press continuously the side of the footswitch marked ▲ to raise the footswitch and check a desired height is achieved.
4. Press continuously the side of the footswitch marked ▼ to lower the footswitch and check a desired height is achieved.

Expected Test Result: Pass-The footswitch height raises and lowers and height adjustment mechanism operates as desired.

Caster Wheel Check (CW)

1. Position the device in a desired location.
2. Lock the caster wheel by pressing down the foot press lever.
3. Unlock the caster wheel by raising the foot press lever.
4. Hold both sides of the accessory rail and push on the accessory rail firmly to check device mobility.

Expected Test Result: Pass, the caster wheels are locked reliably and the caster wheels rotate smoothly.

Bed Tilt Mechanism Check (BT)

1. Grip and compress the double lever to release the tilt lock.
2. Raise the mattress platform up or down to achieve the tilt angle.
3. Release the double lever to lock the mattress in the desired position.

Expected Test Result: Pass, the mattress platform operates as desired.

Keypad Check (KP)

1. Switch ON device power switch.
2. Press the user interface keys to check the expected response.

Expected Test Result: Pass, keypad operates as desired.

Skin Temperature Probe Check (SP)

1. Switch ON device power switch.
2. Connect the Skin temperature probe to probe socket.
3. Select the Manual temperature mode.
4. Expose the probe tip closer to the heater until the measured temperature displays.

Expected Test Result: Pass, a temperature value between 33°C to 38°C is displayed.

Skin Temperature Probe Disconnected Alarm Check (PD)

1. Switch ON device power switch, put in skin mode.
2. Unplug the Skin temperature probe from the probe socket.

Expected Test Result: Pass, Skin Temperature Probe Disconnected Alarm  displays.

Power failure alarm check (PF)

1. Switch ON device power switch.
2. Select Manual temperature mode.
3. Unplug mains power to device at wall outlet.

Expected Test Result: Pass, Power failure alarm LED illuminates 

Skin temperature control check (TC)

1. Switch ON device power switch.
2. Connect the Skin temperature probe to the probe socket.
3. Press to select Skin temperature mode.
4. Expose the probe tip closer to the heater, observe the heater output percentage changes with the changes in the measured skin temperature readings.
   Expected Test Result: Pass, the displayed value is as shown in the following table

Heater Status	Heater Output Percentage	Measured Temperature
ON	> 0%	Below 36 °C
OFF	0%	Above 37 °C

Max temperature limit alarm check (MT)

1. Switch ON device power switch.
2. Connect the Skin temperature probe to the probe socket.
3. Press to select Manual temperature mode.
4. Press the button to increase the heater output to 100%
5. Expose the probe tip closer to the heater until the measured temperature displays 40 °C.
   Expected Test Result: Pass, High temperature limit alarm displays and heater turns OFF.

Temperature Accuracy Check (PT)

This test checks the performance of the temperature measurement.

- Using patient simulator (with Accuracy of ± 0.1 °C or ± 0.2°F)

Tools required: Patient simulator

Note: You can use any commercially available test device.

1. Connect the patient simulator to the temperature connector.
2. Configure the patient simulator to 36 °C.

Expected Test Result: Pass-The displayed value is 36 °C ± 0.3 °C.

- Using precision resistor

Tools required: Precision resistor kit - P/N 110-6197

1. Connect the precision resistor to skin temperature probe socket.
2. Check that the temperature readings label on the precision resistor corresponds to displayed temperature measurements.

Expected Test Result: Pass-The displayed value is as shown in the following table

Precision Resistor	Displayed Temperature
Low temperature jack (33 °C)	33 °C ± 0.3 °C
Medium temperature jack (36.5 °C)	36.5 °C ± 0.3 °C
High temperature jack (38 °C)	38 °C ± 0.3 °C

Bed Tilting Performance Check (PB)

Tools required: Calibrated weight (10 kg)

1. Place the mattress platform in a horizontal position and place a load of approximately 10 kg on the mattress closer to the vertical pillar side. Check that the mattress maintains its horizontal position without tilting.
2. Check that the tilting gas springs below the bed, which are the main components of tilting mechanism, are not rusty, deformed or broken. Also check that no hydraulic fluid leakage is observed.

Expected Test Result: Pass-The bed tilt is freely adjustable and lockable with a longitudinal tilt of ± 12°.

Scale Performance Check and Calibration (SP)

Tools Required: Calibrated 17Kg Weight, Micro-USB to USB Cable, Computer

Note: Ensure that the bed is in a horizontal position during calibration. The computer needs Windows 7 or 10 and Java JRE.

1. Install Windows 32/64bit IB Scale Service Application (IB #: 012-0021) onto a computer.

2. Turn the warmer on (power switch on the back face). If desired, hit the manual heating mode button and turn the warmer down to 0% using the arrows.

3. Remove mattress.

4. Lower the right bed side wall (same side as the bubble level) to gain access to the scale's micro-USB port (if applicable, remove tamper proof label that is covering the Service Port).

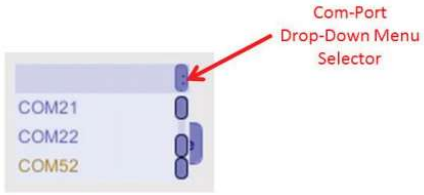
5. Plug the USB side of cable into computer and the Micro-USB side of cable into the warmer.

6. Verify driver is installed and setup correctly by going to 'Devices and Printers' from the Windows start menu. Scroll down to the 'Unspecified' section to find the device. Right click on the device and select 'Troubleshoot'. Take note of which COM port the device is linked to.

7. Start Service Application. Note: You must start the application after plugging in the cable and setting up the COM port.

8. Select the COM port by clicking on the drop down menu selector. When the correct port is selected, the "Indicator" turns from red to green. Note: If you want to switch COM ports, you must close and reopen the application to switch to a different port after selecting a COM-port.

9. Clear the 'Calibration PW' text and type in the password (632111), and then select 'Enter PW'. When the password has been accepted, the "Indicator" will turn from red to green.



10. Press "Read All Values". Record the calibration count.

11. Enter the calibration weight value (17000 ± 100 grams)

12. Press "Set Cal Weight". The "Set Cal Weight" indicator should turn from red to green.

13. With an empty bed (mattress removed), select 'Cal-Offset'. The Cal-Offset "Indicator" turns from red to green when this is complete.

14. Place the 17000 ± 100 gram weight onto the center of the bed, and press 'Cal-Gain'. When the value is accepted the "Indicator" turns from red to green.

15. Select 'Save Calibration'. The corresponding "Indicator" will turn from red to green.

16. Select 'Exit Calibration'. The application interface should reset to red indicators, but remain connected to the scale.

17. Press "Read All Values". The calibration count should increment by one from the value recorded in step 10.

18. Close the service application, remove the Micro-USB cable, turn the warmer off, remove the calibration weight, and put the mattress back. (If applicable, replace tamper proof label that is covering the Service Port).

RTC Battery Test (B)

There are two methods to perform RTC battery check procedure. They are described as follows:

Method 1:

1. Set date and time in Graphics display as mentioned in the following section.

   Setting Date

   i. Press the button to enter the System settings tab.

   ii. Press the button to navigate the settings tab and select the date settings.

   iii. Press the button to increase or press the button to decrease a value within a selection.

   iv. Press the or button to toggle between the selection of date, month, year, or 'Y/N' screen . The selected value is displayed on the main display with the top and bottom arrow buttons.

   v. Press the button so that 'N' changes to 'Y'.

   vi. The graphic display shows the confirmation screen upon successful completion of input.

   vii. If the keypad is inactive for 15 seconds, then the screen exits to main screen within next 10 seconds. Maximum timeout for screen in idle condition is 25 seconds.

Note: Stored trend data is erased if date settings are altered.

   Setting Time

   i. Press the button to enter the System settings tab.

   ii. Press the button to navigate the settings tab and to enter the time settings.

   iii. Press the button to increase or press the button to decrease a value within a selection

   iv. Press the or button to toggle between the selection of minutes, seconds, or 'Y/N' screen. The selected value is displayed on the main display with top and bottom buttons

   v. Press the button so that 'N' changes to 'Y'.

   vi. The graphic display shows the confirmation screen upon successful completion of input.

   vii. If the keypad is inactive for 15 seconds, then the screen exits to main screen within next 10 seconds. Maximum time out for screen in idle condition is 25 seconds.

Note: Stored trend data is erased if time settings are altered.

2. Set a new value and note it.
3. Switch OFF the device for 10 minutes.
4. Switch ON the device and check date and time.
5. Check if the displayed time is set value plus power OFF time.

Note: For details on RTC battery replacement refer Section Real-Time Clock (RTC) Battery Replacement of Chapter 7: Disassembly/Reassembly of Parts.

Method 2:

1. Set the device in Skin temperature mode 34.6°C.
2. Switch OFF the device.
3. Turn ON the system within 1 minute.
4. If system moves to Skin temperature mode 34.6°C, then RTC battery and RTC are working fine or else RTC battery is discharged.

Expected Test Result: Pass-(1) System date and time are retained and recalled correctly, (2) Previous mode setting are retained after system power ON/OFF cycle.

Line Voltage Calibration (LV)

Tools Required: Digital Multimeter

Device needs to be up to 34°C before performing calibration

1. Power Unit 100% in Manual Mode  with the Temperature Probe unplugged.
2. Heat the unit until the 1st check baby alarm ~12 minutes.
3. Acknowledge the check baby alarm leaving the unit at 100%.
4. Measure the AC voltage at or near the power entry connector.
5. Record the lowest stable number observed on the meter while measuring AC voltage for 20 seconds.
6. Confirm that the voltage measurement falls within the acceptable operation range.
    a. 115 V Unit – Voltage : [103,127]
    b. 230 V Unit – Voltage : [207,253]
7. Leave the system at 100% and restart the unit.
8. Wait for the system to boot-up and for the NuBorne logo to appear.
9. After the three audible tones the device warmup screen will appear.
10. Press the down-key  and the manual mode  key simultaneously within 10 seconds.

Tools Required: Digital Multimeter

11. The system will enter calibration mode. The main screen will display  and -5- will be displayed in the patient temperature window.
12. Press the manual mode  key.
    a. The last programmed calibration voltage should appear in the 7 Segment Display.
13. Use the up  and down  key to configure the voltage value identified in Step 5.
14. Press the manual mode  key again to set the configured value.
    a. A  mark will be displayed to indicate success.
    b. An X will be displayed to indicate failure.
    c. If the process has failed go back to Step 1.
15. Restart the unit and resume normal operation.

Safety Tests (S)

Safety test requirements are set according to international standards, their national deviations and specific local requirements. The safety tests detailed in this Service Manual are derived from international standards but may not be sufficient to meet local requirements. It is recommended that you file the results of safety tests. This may help to identify a problem early particularly if the test results deteriorate over a period of time.

Use the test procedures outlined here only for verifying and recording the initial values prior to or at installation, safe installation or service of the product, and for periodic recurrent testing. The setups used for these tests and the acceptable ranges of values are derived from local and international standards but may not be equivalent. These tests are not a substitute for local safety testing where it is required for an installation or a service event. If using an approved safety tester, perform the tests in accordance with the information provided by the manufacturer of the tester and in accordance with your local regulations, for example IEC/EN 60601-1, UL60601-1 (US), IEC/EN 62353, and IEC/EN 60601-1-1. The safety tester should print results as detailed in this chapter, together with other data.

Use approved equipment and techniques to test the unit's leakage current and ground continuity. Follow the directions supplied by the test equipment manufacturer to verify the following test. You can perform all test using commercially available Safety analyzer.

Tools Required: Safety analyzer

Protective Earth-S(1)

Measure the resistance between the ground pin, on the line cord plug, and exposed metal of the electronic enclosure.
Expected Test Result: The ground resistance (a1) ≤ 100 mΩ.

Earth Leakage Current[1] -S(2)

Measure the Earth leakage current for Normal Condition (NC) and Single Fault Condition (SFC) in normal and reverse polarities.

Note[1]: For 220-230-240 V AC, 50/60 Hz and for 105-115-125 VAC, 50/60 Hz rated devices.

Expected Test Results: Pass-The measured value is within the limit as specified below

Test Condition	Neutral	Ground	Reverse polarity	Limit (IEC)
NC (a1)	Closed	Closed	OFF	≤ 100 µA
	Closed	Closed	ON	≤ 100 µA
SFC (a2)	Closed	Open	OFF	≤ 500 µA
	Open	Closed	OFF	≤ 500 µA

Cleaning

Warnings

- Ensure to turn the power OFF, remove the power plug from the power outlet, and allow the heater to cool down before cleaning and disinfecting the device.
- Ensure that the device is cleaned and disinfected before first use, between change of infants, and after maintenance.

Cautions

- After cleaning and disinfecting the device always dry completely before using the device.
- Ensure that water or cleaning agents do not enter near electronics through vents on back of vertical pillar.
- Assemble the removed parts and check that the device operates normally after cleaning and disinfecting.

Cleaning

Use a soft cloth and mild soap/water to clean the device prior to disinfection to remove soil.

Recommended Disinfectant Solution

Use a soft clean cloth and a disinfectant solution for disinfection. After each patient use, follow the hospital's infection control procedures for equipment disinfection. Wipe down the surfaces of the device with a soft cloth dampened with a disinfectant solution. Always follow the disinfectant solution-manufacturer's direction for use. Wipe all surfaces with a damp, soft cloth to remove any cleaner residue.

Approved disinfectant solutions are:

- Soap and water
- Ethanol 96%
- IPA 90% (max concentration)
- Cavicide

Inspection

- After cleaning and disinfection, always inspect the cleaned area for thoroughness.
- If the device doesn't appear adequately clean, repeat the cleaning process.

Notes

- Never use disinfectant solutions at concentrations above recommended values.
- Never use any abrasive cloth or unapproved cleaning solution for disinfection.
- Never autoclave removable parts.
- Follow standard hospital cleaning/disinfecting procedures/protocol.
- Clean and disinfect the device as per the maintenance instructions or whenever you notice any dirt or stain that may cause infection.
- Always use small cotton buds to wipe and disinfect any unreachable area of the device.
- Visual inspection of device for cleanliness requires adequate lighting.

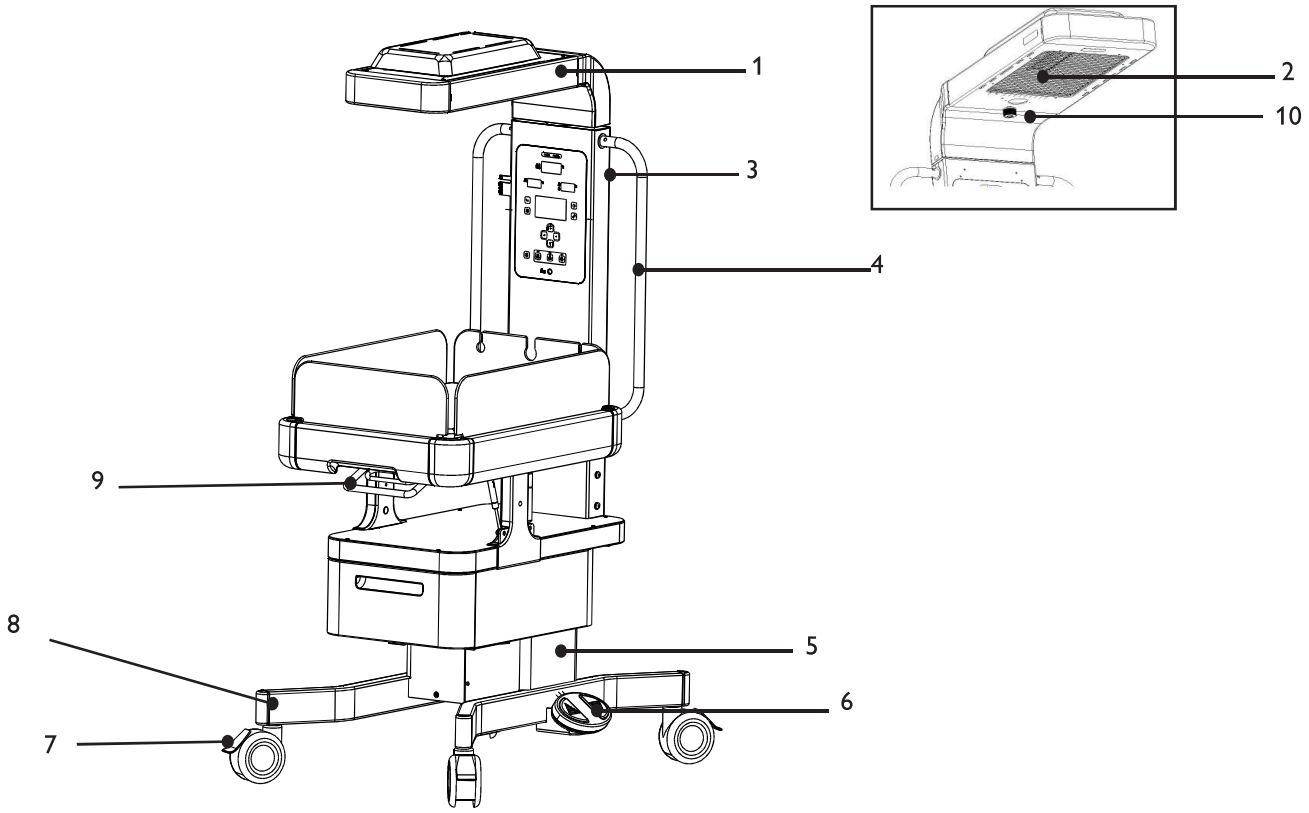
Caution

- Never use alcohol, ammonia, or acetone-based cleaning solutions.

  It can damage the parts that are cleaned.

Main Body

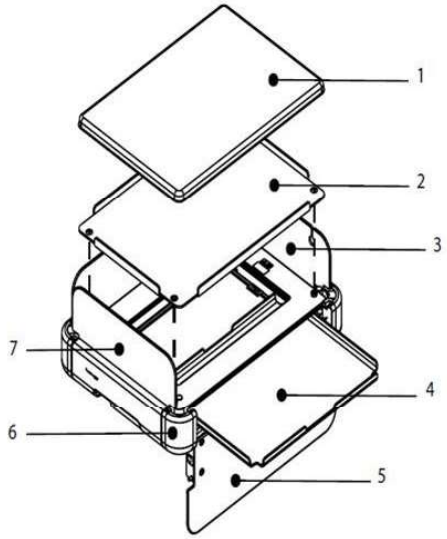
The main body of the device includes the parts displayed in the following figure:



#	Name
(1)	Heater Hood
(2)	Heater Grill
(3)	Vertical Pillar
(4)	Accessory Rail
(5)	VHA Cover
(6)	Footswitch
(7)	Caster Wheels
(8)	Pedestal
(9)	Bed Tilt Handle
(10)	Observation Light

Bed Compartment

Clean the bed compartment by wiping with a soft cloth dampened with a disinfectant solution. The bed compartment of the device includes the parts displayed in the following figure:



#	Name
(1)	Mattress
(2)	Bed Acrylic Tray
(3)	Short sidewall with tubing slots
(4)	X-ray cassette tray (optional)
(5)	Long Sidewall
(6)	Corner Block
(7)	Short Sidewall

Caution

- Never immerse removable parts in disinfectant or soap solution.

Mattress

Clean the mattress with a soft cloth dampened with a disinfectant solution.

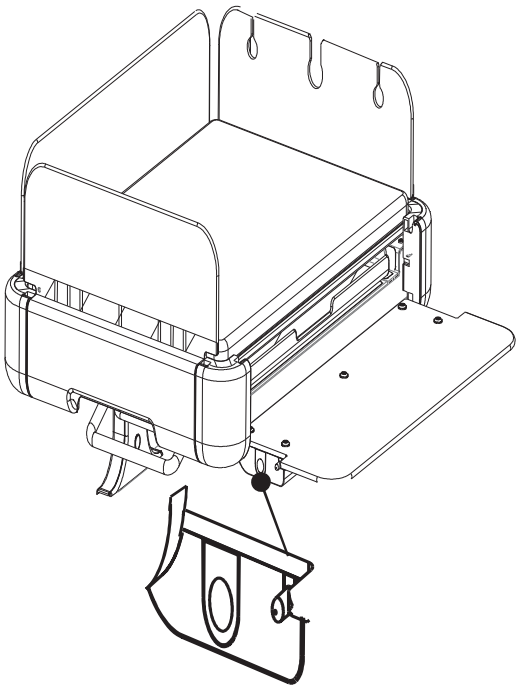
Visually inspect the inside of the mattress for contamination and discontinue use if internal contamination found.

Note: If the cover is torn or damaged discontinue use of the mattress and contact International Biomedical representative.

Sidewalls

Removing the Long and Short Sidewall

1. Open the sidewalls as mentioned in Opening and Closing the Sidewalls section in Chapter 5-3 of the Operator's Manual.
2. Press the side button to remove the sidewall completely.



Note: Each sidewall can be removed completely in this way except for short sidewall with tubing slots.

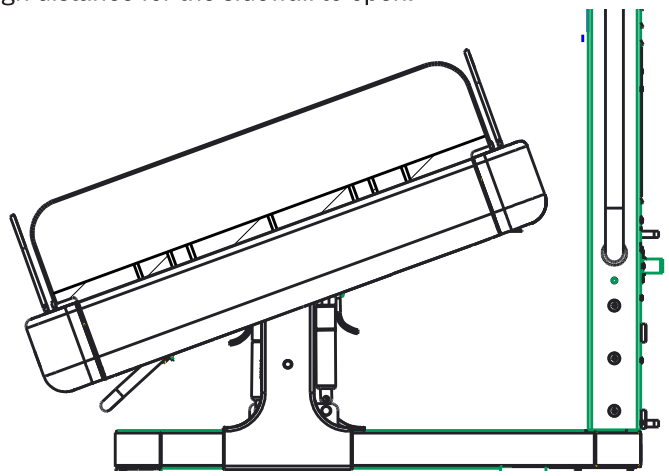
3. Reverse the order of operations to restore the sidewall.

Cautions

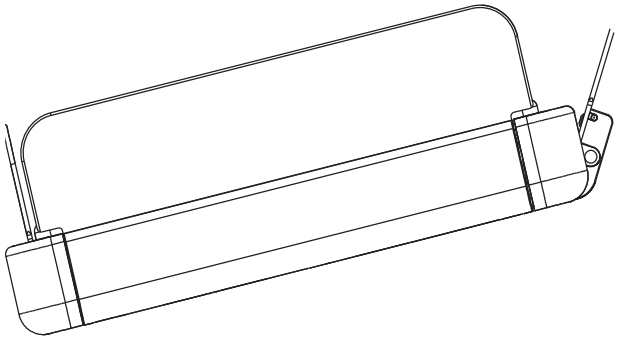
- Never immerse removable parts in disinfectant or soap solution.
- Always clean the sidewalls with a soft cloth dampened with a disinfectant solution.

Removing the Short Sidewall Beside Vertical Pillar

1. For removing the short sidewall beside vertical pillar, tilt the bed until there is enough distance for the sidewall to open.



2. Open the sidewall as mentioned in Opening and Closing the Sidewalls section in Chapter 5: Operation.
3. Press the side button to remove the sidewall completely.



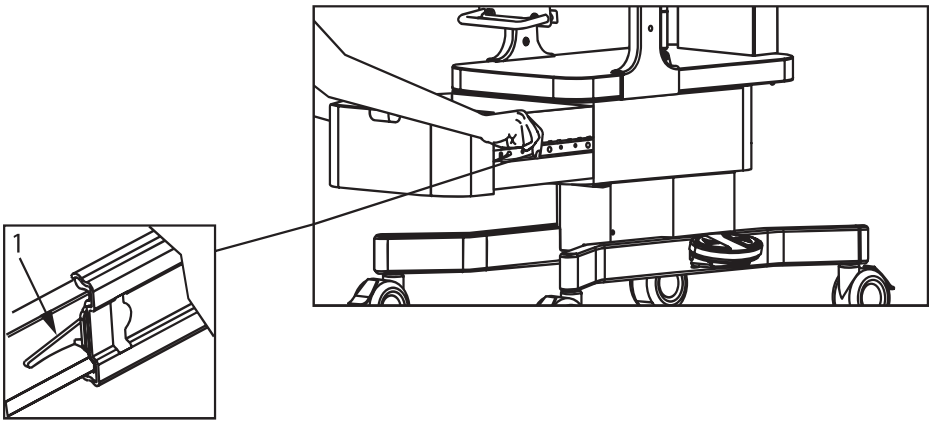
4. Reverse the order of operations to restore the sidewall.

Storage Drawer

Removing the Storage Drawer

1. Open the storage drawer following the steps in Opening and Closing the Storage Drawer section in Chapter 5-7 of the Operator's Manual.
2. Press the tab on both sides and pull out the storage drawer to remove the storage drawer completely.

Note: Press down the tab on the right side and press up the tab on the left side.



3. Clean the storage drawer by wiping with a soft cloth dampened with a disinfectant solution.

Caution

- Never immerse removable parts in disinfectant or soap solution.

4. Align the storage drawer on the sides and push the storage drawer to its original position to close it.

Note: Ensure that the storage drawer is pushed enough for the catch to engage and hold the storage drawer closed.

Skin Temperature Probe

Wipe a used skin temperature probe lightly with a soft dry cloth. Wipe and disinfect the heat-sensing portion with a soft cloth dampened with a disinfectant solution.

After disinfection, rinse the skin temp probe with a clean, damp cloth to remove any residual residue.

Caution

- Never immerse skin temperature probe in disinfectant or soap solution.

Maintenance Inspection

In order to use the device safely for a longer period, perform the maintenance inspections described below:

Operator Maintenance

- Inspection before use

  Check the basic functional operation of each part of the device every time before using the device.

- Quarterly inspection

  Check the operation of each function of the device every three months.

Service Maintenance

- Annual inspection

  Device needs to be inspected for routine maintenance every year. Perform the electrical safety procedures as described in Service Manual.

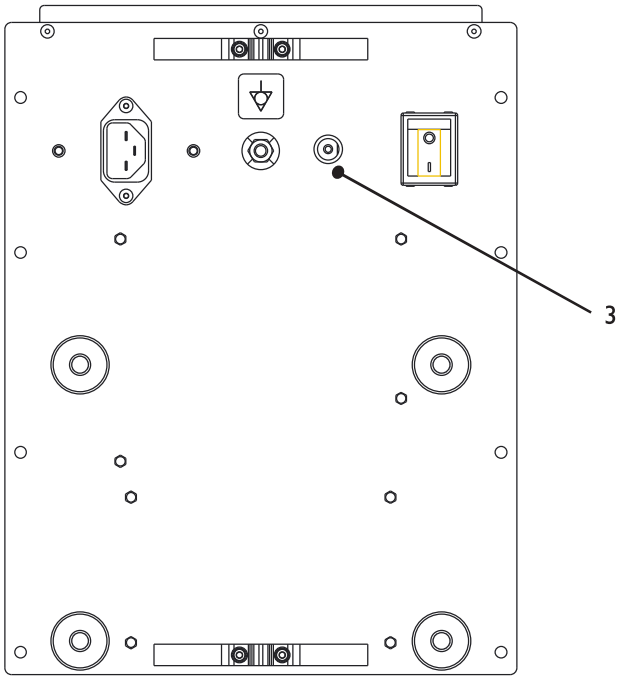
Cautions

- Inspect the device for damage if left unused in storage. If any damage is found, contact your International Biomedical representative.
- Clean and disinfect the device and its accessories before and after maintenance inspections or repairs or before disposal.

Note: Medical institutions are responsible for performing routine and periodic maintenance.

- Main Breaker Reset

1. Switch OFF the device.
2. Locate the resettable breaker (1) on the rear power panel.



3. Push button on breaker to reset.
4. Switch ON the device and check basic functionality.

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intentionally blank.)

Chapter 6. Troubleshooting

This section explains how to troubleshoot NuBorne 500 if problems arise. The following table lists possible errors, along with probable causes, and recommended actions to correct the errors.

Warnings

- Always indicate on the device that it is out of order and stop using it immediately if the NuBorne 500 is defective. Contact your service provider or International Biomedical representative.
- Ensure to turn the power OFF, remove the power plug from the power outlet, and allow the heater to cool down before cleaning and dismantling the device
- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.

Note: There is no separate service mode in this device. When the device powers ON, there are a number of self-tests that occur. If a failure is detected during self-test, the device displays a failure error and initiates an alarm. If no failure is detected, normal startup operation as defined in the Chapter: Setup of NuBorne 500 User Manual commences.

How to use this section

Use this Section in conjunction with Chapter 5: Testing and Maintenance and Chapter 8: Replacement Parts List. To remove and replace a part you suspect is defective, follow the instructions in Chapter 7: Disassembly/Reassembly of Parts. To get information on device functions, see Chapter 3: Theory of Operation. To get details on test points and subassembly level parts mentioned in this Section refer to Appendix C: Schematics

Who Should Perform Repairs

Only qualified service personnel (biomedical engineers or technicians) who are trained or have a general knowledge of repair and experience with devices of similar nature should open the device electrical enclosures/covers, remove and replace the components, or make adjustments. No repairs should ever be undertaken or attempted by anyone not having such qualifications. If your medical facility does not have qualified service personnel, contact your local International Biomedical representative.

Replacement Level Supported

The replacement level supported for this product is limited to the Printed Circuit Board (PCB) and major subassembly level. Once you have isolated a suspected PCB or assembly, follow the procedures in Chapter 7: Disassembly/Reassembly of Parts, to replace the part with a new one. Check to see if the error disappears and that the device passes all performance tests. If the error persists, swap back the replacement part with the suspected malfunctioning part (the original part that was installed when you started troubleshooting) and continue troubleshooting as directed in this section.

Check the following points before requesting repair service.

Software Revision Check

Identify the software revision of your device for some troubleshooting tasks. You can find the software revisions of the device in the following screen as CB: X.X.X and DB: X.X.X and SB: X.X (if scale installed)

- Start-up screen

Obtaining Replacement Parts

See Chapter 8: Replacement Parts List for details on part replacements.

Troubleshooting Guide

Problems with the device are separated into the categories indicated in the following sections and tables. Check for obvious problems first. If further troubleshooting instructions are required refer to the following tables.

Taking the recommended actions discussed in this section corrects majority of the problems you may encounter. However, problems not covered here can be resolved by calling International Biomedical Response Center or your local representative.

Checks for Obvious Problems

When first troubleshooting the instrument, check for obvious problems by answering basic questions such as:

1. Is the power switch turned ON?
2. Is the AC power cord connected to the instrument and plugged into an AC outlet?

Calibration Mode

Calibration mode can be entered by pressing the down arrow and manual mode keys together after splash screen disappears and speaker test is complete. Measured Seven Segment LED will display “-S.-”. All other Seven segment LEDs will be off. LCD will display Version screen where both software and hardware version of PCBAs that has micro-controller (e.g., Display Board and Controller Board) will be displayed. The software and hardware versions will be separated by a “|” symbol.

Figure 1 : Service Mode default screen

Service Error Codes

Error Code	Meaning	Cause	Action
1	Any software error in display board	Defective display PCB	Replace display PCB
2	I2C bus expander error in display board	Defective display PCB	Replace display PCB
7	Flash access failures	Defective display PCB	Replace display PCB
8	Under/incorrect voltage	Incorrect power source	Recalibrate or plug into a correct power source
9	Graphic display controller failure	Defective display PCB	Replace display PCB
3	Real-Time Clock (RTC) read-write error	Defective display PCB	Replace display PCB
31	Skin temperature measurement circuit failure	Defective controller PCB	Replace controller PCB
4	Buzzer and driving circuit failure	Defective buzzer or driving circuit in controller PCB	Replace controller PCB
5	Communication failure	Defective controller board and/or cable harness	Replace controller PCB and/or cable
6	Heater control circuit (or relay failures)	Defective AC power PCB and/or cable harness	Check inline cable fuse then replace AC power PCB and/or harness cable
53	Key stuck to 1 or 0	Defective keypad assembly and/or display PCB	Replace keypad and/or display PCB
100	Scale Gravity Error	Gravity compensation not enabled	Recalibrate scale
101	Scale Communication Error	Communication with scale failed	Weigh again. If problem persists, inspect cabling and connectors.
102	Scale Zeroing Error	Issue zeroing scale	Recalibrate scale

Troubleshooting Tables

The following tables list troubleshooting activities sorted according to symptoms.

Notes

- Ensure to check all cable connections within the device before proceeding with additional troubleshooting steps.
- ‘X’ denotes PCB connector location.

Message	Meaning	Cause	Action
Probe failure	Not getting a reading from temperature probe	Defective probe	Replace infant probe
		Defective harness	Check skin sensor harness going to skin sensor (X7) on controller PCB
		Defective controller PCB	Replace controller PCB

Message	Meaning	Cause	Action
Probe disconnected	Occurs if the skin temperature probe is unplugged	Skin probe is not connected to infant	Connect infant probe
		Defective harness	Check skin sensor harness going to skin sensor (X7) on controller PCB

Note: Measurement voltages mentioned in this manual are DC voltages with the exception of 230 VAC and 115 VAC which is AC voltage.

Trouble	Probable Cause	Action to Take
LCD display not ON	• TFT graphic display cable not connected or defective • Defective display PCB • Defective TFT graphic display assembly	1. Check if the flexible cable connection between graphic display and the display board is proper. If 'No' connect properly. If 'Yes' go to Step 2. 2. Check if the output voltages of main power supply PCB across pin 1 and 3 of I/P Pwr (X3) connector in display PCB and measured voltage is + 24V ± 10%. If 'No' go to Step 3, if 'Yes' go to Step 4. 3. Probable error with Main Power Supply Board (SMPS), check and replace the power supply PCB. 4. Check the status of display PCB LEDs H6 and H7. LEDs should remain OFF. If 'Yes' go to Step 5 , if 'No' go to Step 7. 5. Check the voltage across L9 (Pin 1 or 2) and TP 58 (GND) of display PCB and measured voltage is +17.2 ± 10% V. If 'Yes' go to Step 6, if 'No' go to Step 7. 6. Check the voltage across TP 59 (+1.5V) and TP 64 (GND) of display PCB and measured voltage is +1.5 ± 5% V. If 'No' go to Step 7, if 'Yes' go to Step 8. 7. Probable error with display PCB, replace the display PCB. 8. Probable error with TFT graphic display, replace the TFT graphic display assembly.
Keypad (keys or LEDs) on the control panel does not function normally	• Improper connection • Defective keypad • Defective display board	1. Check if indicators in the keypad are glowing when power is ON. If 'Yes' go to Step 2. If 'No' probable error with power supply, check 'System does not turn ON' section. 2. Check if the cable between keypad and display board is connected properly. If 'No' connect properly, if 'Yes' go to Step 3. 3. Check if all the keys or only few keys on keypad do not function normally. If only few keys do not function normally then there is probable error with faulty keypad, replace the keypad. If the problem persists go to Step 4. 4. Remove and connect back keypad, check it and then replace. If the problem persists go to Step 5. 5. Probable error with display board, replace the display board.

Trouble	Probable Cause	Action to Take
Display panel (7-segment) LED display does not function normally	• The display panel (7-segment) LEDs are faulty • Display board faulty	1. Check if all 7-segment LEDs '8' are glowing when power is ON. If 'No' proceed to Step 2. 2. Probable error with 7-segment LED or display PCB, replace the display PCB.

Trouble	Probable Cause	Action to Take
System does not turn ON	• Power cord is not connected to the power supply • Blown fuse on power inlet cable harness • Defective main ON/OFF switch • Defective power inlet cable harness • Defective AC circuit PCB • Defective main power supply PCB (SMPS) • Internal fuse on power supply AC cable	1. Check if the power cord is connected to the wall socket. If 'No' connect the power cord to the wall socket, if 'Yes' go to Step 2. 2. Check if there is a problem with the main breaker. If 'Yes' reset the breaker, if 'No' go to Step 3. 3. Check if there is a problem in the main ON/OFF switch. If 'Yes' replace the main ON/OFF switch, if 'No' go to Step 4. 4. Check if there is a defect in the wiring from power inlet to switch to AC Circuit PCB. If 'Yes' replace the harness, if 'No' go to Step 5. 5. Check if the input voltage to AC Circuit PCB is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 6, if 'Yes' go to Step 7. 6. Check the main voltage in the wall socket and operate the device with the input power in specified range. 7. Check if the voltage at the input of the Main Power Supply (digital SMPS) PCB (pin 1 and 2 of digital SMPS connector (X3) in AC Circuit Board) and measured voltage is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 8. If 'Yes' go to Step 9. 8. Probable failure of AC Circuit PCB, replace AC Circuit PCB. 9. Check if the voltage from the output of the Main Power Supply (Digital SMPS) PCB (pin 1 and 4 connector (X1) in AC Circuit PCB) and measured voltage is +24V ± 10%. If 'Yes' go to Step 10, if 'No' go to Step 12. 10. Check if the voltage at the input of display PCB across Pin 1 and 2 of Input Power (X3) Connector on Display PCB is + 24V ± 10%. If 'No' go to Step 11, if 'Yes' probable error with Display PCB (refer 'LCD display not ON' section of Chapter 6: Troubleshooting. 11. Check if there is any problem in cable wiring harness from AC-Circuit Board to display board. If 'Yes' replace the cable wiring harness, if 'No' go to Step 12. 12. Probable failure of main power supply (SMPS), replace main power supply.

Trouble	Probable Cause	Action to Take
Heater is not heating up	• Problem with heater input voltage • Defective ceramic heater • Defective AC Circuit PCB • Internal fuse on power supply AC cable	1. Position the heater hood assembly such that the heater hood indicators are centrally aligned and check the status of swivel switch by using multimeter. If 'Closed' switch condition replace swivel switch, if 'Open' switch condition, go to Step 2. 2. Check the fuse f2 (rating 8A, 250 V, fast blow, 5 mm x 20 mm) of AC circuit PCB and replace AC circuit PCB if found defective. Check if the heater input voltage across pin 1 and pin 3 of Air/IR Heater(X6) connector in AC Circuit PCB and measured value is 230 VAC ± 10% or 115 VAC ± 10%. If 'Yes' go to Step 3, if 'No' go to Step 5. 3. Check if there is any problem in wiring harness from AC Circuit Board PCB to ceramic heater. If 'Yes' replace the harness, if 'No' go to Step 4. 4. Check if the measured resistance between ceramic heater terminals and measured value is > 80 ± 8Ω for 230 VAC or > 20 ± 2Ω for 115 VAC. If 'No' go to Step 6, if 'Yes' go to Step 5. **Warnings** • Ensure heater is cooled down prior to resistance measurement of ceramic heater. • Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure. 5. Possible error with AC Circuit PCB, replace AC Circuit PCB. 6. Possible error with ceramic heater, replace ceramic heater.

Trouble	Probable Cause	Action to Take
Power failure alarm occurs while system main power is switched ON	• Power cord is not connected to the power supply • Blown fuse on power inlet cable harness • Defective power inlet cable harness • Defective AC Circuit PCB • Defective main power supply PCB • Defective main power supply to AC Circuit Board cable harness • Defective AC Circuit Board to display board cable harness • Defective display board to controller board cable harness • Defective display board PCB • Defective controller board PCB • Internal fuse on power supply AC cable	1. Check if the power cord is connected to the wall socket. If 'No' connect the power cord to the wall socket, if 'Yes' go to Step 2. 2. Check if there is a problem with the breaker. If 'Yes' replace the breaker (rating-250V, 10 A, slow, 5 mm x20 mm), if 'No' go to Step 3. 3. Check if there is a defect in the wiring from power inlet switch to AC Circuit PCB. If ' Yes' replace the harness, if 'No' go to Step 4. 4. Check if the input voltage to AC Circuit PCB is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 5, If 'Yes' go to Step 6. 5. Check the main voltage at the wall socket and operate the device as per manufacturer's specification. 6. Check if the input voltage to the main power supply (digital SMPS) PCB (pin 1 and 2 of digital SMPS connector (X3) in AC Circuit Board) is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 7, if 'Yes' go to Step 8. 7. Probable failure of AC Circuit PCB, replace AC Circuit PCB. 8. Check if the output voltage from main power supply (digital SMPS) PCB (pin 1 and pin 4 of connector in AC Circuit PCB (X1) is +24V ± 10%. If 'No' go to Step 9, if 'Yes' go to Step 10. 9. Probable failure of main power supply, replace main power supply PCB. 10. Check if the input voltage to display PCB across pin 1 and 2 of I/P Pwr (X3) connector in Display PCB + 24V ± 10%. If 'No' go to step 11, if 'Yes' go to Step 12. 11. Check if there is any defect in wiring harness from AC Circuit PCB to display PCB. If 'Yes' replace the harness, if 'No' go to Step 12. 12. Check if the voltage across TP62 (+5V) and TP60 (GND) of display board is +5V ± 5%. If 'No' go to Step 13, if 'Yes' go to Step 14. 13. Probable error with display PCB, replace the display PCB. 14. Check if the voltage across TP53 (+3.3V) and TP55 (GND) of controller board is +3.3V ± 5%. If 'No' go Step 16, if 'Yes' go to Step 15. 15. Check if the voltage across TP34 (+5V) and TP55 (GND) of controller board is +5V ± 5%. If 'Yes' go to Step 16, if 'No' go to Step 17. 16. Check if there any defect in wiring harness from display PCB to controller PCB. If 'Yes' replace the harness, If 'No' go to Step 17. 17. Possible error with controller PCB, replace controller PCB.

Trouble	Probable Cause	Action to Take
VHA does not go up or down with actuation of footswitches. (with input power to VHA)	• Defective VHA power supply PCB • VHA controller PCB and/or relay is not working • Display board enable signal is not active • Defective VHA module • Defective footswitch harness cable • Defective footswitch	1. Check if the input voltage to VHA power supply PCB across pin 1 and pin 2 of main power supply-VHA connector (X4) in AC Circuit Board is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 2, if 'Yes' go to Step 4. 2. Check if the input voltage to AC Circuit PCB is 230 or 115 VAC ± 10%. If 'No' go to Step 3, if 'Yes' go to Step 4. 3. Possible error with AC Circuit PCB, replace AC Circuit PCB. 4. Check if the output voltage from VHA power supply across SK1 is 24 V ± 10%. If 'No' go to Step 5, if 'Yes' go to Step 6 5. Possible error with VHA power supply, replace VHA main power supply. 6. Check if there is any defect in wiring harness from VHA main power supply to VHA control PCB. If 'Yes' replace the harness, if 'No' go to Step 7. 7. Check if there is any defect of fuse (rating 8A, 250 V, Timelag, 5 mmx 20 mm) in VHA Control PCB. If 'Yes', replace VHA control PCB, if 'No' go to Step 8. 8. Check if there is any defect in cable harness from VHA Control PCB to VHA, if 'Yes' replace the harness, if 'No' go to Step 9. 9. Check if shorting pin 1 and pin 2 of FS connector (X4) in VHA control PCB actuates the VHA assembly. If 'No' go to Step 10. If 'Yes' go to Step 11. Notes: a. Shorting Pin 1 and 2 actuates raising VHA. b. Shorting Pin 3 and 4 actuates lowering VHA. 10. Possible error with VHA control PCB. Replace VHA control PCB. 11. Check if there is any defect in wiring harness between display PCB and VHA control PCB. If 'Yes' replace the harness, if 'No' go to Step 12. 12. Possible error with display PCB, replace display PCB. If problem persists go to Step 13. 13. Check if there is any defect in wiring harness between footswitch and VHA control PCB. If 'Yes' replace the harness, if 'No' go to Step 14. 14. Check if actuation of footswitch is easy. If 'No' go to Step 15, if 'Yes' go to Step 16. 15. Possible error with footswitch assembly, replace footswitch assembly. 16. Possible error with VHA assembly, replace VHA assembly.

Trouble	Probable Cause	Action to Take
Audible alarm does not function	• Defective wire harness • Defective control PCB • Defective display PCB • Speaker not connected properly to the board	1. Check if there any defect in wiring harness from AC Circuit PCB to display PCB. If 'Yes' replace the harness, if 'No' go to Step 2. 2. Check if there any defect in wiring harness from display PCB to control PCB. If 'Yes' replace the harness, if 'No' go to Step 3. 3. Check if the voltage across TP34 (+5V) and TP55 (GND) of controller board is +5V ± 5%. If 'Yes' go to Step 4, if 'No' go to Step 7. 4. Check if the voltage across TP53 (+3.3V) and TP55 (GND) of controller board is +3.3V ± 5%. If 'Yes' go to Step 5, if 'No' go to Step 6. 5. Check if the voltage across out pin of transistor D9 and TP55 (GND) of controller board is +16V ± 10%. If 'Yes' go to Step 7, if 'No' go to Step 6. 6. Possible error with controller PCB, replace controller PCB. 7. Verify the voltage across TP62 (+5V) and TP60 (GND) and across TP61 (+3.3V) and TP60 (GND) of the display board is +5V ± 5% and 3.3V ± 5% respectively. If not probable error with display PCB, replace the display PCB.

Trouble	Probable Cause	Action to Take
The temperature on the mattress does not rise.	• International Biomedical's supplied mattress is not used. • The ambient temperature is too low • Input power supply voltage is too low (rated voltage 230V or 115V) • The device is installed near by a cold window • The device is installed in the vicinity of direct flow of air generated by an Air-Conditioner • The heater output is too low • Defective AC circuit PCB • Defective Control PCB • Defective ceramic heater	1. Check that the device operates using the International Biomedical' supplied mattress. If 'Yes' go to Step 2, if 'No' replace the mattress. 2. Check that the device operates in an ambient temperature of 18°C to 30°C. If 'No' operate the device in the specified range, if 'Yes' go to Step 3. 3. Check if the measured input main voltage of wall socket is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' operate the device in the specified range. If 'Yes' go to Step 4. 4. Check if the device is near the window. If 'Yes' move the device away from the window, if 'No' go to Step 5. 5. Check that the device is installed out of the current of air generated by an Air-Conditioner. If 'No' move the device away from the Air-Conditioner, if 'Yes' go to Step 6. 6. Check if the heater temperature rises in device warm-up mode. If 'No' go to Step 7, if 'Yes' go to Step 8. 7. Measure the resistance between ceramic heater terminals and measured value is > 80 ± 8Ω (230VAC) or >20±2Ω (120VAC). If 'Yes' go to Step 8, if 'No' go to Step 14. **Warnings** • Ensure heater is cooled down prior to resistance measurement of ceramic heater. • Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure. 8. Check if the heater input voltage across connector pin 1 and pin 3 of Air/IR heater(X6) connector in AC Circuit Board PCB and measured value is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 9, if 'Yes' go to Step 10. 9. Possible error with AC Circuit PCB, replace PCB. 10. Check if the wiring harness from display PCB to control PCB is proper. If 'Yes' go to Step 11, if 'No' replace wiring harness. 11. Check if the voltage across TP34 (+5V) and TP55 (GND) of controller board is +5V ± 5%. If 'No' go to Step 13, if 'Yes' go to Step 12. 12. Check if the voltage across TP53 (+3.3V) and TP55 (GND) of controller board is +3.3V ± 5%. If 'No' go to Step 13, if 'Yes' go to Step 14. 13. Possible error with controller PCB, replace controller PCB. 14. Possible error with ceramic heater, replace the ceramic heater.

Trouble	Probable Cause	Action to Take
The temperature on the mattress is too high	• International Biomedical's supplied mattress is not used. • The ambient temperature is too high • Input mains voltage is too high (rated voltage 230V or 115V) • The device is installed near by a window in sun • A phototherapy device used with the warmer device • The heater output is too high	1. Check that the device operates using the International Biomedical' supplied mattress. If 'Yes' go to Step 2, if 'No' replace the mattress. 2. Check that the device operates in an ambient temperature of 18°C to 30°C. If 'No' operate the device in the specified range, if 'Yes' go to Step 3. 3. Check if the measured input main voltage to wall socket is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' operate the device in the specified range, if 'Yes' go to Step 4. 4. Check if the device is near the window. If 'Yes' move the device away from the window, if 'No' go to Step 5. 5. Check if the device is in use along with another phototherapy device. If 'Yes' set the heater output low, if 'No' go to Step 6. 6. Check if the heater temperature rises in device warm-up mode. If 'No' go to Step 7, if 'Yes' go to Step 8. 7. Measure if the resistance between ceramic heater terminals and measured value is > 80 ± 8Ω (230VAC) or >20±2Ω (120VAC). If 'Yes' go to Step 8, if 'No' go to Step 14. 8. Check if the heater input voltage across connector pin 1 and pin 3 of Air/IR heater (X6) connector in AC Circuit PCB is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' go to Step 9. If 'Yes' go to Step 10. 9. Possible error with AC Circuit PCB, then replace PCB. 10. Check if wiring harness from display PCB to control PCB is proper. If 'Yes' go to Step 11, if 'No' replace wiring harness. 11. Check if the voltage across TP34 (+5V) and TP55 (GND) of controller board is +5V ± 5%. If 'No' go to Step 13, if 'Yes' go to Step 12. 12. Check if the voltage across TP53 (+3.3V) and TP55 (GND) of controller board is +3.3V ± 5%. If 'No' go to Step 13, if 'Yes' go to Step 14. 13. Possible error with controller PCB, replace controller PCB. 14. Possible error with ceramic heater, replace the ceramic heater.

Trouble	Probable Cause	Action to Take
The temperature on the mattress does not stabilize	• International Biomedical's supplied mattress is not used. • Skin probe is not connected to the infant • Power supply voltage is not stable • The device is installed in the vicinity of air generated by an Air-Conditioner • The device is installed near a window	1. Check that the device operates using the International Biomedical's supplied mattress. If 'Yes' go to Step 2, if 'No' replace the mattress. 2. Check if the skin temperature probe connection to the infant is proper. If 'No' connect properly, if 'Yes' go to Step 3. 3. Check if the measured input main voltage to wall socket is 230 VAC ± 10% or 115 VAC ± 10%. If 'No' operate the device in the specified range. If 'Yes' go to Step 4. Note: The device should not share a power outlet with another device. 4. Check that the device is installed out of the vicinity of air generated by an Air-Conditioner. If 'No' move the device away from the Air-Conditioner, if 'Yes' go to Step 5. 5. Check if the device is near the window. If 'Yes' move the device away from the window.
Bed does not tilt or tilt with ease	• Foreign body is caught under the mattress platform • Improper bed tilt mechanism assembly alignment • Damaged bed tilt gas spring assembly • Defective bed tilt mechanism assembly	1. Check if any foreign body is caught in the space under bed platform. If 'Yes' remove the foreign body, if 'No' go to Step 2. 2. Check if the actuation of Bowden cable and adjustment of the nut at the tilt handle assembly is proper. If 'No' adjust properly, if 'Yes' go to Step 3. 3. Probable error with damaged bed tilt gas spring assembly (lockable/non-lockable), replace bed tilt gas spring assembly. If problem persists go to Step 4. 4. Probable error with bed tilt mechanism assembly, replace bed tilt mechanism assembly.
Heater hood does not swivel or swivel with ease	• Defective part in the hood swivel assembly	Probable error with hood swivel assembly. Identify and replace the required parts: • Stopper hood rotate • Neck assembly
Heater hood exterior damage	• Damaged due to an accident	• Replace the heater hood exterior covers

Trouble	Probable Cause	Action to Take
No mobility	• Locked caster brake • Damaged caster	1. Check if the caster brake is locked. If 'Yes' release the caster brake, if 'No' go to Step 2. 2. Probable error with the casters, replace the caster wheel (set of 4). Note: It is recommended to replace all the four casters together for the stability of the device on the floor.

Chapter 7. Disassembly/Reassembly of Parts

Introduction

The following section describes the disassembly and reassembly procedures for the device and its components.

Who Should Perform Repairs

Only qualified service personnel (biomedical engineers or technicians) should open the device electrical enclosures/covers, remove and replace the components, or make adjustments. If your medical facility does not have qualified service personnel, contact your local International Biomedical representative.

Warnings

- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.
- Ensure to turn the power OFF, remove the power plug from the power outlet, and allow the heater to cool down before cleaning and dismantling the device.
- Ensure to check the electrical characteristics of anti-static mats before use (as described in the manufacturer's instructions) for continued protection to both you and the device.

Caution

- Always touch the exposed metal on the case to equalize the ground potentials before handling any circuit boards. This will prevent static discharge and protect the logic components of the device. Handle circuit boards on the edges only. Avoid touching board surfaces unless performing circuit board repair. Contaminants like skin oil attracts dust to accumulate which could retain moisture and affect the circuit performance.

Replacement Level Supported

The replacement level supported for this product is limited to the printed circuit board (PCB) and major subassembly level. Once you isolate a suspected PCB or assembly, follow the procedures in this Chapter, to replace the part with a known good one. Check to see if the error disappears and that the device passes all performance tests. If the error persists, swap back the replacement part with the suspected malfunctioning part (the original part that was installed when you started troubleshooting) and continue troubleshooting as directed in Chapter 6: Troubleshooting.

Tools Required

Field Service Engineer (FSE) Toolkit

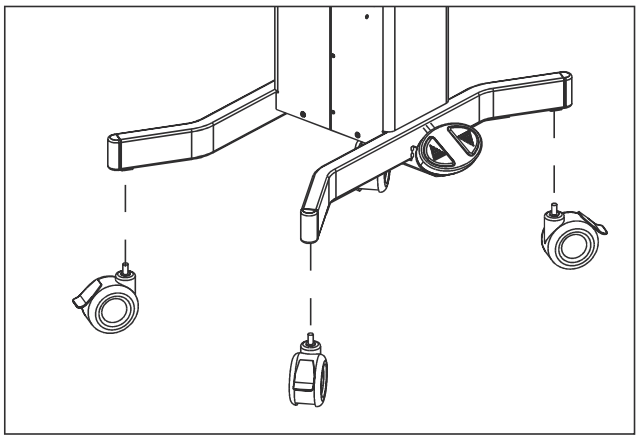
- Allen Wrench (Hex) key set sizes-3 mm, 4 mm, 5 mm, 6 mm
- T-type Allen Wrench (Hex) key sizes-2.0 mmx 200 mm, 2.5 mm x 200 mm, 3.0 mm x 200 mm, 3.0 mm x 200 mm, 4.0 mm x 200 mm, 5.0 mm x 150 mm
- Socket (Hex)/Nut Driver Kit sizes - 7 mm, 8 mm, 10 mm, 17 mm
- Torx driver sizes - T-30
- Screw driver (flat tip, P1)
- Wire Stripper/Cutter
- Digital Multimeter
- Calibrated Test Weights - 17 Kg (multiple weights acceptable)
- Precision Resistor Kit
- Loctite (# 242), Loctite (#7414) (consumables)
- 5 mm Open Wrench

Parts Replacement

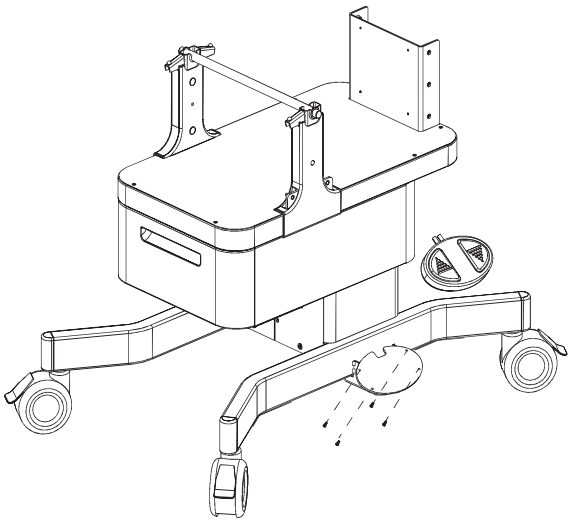
Warnings

- Ensure to do the following before replacing the Field Replacing Unit (FRU)s:
  - Turn OFF device main power switch.
  - Lock all caster wheels.
  - Remove any accessories mounted to the accessory rail.
  - Use anti-static material and wear anti-static wrist strap, safety glasses, safety shoes, and safety gloves while dismantling the device to avoid possible damage due to static electricity and sharp edges.
- Ensure to do the following after performing any repair or calibration:
  - Perform visual, power on, operational check, and safety test (if applicable) before patient use. See Chapter 5: Testing and Maintenance for details.

Caster Replacement

Illustration	Description
 Figure 1. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble and Reassemble the Caster Set Note: -It is recommended to replace all the four casters together for stability of the device. 1. Lock all caster wheels except the one that has to be replaced. 2. Lift the pedestal end of caster to be replaced and use blocks to support the leg near the caster you are replacing. 3. Rotate the caster nut (see View A) on the caster using 3 mm thick Wrench spanner (type open end, size 21 mm) in anticlockwise direction to remove the caster as shown in View B. Note: Do not rotate the caster. 4. Replace with a new caster and apply Loctite 242 on the threads of the new caster. 5. Rotate and tighten the nut on the caster in clockwise direction to fix the caster by using 3 mm thick Wrench spanner (type open end, size 21 mm). 6. Repeat the steps for rest of the casters. Note: The casters may be replaced with the device in a raised position with supporting blocks below the pedestal assembly. Finalization Perform caster wheel check as mentioned in Chapter 5: Testing and Maintenance.

Footswitch Assembly Replacement

Illustration	Description
 Figure 2. View A	Tools Required Philips screwdriver Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Footswitch Assembly 1. Switch OFF the device. 2. Locate the footswitch harness cable below the VHA bottom plate. Cut the tie wrap and disconnect the connector to release the footswitch cable. 3. Unfasten the screws (x4), located below the footswitch assembly, secured on the pedestal base to remove the footswitch assembly. Note: The cable from the replacement footswitch must feed up through the same slot. Instructions to Reassemble Footswitch Assembly Reassemble the footswitch assembly in the reverse order of the disassembly procedure using a new part. Ensure that you do not pinch the electrical wires. Finalization Power ON the device and check the vertical height adjustment of the device by actuating the footswitch.

Storage Drawer Assembly Replacement

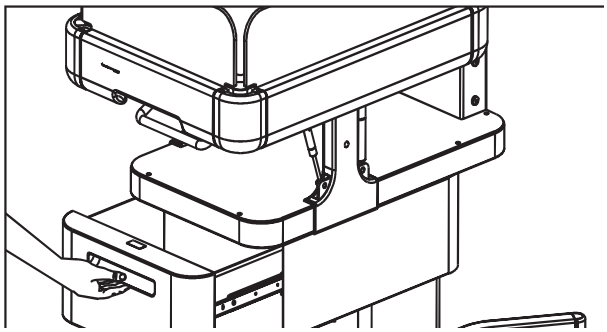
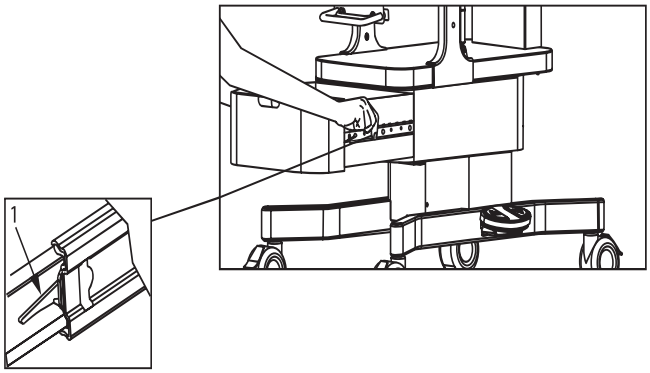
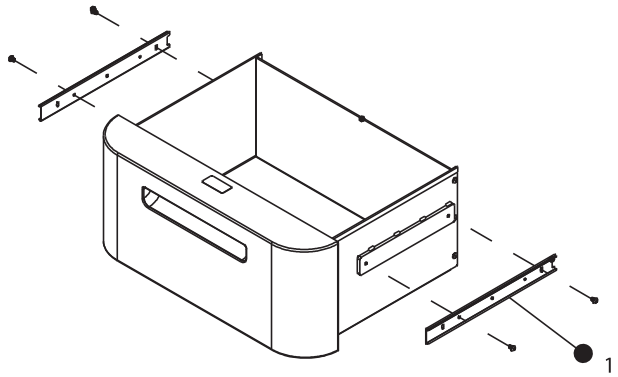
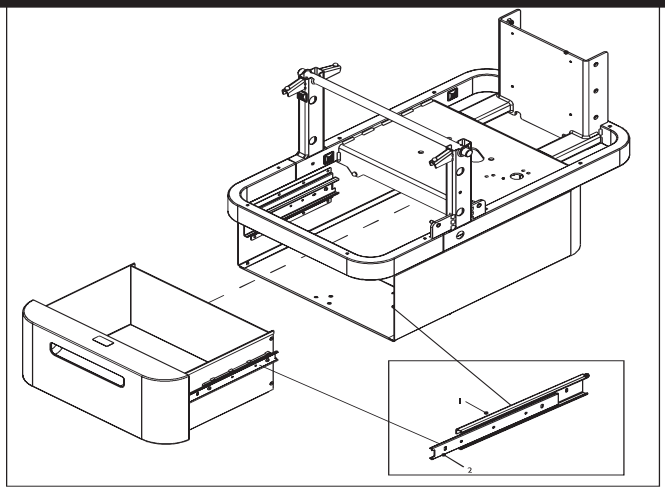
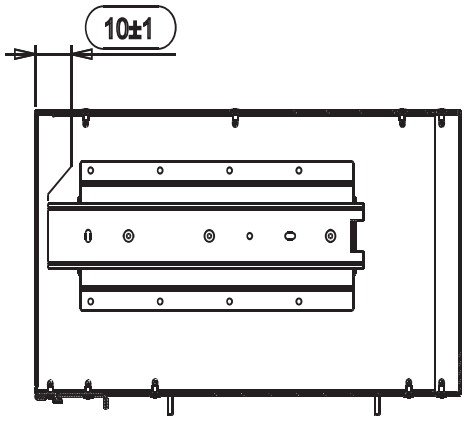
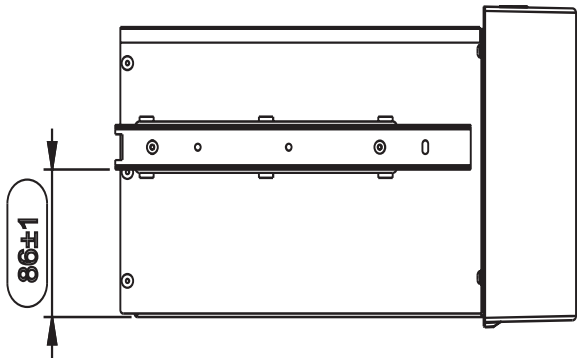
Illustration	Description
 Figure 3. View A  1. Tab Figure 4. View B  1. Inner slide Figure 5. View C	Tools Required 25 mm Allen wrench (Hex key) and Loctite 242 Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Storage Drawer Assembly 1. Place your fingers in the shaped slot on the storage drawer and pull to slide it out (see View A). 2. Press down the tab on right side and pull up the tab on left side simultaneously to remove the storage drawer completely (see View B). 3. Remove the inner slide from the disassembled storage drawer and secure for reuse (see View C). Notes • In case of failure of the storage drawer slide, order the Drawer Slide kit. Replace the storage drawer slides as explained in the following section, or reassemble the storage drawer with existing storage drawer slide. • Apply Loctite 242 on fasteners while assembling drawer slide.

Illustration	Description
 1. Outer slide 2. Inner slide Figure 6. View D	Instructions to Disassemble and Reassemble Storage Drawer Slide 1. Remove the inner slide (x2) from the disassembled storage drawer (see View C). 2. Replace with new inner slides (x2) with the same orientation as the existing slides as shown in View C and maintain the dimension as shown in View F. 3. Remove the outer slides (x2) with bracket assembly from the lower storage drawer cabinet (see View D). 4. Assemble new storage drawer outer slide (x2), with bracket, on the lower storage drawer cabinet and maintain the dimension as shown in View E. Instructions to Reassemble Storage Drawer Assembly 1. Fix the inner slide (removed from defective storage drawer assembly) to new storage drawer assembly by fastening screws (available with the drawer slide kit) and maintain the dimension as shown in View E. 2. Hold storage drawer assembly to align inner slide into outer slide channel of the storage drawer cabinet.
 Note: Dimensions are in mm Figure 7. View E (Storage Drawer Cabinet)	Note: Push the outer slide fully inside the bracket for easy alignment of inner slide of the storage drawer assembly. 3. Push the storage drawer assembly gently till it flushes with storage drawer cabinet. Finalization Check storage drawer moves without any obstructions and gets engaged in the catch on closing.
 Note: Dimensions are in mm Figure 8. View F (Storage Drawer Assembly)	

Bed Tilt Gas Spring Set Replacement

Illustration	Description

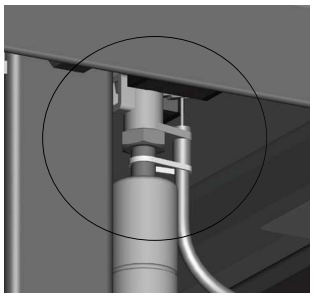
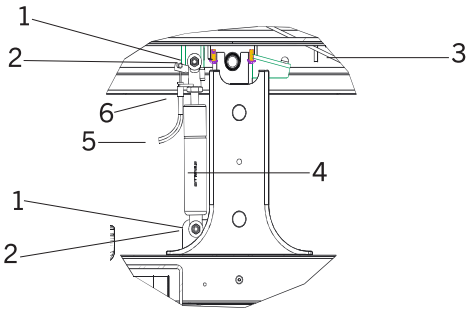
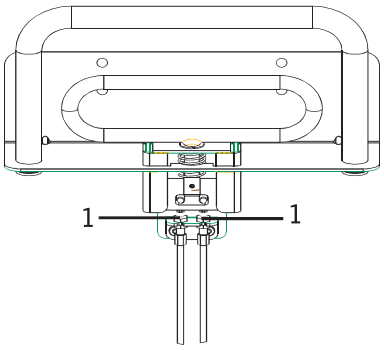


Figure 9. View A



1. Nylock Nut
2. Washer
3. Bed Structure
4. Lockable Gas Spring Assembly
5. Bowden Cable
6. Bowden Cable Removal Direction
7. Tie Wrap

Figure 10. View B



1. Adjustable Nuts

Figure 11. View C

Tools Required

Loctite 242, 10 mm Socket Nut Driver, 5 mm Allen Wrench (Hex key), and 5 mm Open Wrench

Replacement Parts

See Chapter 8: Replacement Parts List for details on Replacement Parts.

Instructions to Disassemble Bed Tilt Gas Spring

1. Cut and remove the tie wrap (see item 8, View B) that secures Bowden cable with the gas spring assembly. Pull and remove the Bowden cable out from the gas spring assembly (see item 6, View B).
2. Remove Shoulder screw from the lockable gas spring using Allen wrench (Hex key)(see View B) (2x both sides).
3. Remove Nylock nut from the lockable gas spring using nut driver (see item 2, View B) (2x both sides).

Notes

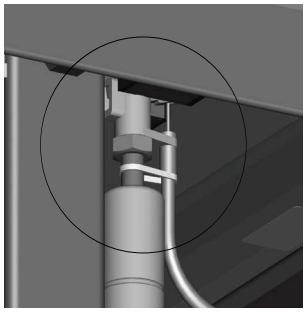
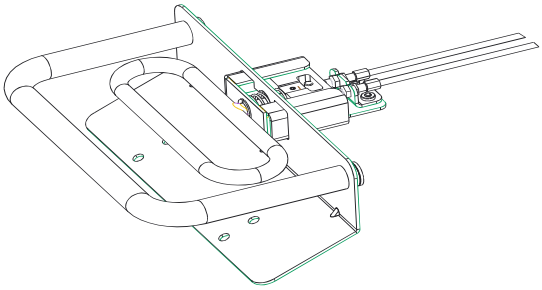
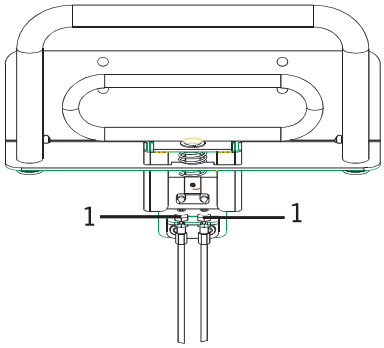
- While loosening the shoulder screws of lockable gas spring, tap gently on the side opposite to the mounting position of gas spring assembly for easy removal of shoulder screw.
- Provide a bottom support to the bed assembly to avoid sudden fall of the bed assembly.

Instructions to Reassemble Bed Tilt Gas Spring (2x both sides)

1. Replace the lockable gas spring assembly (with Bowden cable portion facing vertical pillar) on to the bed support structure mounting location (see View B).
2. Orient the lockable gas spring on to the bed assembly and mount the shoulder screw using Loctite 242 through the opening of the lockable gas spring and then tighten the Nylock nut (see View B).
3. Assemble the Bowden cable and tie the tie wrap at the location of the neck of the lockable gas spring in such a way that the Bowden cable does not come out and there is no problem in bed tilt function (see View B).

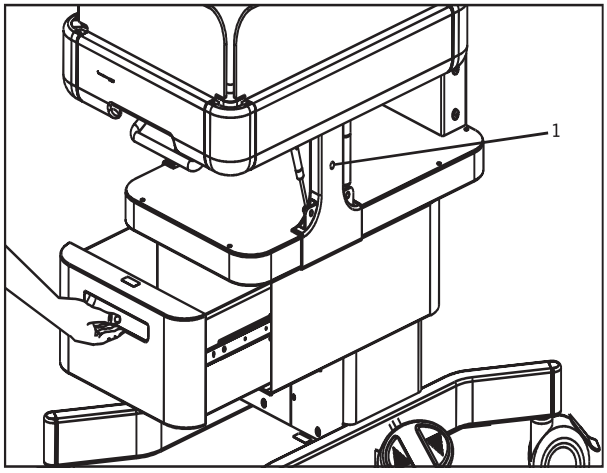
Finalization

Perform bed tilt performance check as explained in Chapter 5: Testing and Maintenance.

Illustration	Description
 Figure 12. View A  Figure 13. View B  1. Adjustable Nuts Figure 14. View C	Tools Required 5 mm Open Wrench, 3 mm Allen Wrench (Hex key) Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Bed Tilt Handle Assembly 1. Cut and remove the tie wrap from the Bowden cable of tilt handle assembly secured on the bed frame assembly. 2. Remove the Bowden cable out from the gas spring by pressing it out (see View A). 3. Remove the fasteners that secure the bed tilt assembly to bed frame assembly. Instructions to Reassemble Bed Tilt Handle Assembly Reassemble the bed tilt handle assembly in the reverse order of the disassembly procedure. Note: Adjust the nut at the tilt handle assembly to remove slackness of Bowden cable and to facilitate bed tilt actuation mechanism (see View C). Finalization Check the bed tilt along with locking of bed at all the locations of the tilt. Perform bed tilt performance check (see Chapter 5: Testing and Maintenance for details).

Cart Aesthetic Covers Replacement

Illustration	Description



1. Plug

Figure 15. View A

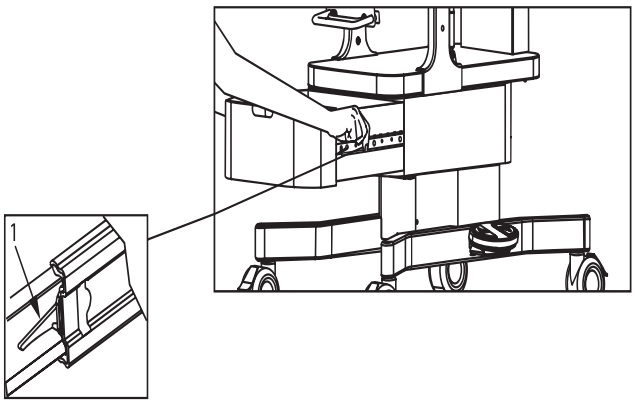
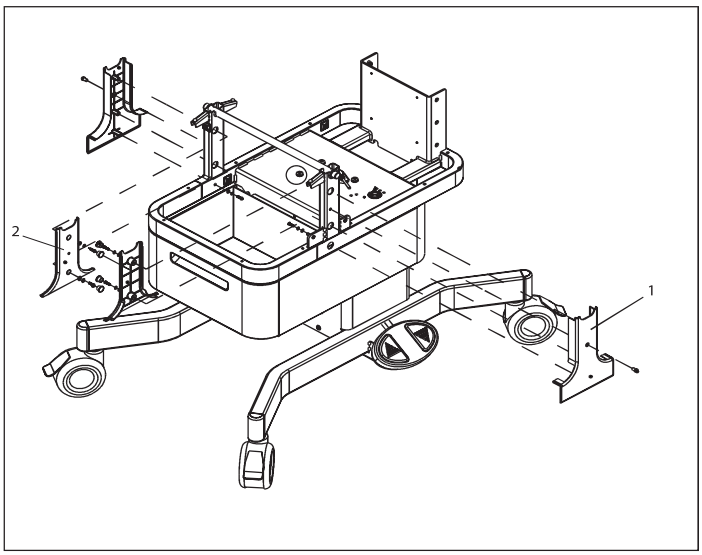


Figure 16. View B



1. Cart outer cover (x2) 2. Cart inner cover (x2)

Figure 17. View C

Tools Required

FSE Toolkit

Replacement Parts

See Chapter 8: Replacement Parts List for details on Replacement Parts.

Instructions to Disassemble Cart Aesthetic Covers

1. Place your fingers in the shaped slot on the storage drawer and pull to slide it out (see View A).
2. Press the tab on both sides and pull out the storage drawer to remove the storage drawer completely (see View B).

Note: Press down the tab on the right side and press up the tab on the left side.

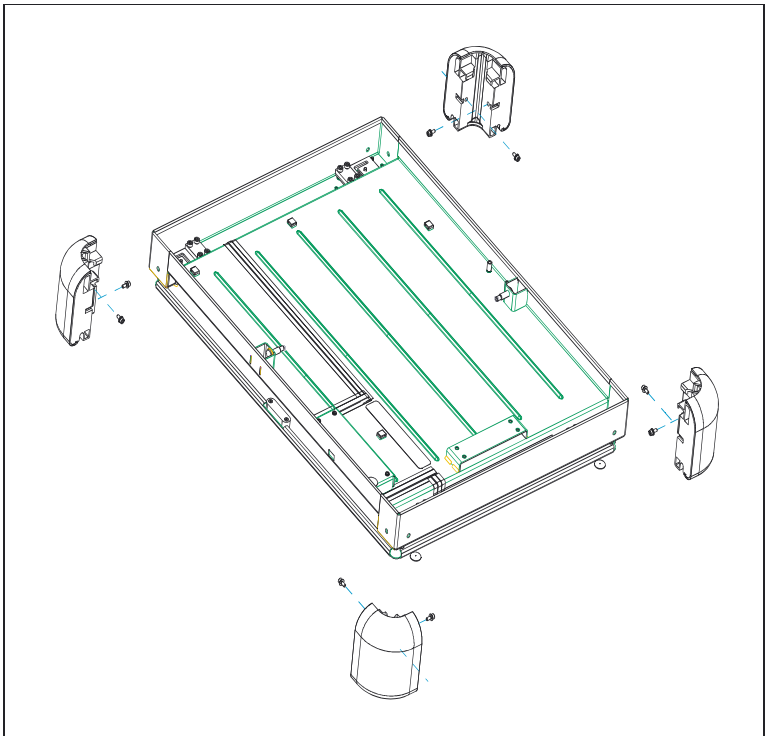
3. Remove the plug from the cart covers (see View A).
4. Remove the fasteners for the cart covers and remove both the covers from the cart structure (see View C).

Instructions to Reassemble Cart Aesthetic Covers

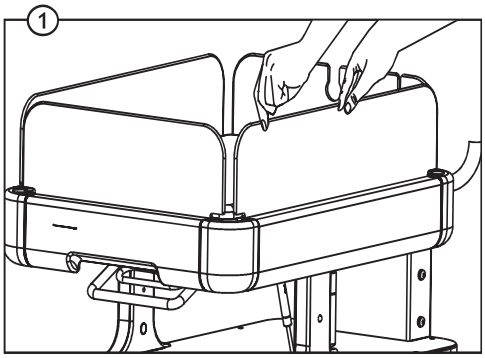
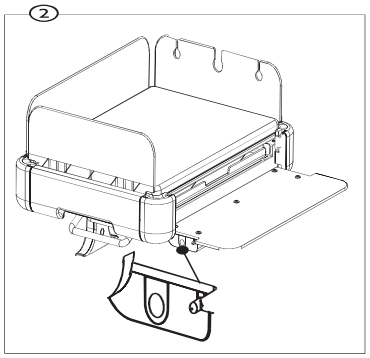
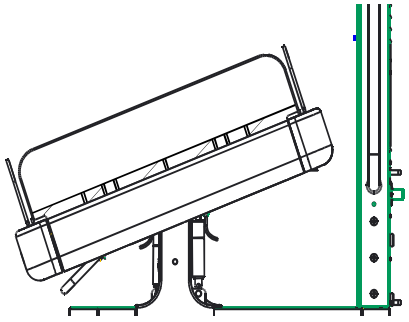
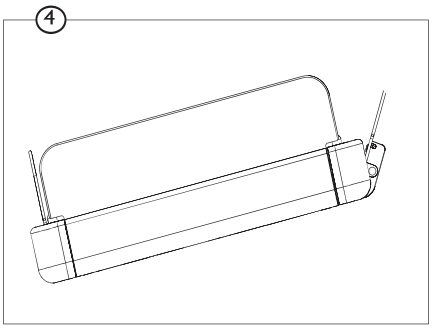
Reassemble the cart aesthetic covers in the reverse order of the disassembly procedure using new parts from the kit.

Finalization

Visually check the alignment of the covers.

Illustration	Description
 Figure 18. View A	Tools Required 2.5 mm Allen Wrench (Hex key) Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Corner Assembly 1. Remove mattress, x-ray cassette tray, bed acrylic tray, and all the sidewalls of the bed assembly. 2. Unfasten the M4x6, BTN (x2) screws by using Allen wrench (Hex key) to remove the corner block (see View A). Note: The Allen screws are fixed to the corner block on the inner side. Tilt the bed frame for better access of the screws. Instructions to Reassemble Corner Assembly Reassemble the bed corner/inner block assembly in the reverse order of the disassembly procedure using new corner assembly from the kit. Finalization Check the function of all sidewall opening and closing and check the sidewalls are secured by pressing the walls from inside bed in closed condition.

Sidewall Replacement

Illustration	Description
 Figure 19. Step 1	Tools Required None Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Sidewalls 1. Hold the edges of the sidewall with both hands so that the sidewall comes out of the hinge sockets on the sides (repeat this to open all four sidewalls) as shown in Step 1. 2. Press the side button to remove the sidewall completely (see Step 2).
 Figure 20. Step 2	Note: Each sidewall can be removed completely in this way except for the short sidewall with tubing slots. 3. For removing the short sidewall with tubing slots, tilt the device bed until there is enough distance for the sidewall to open. 4. Repeat steps 1 and 2 to completely remove the sidewall with tubing slots.
 Figure 21. Step 3	Instructions to Reassemble Sidewalls Reassemble the sidewall in the reverse order of the disassembly procedure using new sidewall. Finalization Check the function of all sidewall opening and closing and check the sidewalls are secured by pressing the walls from inside bed in closed condition.
 Figure 22. Step 4	

Mattress, Acrylic Tray, and X-ray Cassette Tray Replacement

Warnings

- Ensure to lock the caster wheels during installation of accessories.
- Never install an accessory when the infant is in the device.

The bed compartment of the device includes the following parts.

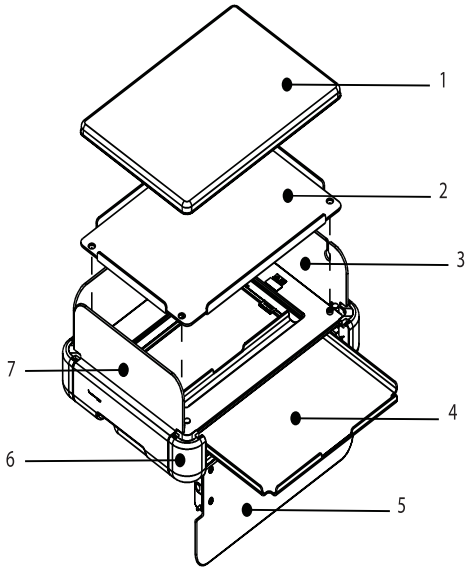


Figure 23. Bed compartment

1. Mattress
2. Bed acrylic tray
3. Short sidewall with tubing slots
4. X-ray cassette tray (optional)
5. Long sidewall
6. Corner block
7. Short sidewall

The procedure for assembling/disassembling the mattress, acrylic tray, and x-ray cassette tray is described as follows:

Instructions to Assemble/Reassemble Mattress

1. Place the acrylic tray followed by the foam mattress on the bed compartment.
2. To replace the foam mattress, remove the foam mattress from the bed compartment and replace using a new part from the Accessory kit.
3. Reverse the steps to reassemble the mattress.

Instructions to Assemble/Reassemble Acrylic Tray

1. Place the bed acrylic tray on the bed compartment.
2. To replace the bed acrylic tray, remove the foam mattress followed by the bed acrylic tray from the bed compartment and replace using a new part from the Accessory kit.
3. Reverse the steps to dismantle the acrylic tray.

Instructions to Assemble an X-ray Cassette Tray

1. To open the sidewall, hold the edges of the sidewall and lift the sidewall with both hands so that the sidewall comes out of the hinge sockets on the sides. The sidewall can be lowered and hangs down.

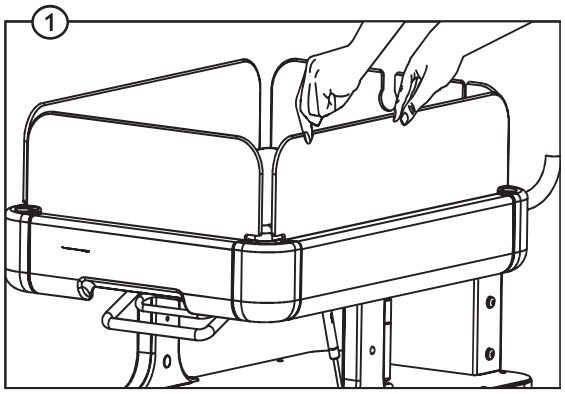


Figure 24. Step 1

2. Insert the x-ray cassette tray in the slot on the bed frame and push in the x-ray cassette tray to its fully inserted position.

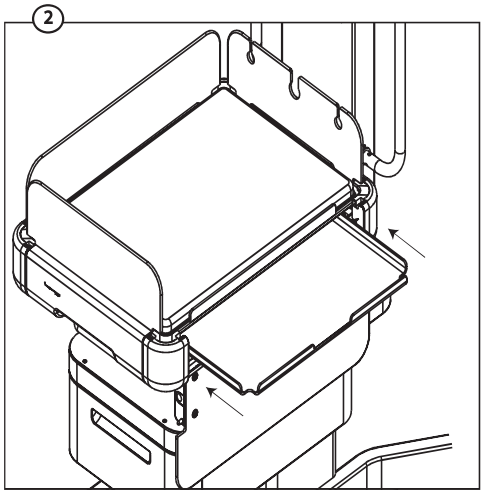


Figure 25. Step 2

3. To close the sidewall, lift the sidewall with both hands so that the sidewall becomes vertical and the hinge pin drops into the hinge pin slot on the sides.

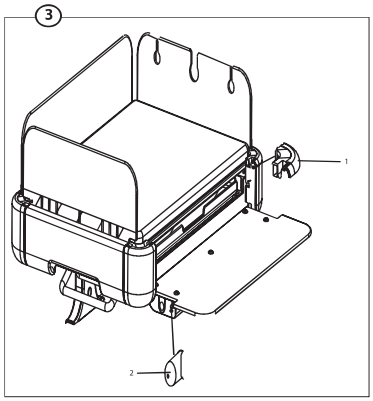


Figure 26. Step 3

1. Hinge pin slot 2. Hinge pin

4. Lock the sidewall firmly into the hinge slot on the sides.

Instructions to Reassemble an X-ray Cassette Tray

1. To open the sidewall, hold the edges of the sidewall and lift the sidewall with both hands so that the sidewall comes out of the hinge sockets on the sides. The sidewall can be lowered and hangs down. For details see Instructions to Assemble an X-ray Cassette Tray.
2. Draw out the x-ray cassette tray and replace using a new part from the Accessory kit.
3. Repeat Steps 2 through 4 of Instructions to Assemble an X-ray Cassette Tray.

Bed Frame Replacement

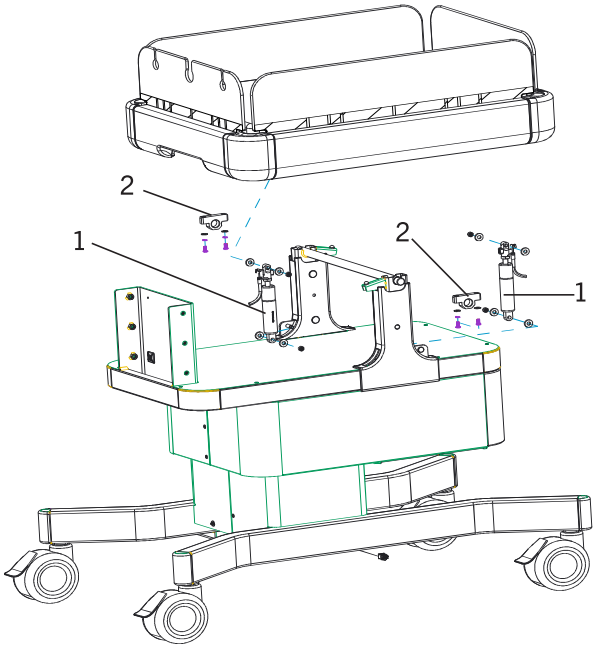
Illustration	Description
 1. Gas springs 2. Plummer block Figure 27. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Bed Frame Replacement 1. Remove the mattress, x-ray cassette tray, bed acrylic tray and all sidewalls from bed assembly. 2. Remove the bed tilt handle assembly as explained in the Section Bed Tilt Handle Assembly Replacement. 3. Remove the gas springs as explained in the Section Bed Tilt Gas Spring Set Replacement. 4. If device has scale option installed, unplug scale interface cable underneath bed frame. 5. Unfasten the Plummer block and remove bed assembly (see View A). 6. Remove the corner blocks as explained in the Section Corner Assembly Replacement. Instructions to Reassemble Bed Frame Replacement Reassemble the bed frame in the reverse order of the disassembly procedure using new parts from the kit. Finalization Perform bed tilt mechanism check procedure (as applicable) as explained in Chapter 5: Testing and Maintenance.

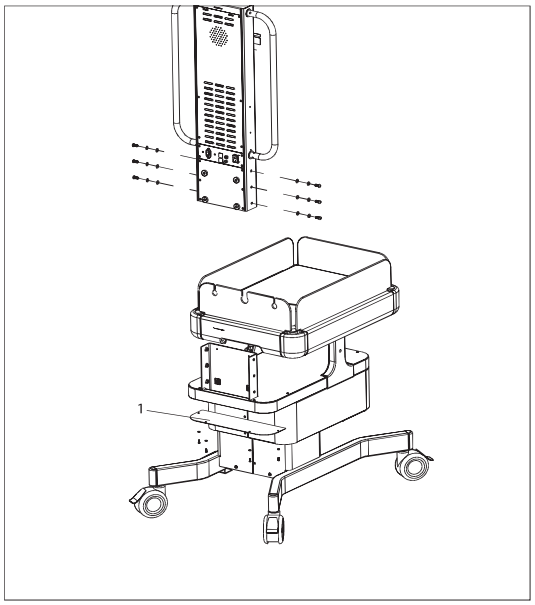
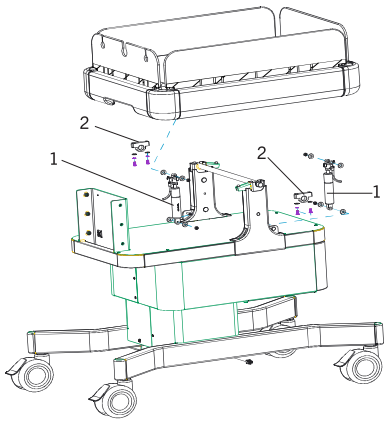
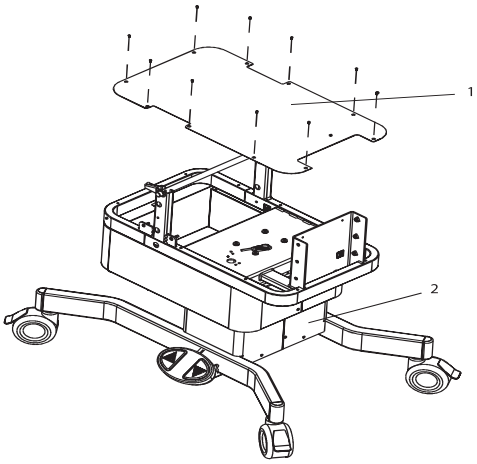
Illustration	Description
 1. Bottom plate Figure 28. View A	Tools Required Torx Driver, Loctite (#7414) Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble VHA Three Column Assembly Note: Ensure that all the caster wheels are locked. 1. Unfasten and remove the bottom plate in the cart cover (see View A) and then disconnect the cable harness connectors (see Cart-Vertical Pillar-Hood Assembly-Cabling section as mentioned in Chapter 4: System Installation Procedures). Warning • Remove the cylinder holder if available. 2. Unfasten the fasteners from the vertical pillar structure (see View A) and to disassemble the vertical pillar structure from the cart assembly. 3. Remove the storage drawer completely as explained in the Section Storage Drawer Assembly Replacement. 4. Remove the Cart Aesthetics covers as explained in the section Cart Aesthetic Covers Replacement. 5. Remove the gas springs as explained in the Section Bed Tilt Gas Spring Set Replacement (see View B). 6. Snap apart cable 7. Unfasten and remove the cart top plate (see View C). 8. Cut the tie wrap to release the cable and to remove the VHA power supply cable out from the VHA. Note: While reconnecting the VHA power supply cable check for correct orientation as shown in View C.

Illustration	Description



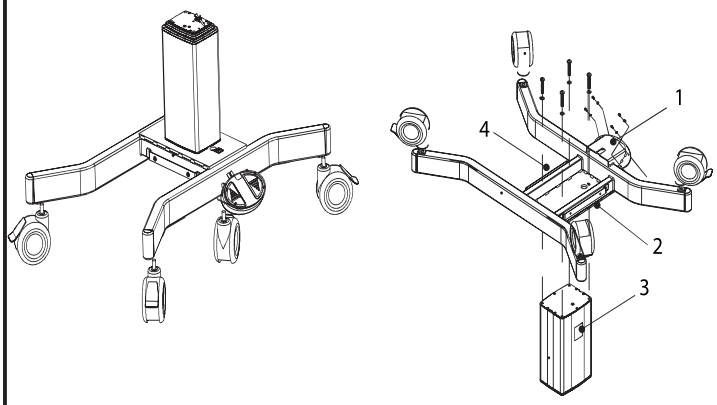
1. Plummer block 2. Gas spring

Figure 29. View B



1. Cart top cover 2. VHA closure cover

Figure 30. View C



1. Footswitch 2. Rear side
3. VHA with label side 4. Front side

Figure 31.View D

9. Remove the fasteners (x4) from the VHA top portion using torx (M8) fastener head driver
10. Unfasten the fasteners to remove VHA closure cover and cut the tie wrap to release the footswitch cable (see View C).
11. Tilt the base assembly (with the help of another person) upside down such that base assembly is at the top and the VHA at the bottom (see View D) with a supporting base between the floor and the VHA.

Caution

- Provide a supporting base between the floor and the VHA to avoid any scratches or damage.

12. Remove the fasteners (x4) from the VHA bottom portion using a torx (M8) fastener head driver (see View D).

Instructions to Reassemble VHA Three Column Assembly

Reassemble the VHA three column assembly in the reverse order of the disassembly procedure using new parts from the kit.

Cautions

- Always apply 23±2 NM torque to both the ends of the VHA fasteners and apply the Loctite 7414 over the head of the torx head and the adjacent joining structure to track the tampering of the self-tapping fasteners.
- Ensure the orientation of the VHA is correct before tapping the VHA. Once the VHA is tapped, the VHA cannot be used more than once.

Notes

1. Route the footswitch, VHA cable through the bed structure cable routing hole and secure the cable by tie wraps.
2. See View D for correct orientation of the VHA before and after assembly.

Finalization

Power ON the device and check the vertical height adjustment of the device by actuating the footswitch.

Hood Covers Replacement

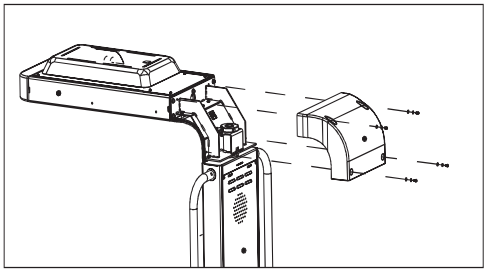
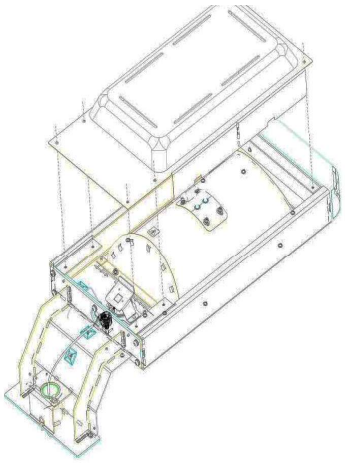
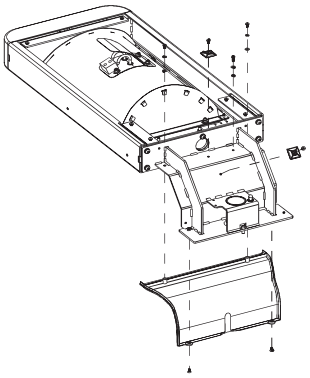
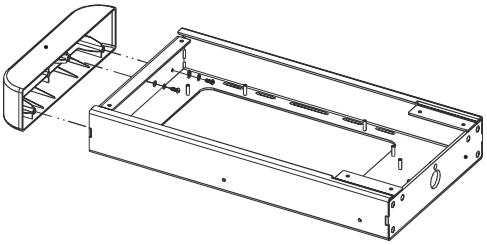
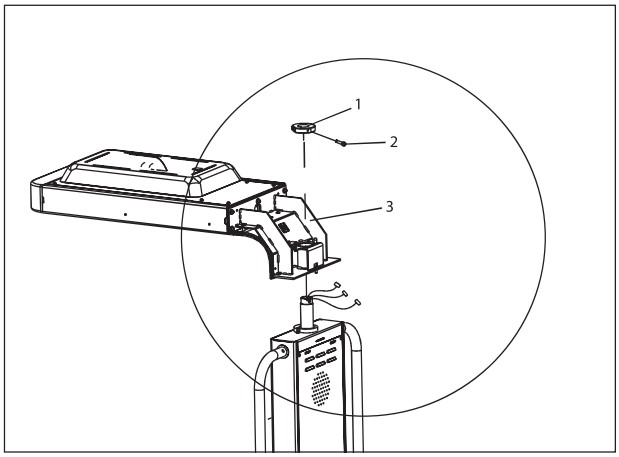
Illustration	Description
 Figure 32. View A  Figure 33. View B  Figure 34. View C  Figure 35. View D	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. **Warning** • The heater reflector assembly is hot during or immediately after the operation of the device. Before disassembling, ensure that they have cooled down. Instructions to Disassemble Hood Covers 1. Unfasten and remove the hood neck top cover (View A) by using T 2.5 mm x 200 mm Allen Wrench (Hex) key. 2. Remove the hood top plate assembly containing hood top cover, and then unfasten to remove the hood top cover (View B). 3. Remove the top fasteners of the hood neck bottom cover, and then swivel the hood away from the center to expose the bottom fasteners of the hood neck bottom cover fasteners (View C). 4. Remove the heater reflector assembly from the hood assembly. Refer Section Heater Reflector Assembly Replacement. 5. Remove the observation light from the hood assembly. Refer to section Observation Assembly Replacement. 6. Unfasten and remove the hood front cover (View D). Instructions to Reassemble Hood Covers Reassemble the heater hood covers in the reverse order of the disassembly procedure using new parts from the kit. Finalization Visually check the alignment of the covers. Check the function of the observation light.

Illustration	Description



1. Hood swivel stopper 2. Shoulder screw 3. Neck assembly

Figure 36. View A

Tools Required

Torx driver, Loctite 7414

Replacement Parts

See Chapter 8: Replacement Parts List for details on Replacement Parts.

Instructions to Disassemble Hood Swivel Assembly

1. Remove the hood neck top cover by removing the fasteners (see Section Hood Covers Replacement for details).
2. Remove the harness connections for ceramic heater, observation light, and micro switch (swivel sensor) and then remove the earthing lug.
3. Align the heater hood to the central position, then remove the Shoulder screw (see View A).
4. Remove the hood swivel stopper out from the assembly.
5. Push the hood assembly upwards to remove it.
6. Unfasten and remove the thrust bearing part.
7. Unfasten M6x20, BTN, SST screws (x5) to remove Neck assembly from Hood assembly.

Instructions to Reassemble Hood Swivel Assembly

Reassemble the hood swivel assembly in the reverse order of the disassembly procedure using new parts from the kit.

Apply 3 NM torque to Neck assembly fasteners and apply the Loctite 7414 over the head of the torx head and the adjacent joining structure to track the tampering of fasteners.

Finalization

Check the heater is heating the ceramic heater refer Power On check section of Chapter 5: Testing and Maintenance.

Check the hood swivel operation for lateral spring plunger operation, +90° to -90° and micro switch operation for heater cut OFF on either direction refer Heater Hood Swivel Mechanism check section of Chapter 5: Testing and Maintenance.

Check the function of the observation light.

Hood Swivel Sensor Replacement

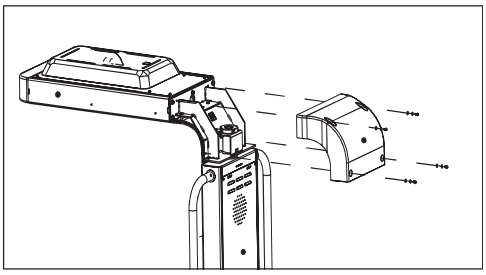
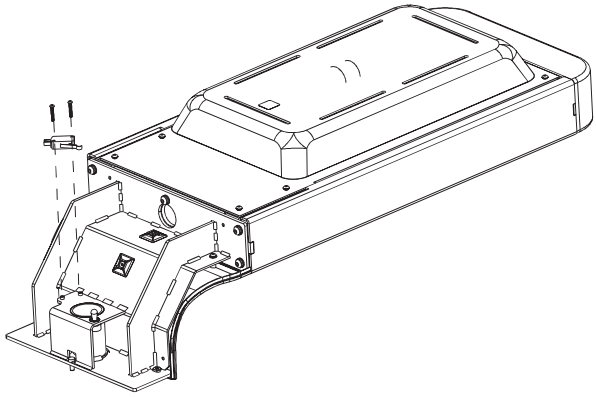
Illustration	Description
 Figure 37. View A  Figure 38. View B	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Swivel Sensor Assembly 1. Unfasten and remove the hood neck top cover (see View A by using T 2.5 mm x 200 mm Allen Wrench (Hex) key. 2. Cut the tie wrap to release the swivel sensor cable harness from the hood neck. 3. Align the heater hood to its central position and unfasten screws to remove the micro switch (see View B). Instructions to Reassemble Swivel Sensor Assembly Reassemble the swivel sensor assembly in the reverse order of the disassembly procedure using new parts from the kit. Finalization Check the heater cut off function on both the side of the device by rotating the hood in power on condition. Refer Heater Hood Swivel Mechanism Check as explained in Chapter 5: Testing and Maintenance.

Illustration	Description

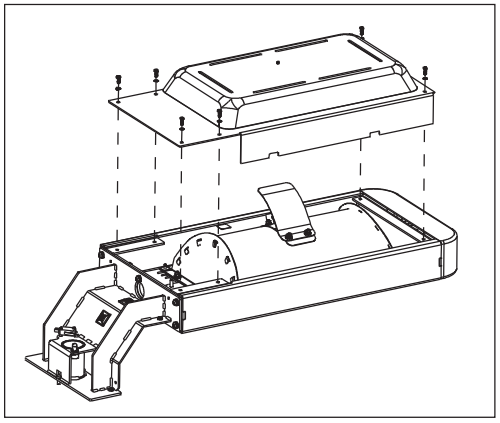
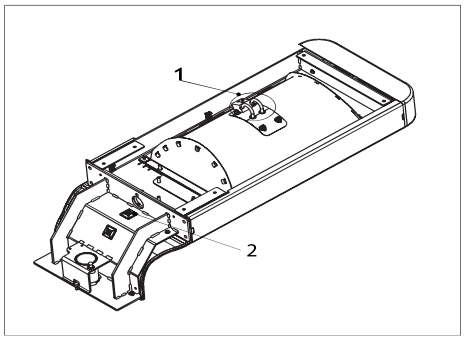


Figure 39. View A



1. Ceramic terminal 2. Tie wrap holder

Figure 40. View B

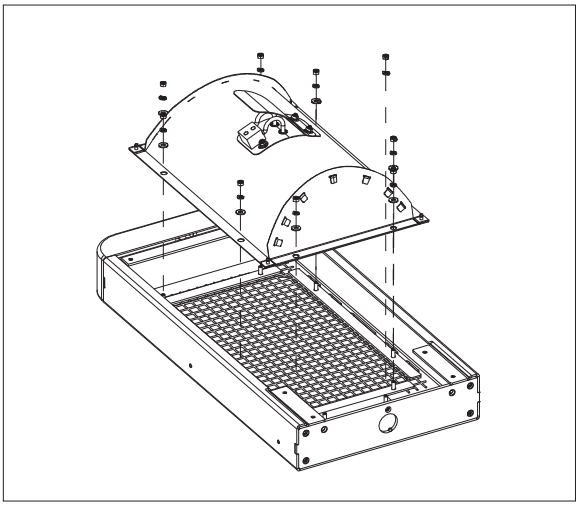


Figure 41. View C

Tools Required

FSE Toolkit

Replacement Parts

See Chapter 8: Replacement Parts List for details on Replacement Parts.

Warning

- The heater reflector assembly is hot during or immediately after the operation of the device. Ensure that they have cooled down before disassembling.

Instructions to Disassemble Heater Reflector Assembly

1. Unfasten and remove the hood top cover and hood neck top cover as explained in the Section Hood Covers Replacement (see View A).
2. Cut the tie wrap to release the heater wire
3. Remove the harness out from the ceramic terminal (see View B).
4. Unfasten the nuts from the hood assembly to remove heater reflector assembly (see View C).

Notes

- *In case of grill replacement, unfasten the nuts to remove the grill.*
- *Retain reflector insulators for reuse while reassembly of new reflector.*
- *In case of damage of heater hood grill, reflector insulator, Teflon sheets and ceramic terminal, order Heater Hardware.*

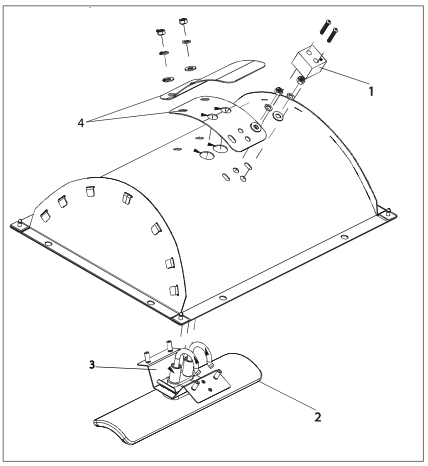
Instructions to Reassemble Heater Reflector Assembly

Reassemble the heater reflector assembly in the reverse order of the disassembly procedure using new parts from the kit.

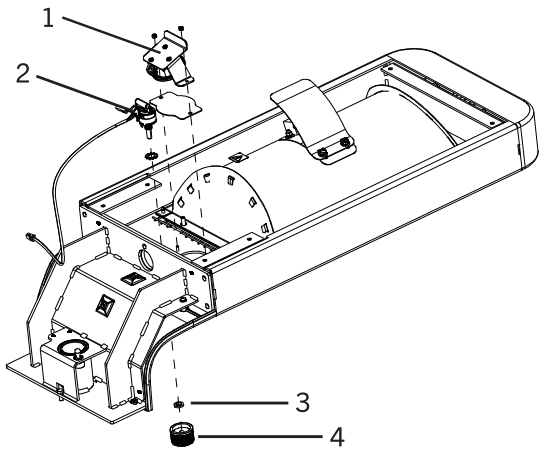
Finalization

Check that the heater is heating the device when powered ON. Perform Power On Check as explained in Chapter 5: Testing and Maintenance.

Ceramic Heater Replacement

Illustration	Description
 1. Ceramic terminal 2. Ceramic heater 3. Heater clamp 4. Teflon sheets Figure 42. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. **Warning** • The ceramic heater is hot during or immediately after the operation of the device. Before disassembling, ensure that it has cooled down. *Note: In case of damage of heater hood grill, reflector insulator, Teflon sheets, and ceramic terminal, order Heater Hardware Kit.* Instructions to Disassemble Ceramic Heater 1. Remove the heater reflector assembly from hood assembly as explained in the Section Heater Reflector Assembly Replacement. 2. Unfasten the nuts from the heater reflector assembly to remove the ceramic terminal and teflon sheets (see View A). 3. Unfasten the nuts to remove the ceramic heater holder assembly (see View A). **Caution** • Ensure that the ceramic heater does not fall during disassembly. Instructions to Reassemble Ceramic Heater Reassemble the ceramic heater in the reverse order of the disassembly procedure using new parts from the kit. Torque 2x ceramic terminal screws to 0.5 Nm ± 0.1 Nm. Finalization Check that the heater is heating the device when powered ON. Perform Power On Check as explained in Chapter 5: Testing and Maintenance.

Observation Light Replacement

Illustration	Description
 1. Reflector Assembly 2. Potentiometer 3. Potentiometer Nut 4. Knob Figure 43. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. **Warning** • The LED is hot during or immediately after operation of the device. Before disassembling ensure its cool down. *Note: These instructions explain how to remove the LED light and the potentiometer. Before you disassemble determine which component is not working.* Instructions to Disassemble LED Light 1. Unfasten and remove hood cover top and neck top cover as explained in the section Hood Covers Replacement (see View A). 2. Cut the cable tie and disconnect LED cable. 3. Remove the LED light assembly from heater hood using socket driver. Instructions to Reassemble LED Light Reassemble the LED light in the reverse order of the disassembly procedure using new parts from the kit. Instructions to Disassemble Potentiometer 1. Unfasten and remove hood cover top and neck top cover as explained in the section Hood Covers Replacement (see View A). 2. Loosen the set screws and remove the knob. 3. Using a socket driver, remove the nut. 4. Carefully remove the potentiometer and washer from the heater hood and disconnect the cable. Instructions to Reassemble Potentiometer Reassemble the potentiometer in the reverse order of the disassembly procedure using new parts from the kit. Finalization: Check the function of the observation light.

Vertical Pillar Assembly Parts Replacement

For details on Vertical Pillar Assembly Parts see Section 7-25 for Replacement Parts List.

Tools Required

Replacement Parts

See Chapter 8: Replacement Parts List for details on Replacement Parts.

Warnings

- Always disconnect the power supply to device before performing service or maintenance procedures, apply power only if you are specifically instructed to do so as part of a procedure.
- Ensure to check the electrical characteristics of anti-static mats before use (as described in the manufacturer's instructions) for continued protection to both you and the device.

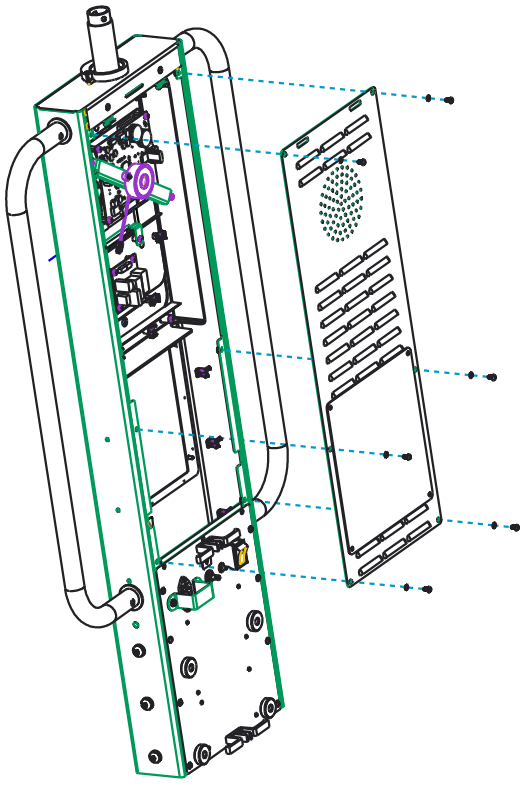
Note: See Cabling-Harness Routing Table of Appendix C: Schematics for routing and connection of cable harnesses.

Vertical Pillar Enclosure Panel Removal

Loosen the fastener screws at the vertical pillar enclosure panel and raise the vertical panel to remove it.

Note: Ensure that the vertical pillar enclosure panel is raised until the vertical panel comes out of the two tabs that holds the panel.

Figure 44. View A



Remove Speaker Assembly

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Disconnect the speaker cable from the control board.
3. Loosen fasteners to remove the controller the speaker bracket.

Speaker Replacement

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Disconnect the speaker cable from the control board.
3. Use socket driver to remove speaker from bracket.
4. Replace speaker and connect cable.

Controller PCB Replacement

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Disconnect the board's electrical harness cable connectors and remove the speaker assembly as explained above.
3. Loosen fasteners to remove the controller PCB.
4. Replace new PCB from the kit and assemble in the reverse order of the steps above.

VHA Control PCB Replacement

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Remove speaker and bracket.
3. Disconnect the board's electrical harness cable connectors.
4. Loosen fasteners to remove the VHA Control PCB.
5. Replace new PCB from the kit and assemble in the reverse order of the steps above.

AC Circuit Board Replacement

1. Remove the vertical pillar enclosure panel as explained in Section 7-31: Power Input Assembly Replacement.
2. Disconnect the board's electrical harness cable connectors.
3. Loosen fasteners to remove the AC control PCB.
4. Replace new PCB from the kit and assemble in the reverse order of the steps above.

Main Power Supply Replacement

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Disconnect the board's electrical harness cable.
3. Loosen fasteners to remove the Main Power Supply PCB.
4. Replace new PCB from the kit and assemble in the reverse order of the steps above.

Display PCB Replacement

1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal.
2. Remove speaker and bracket
3. Remove Controller PCB (refer Controller PCB replacement procedure)
4. Disconnect the board's electrical harness cable connectors, LCD, keypad cables. For correct direction of releasing the LCD tail cable from the display board connector see Figure 49. View B.

Caution

- Take care while disengaging the LCD tail cable from display board connector. Releasing the connector in wrong direction may lead to permanent damage of the display connector on the display PCB.

5. Loosen fasteners to remove the Display PCB.
6. Replace new PCB from the kit and assemble in the reverse order of the steps above.

   Note: Remove the PCB holding stand from the defective display PCB and re-use while replacing the new PCB.

LCD Assembly Replacement

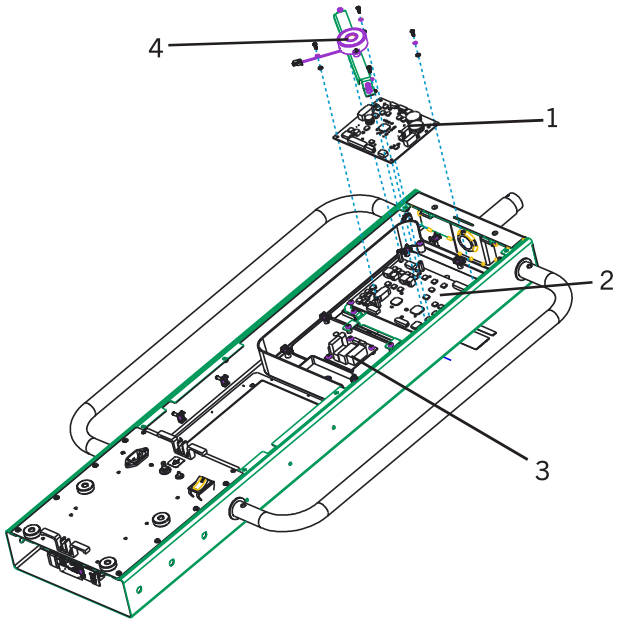
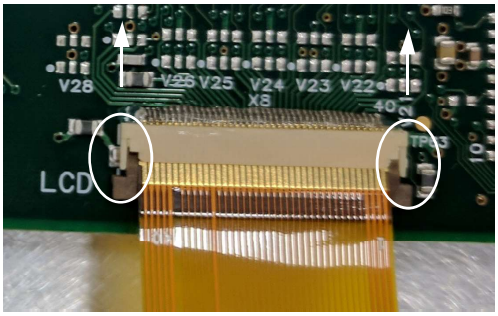
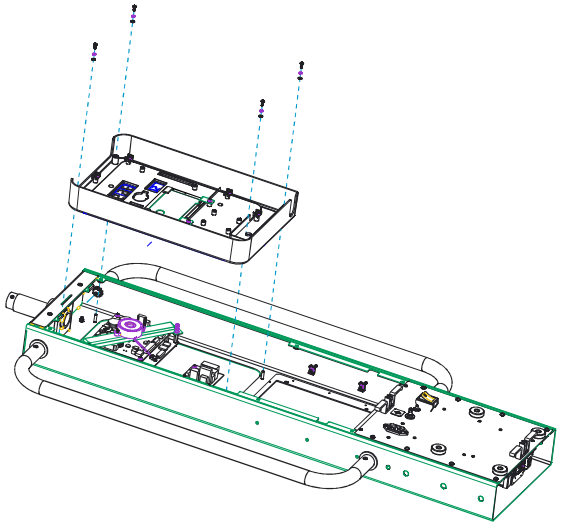
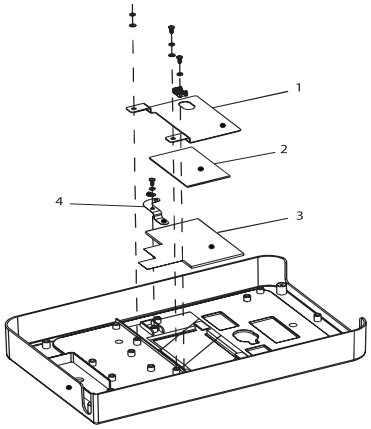
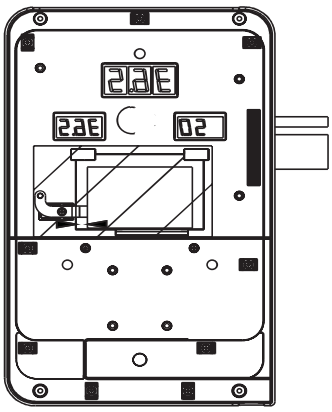
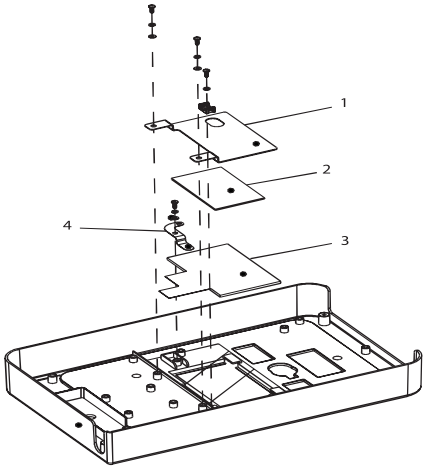
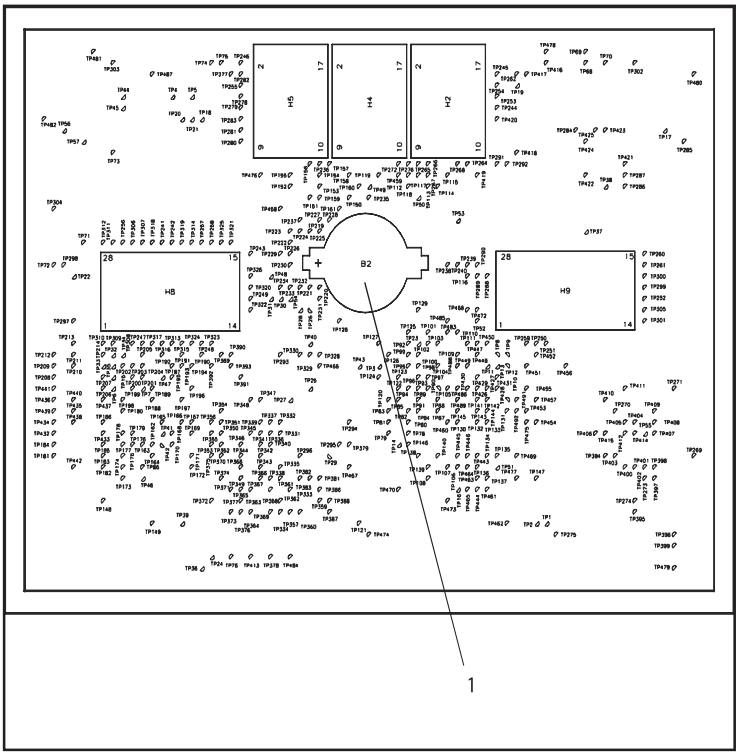
Illustration	Description
 1. Controller Board 2. Display Board 3. VHA control board 4. Speaker Assembly Figure 45. View A  Figure 46. View B	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble LCD Assembly 1. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal. 2. Remove speaker assembly. 3. Remove harness from the controller board and unfasten the screws to remove the controller board (see View A). 4. Disconnect the harness from display board and unfasten the screws to remove the display board. For correct direction of releasing the LCD tail cable from the display board connector see View B. **Caution** • Take care while disengaging the LCD tail cable from display board connector. Releasing the connector in wrong direction may lead to permanent damage of the display connector on the display PCB. 5. Disconnect the harness from the VHA control board and unfasten the screws to remove the VHA control PCB. 6. Remove the cable ties from the display housing. 7. Remove the display housing from the vertical pillar by removing the fasteners (see View C). 8. Loosen the fasteners of TFT display assembly from display housing (View D). Lift up the TFT assembly gently and pull down to remove it from the display housing. 9. Remove the bracket, foam, and ground foil sequentially to disengage the TFT display (View D and View E).

Illustration	Description
 Figure 47. View C  1. TFT bracket 2. TFT foam 3. LCD display 4. Ground foil Figure 48. View D  Figure 49. View E	Instructions to Reassemble LCD Display Assembly 1. Orient and assemble the LCD display, grounding foil to the display housing (see View D and View E). 2. Locate and paste the TFT foam on to the TFT bracket (View D). 3. Orient and assemble the TFT bracket with TFT foam on top of the TFT display (View D and View E). 4. Reassemble the display housing to vertical pillar by tightening the fasteners. 5. Reassemble the display board, VHA control board and controller board sequentially by tightening the fasteners. 6. Reconnect the cable harness of the display board, controller board and VHA control board. 7. Route the cable harness and tie to the cable mount located on the display housing (refer Appendix C: Schematics for cable routing details). 8. Reassemble the enclosure to the vertical pillar. Finalization Check the device power ON. Refer Power On check section of Chapter 5: Testing and Maintenance. Notes • Never cross any harness over the PCB boards. • Never cross or route harness along with skin sensor harness.

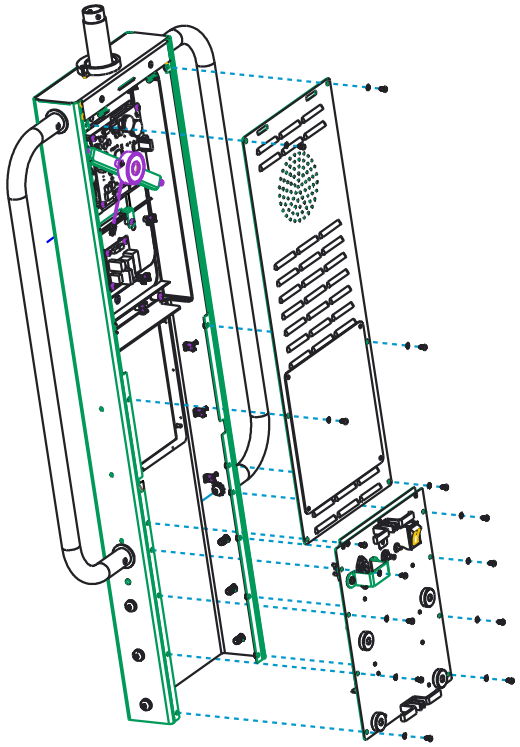
Keypad Replacement

Illustration	Description
 Figure 50. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Display Front Keypad 1. Remove the display housing from the vertical pillar and disassemble the LCD assembly (refer disassembly of LCD assembly replacement procedure) (see View A). 2. Remove the cable mounts from the display housing and secure for reuse. Instructions to Reassemble Keypad Assembly 1. Orient and assemble the cable mounts (removed from the disassembled display housing) to the new keypad assembly. 2. Orient and assemble the LCD display to the new display housing with keypad (refer LCD replacement procedure). 3. Reassemble the new display housing with keypad to vertical pillar (refer LCD replacement procedure). Finalization Check the device power on and keypad check. Refer Power on and keypad check section of Chapter 5: Testing and Maintenance. Notes • Never cross any harness over the PCB boards. • Never cross or route harness along with skin sensor harness.

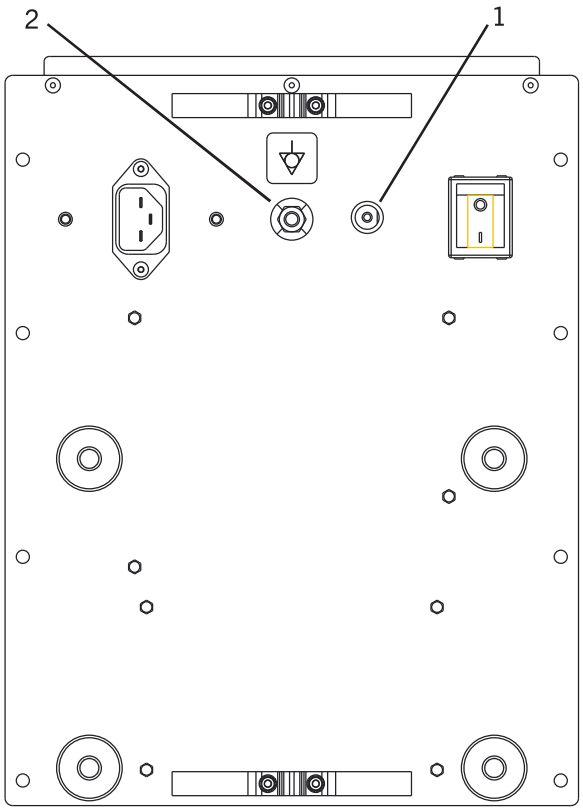
Real-Time Clock (RTC) Battery Replacement

Illustration	Description
 1. Battery Holder Figure 51. View A (Display PCB)	Tools Required FSE Toolkit Replacement Parts Standard Lithium 3V battery - CR2032(x1) **Warnings** • Always replace the battery with the same type or with an equivalent type as recommended by the manufacturer • Always dispose of used batteries according to your country-specific regulation and International Biomedical guidance. Instructions to Disassemble and Reassemble Real-Time Clock (RTC) Battery 1. Unfasten the screws at the vertical pillar enclosure panel and raise the vertical panel to remove it. Note: Ensure that the vertical pillar enclosure panel is raised until the vertical panel comes out of the two tabs that holds the panel. 2. Remove Display PCB (See Section Display PCB Replacement for details). 3. Locate the battery on the display PCB and remove the battery from the holder using tweezers (see View A). 4. Check for correct polarity (see View A) and insert the new battery into the holder. 5. Press to secure the battery into the holder. 6. Reassemble Display PCB (See Section Display PCB Replacement for details). Finalization Perform RTC Battery Test (B) as explained in Chapter 5: Testing and Maintenance.

Power Input Assembly Replacement

Illustration	Description
 Figure 52. View A	Tools Required FSE Toolkit Replacement Parts See Chapter 8: Replacement Parts List for details on Replacement Parts. Instructions to Disassemble Power Input Assembly 1. Unfasten and remove the IEC inlet bracket from the vertical pillar and then remove the power cord from the device (see Section Assembly of Power Cord of Chapter 4: System Installation Procedures). 2. Remove the vertical pillar enclosure panel as explained in the Section Vertical Pillar Enclosure Panel Removal. 3. Remove the harness that connects power input assembly and bifurcates into AC circuit board and device main power supply. 4. Remove the ground cables. 5. Remove the power input assembly by removing the fasteners as shown in figure (see View A). Instructions to Reassemble Power Input Assembly Reassemble the power input assembly in the reverse order of the disassembly procedure using new parts from the kit. Finalization Perform Visual, Power on, Operational and Safety test as per test procedure in Chapter 5: Testing and Maintenance .

Main Breaker Reset

Illustration	Description
 1. Breaker 2. Equal potential stud Figure 53. View A	Tools Required None Replacement Parts None Main Breaker Reset 1. Switch OFF the device 2. Locate the resettable breaker (1) on the rear power panel 3. Push button on breaker to reset. Switch ON the device and check basic functionality Finalization Switch ON the device and check basic functionality.

Chapter 8. Replacement Parts List

The parts lists in this chapter supply enough detail for you to order parts for the assemblies, stand-alone pieces and kits considered field serviceable. Only items, assemblies, and kits which have an orderable part number given in this chapter are available for purchase. To order parts, contact International Biomedical service center.

Heater Hood Assembly

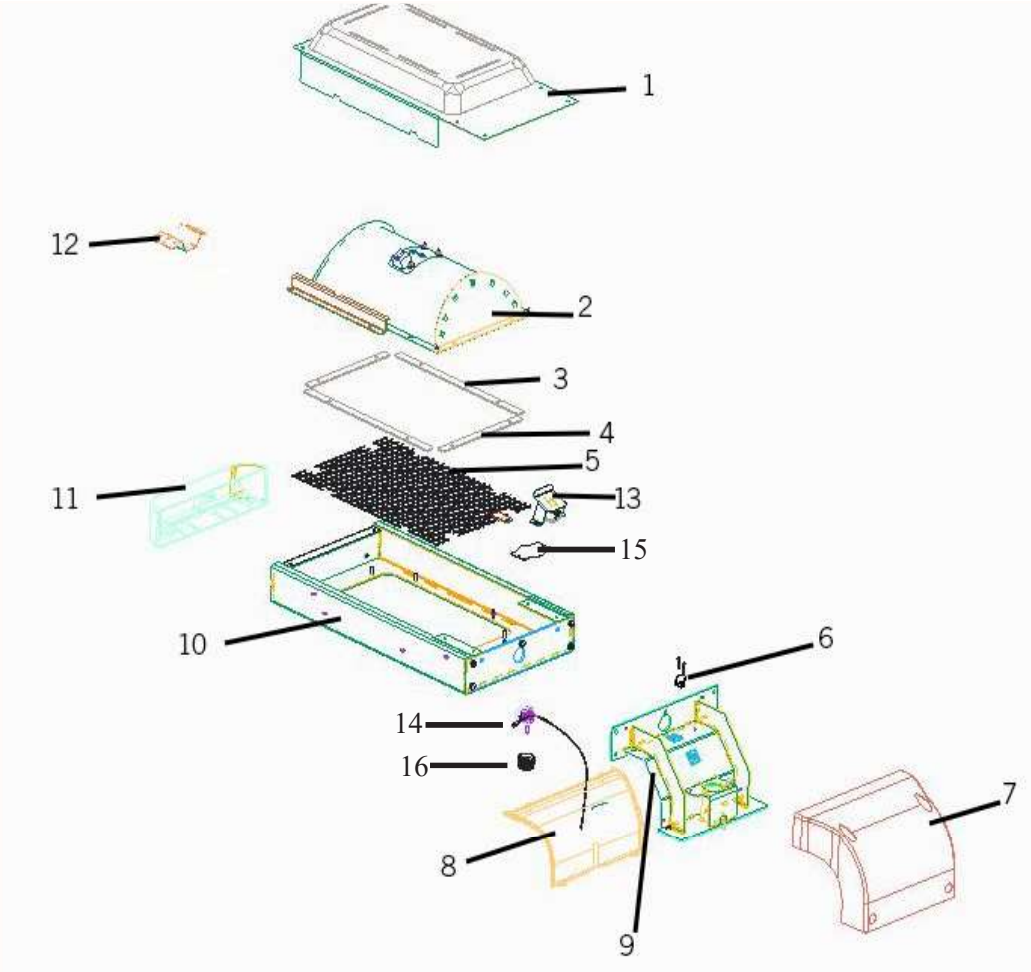


Figure 1. Heater Hood Assembly

1	Reflector cover	9	Hook neck
2	Heater unit assembly	10	Hood structure
3	Reflector insulator long	11	Hood front cover
4	Reflector insulator short	12	Ceramic heater
5	Heater wire mesh	13	LED assembly
6	Swivel sensor	14	LED Switch ASM
7	Hood top cover	15	LED Lens
8	Hood neck bottom cover	16	Knob

RP Kit Name	Kit Contents (x Quantity)	Label as in Figure 1
RP-WMR5XX-Hood Swivel Assembly	• Stopper Hood Rotate (x1) • Neck Assembly (x1) • Washer M6 SST (x5) • Washer M6 Spring SST (x5) • Screw M6x20, BTN, SST (x5) • Shoulder Screw M5 X 30L Hex Socket (x1) • Thrust Bearing Hood Neck (x1)	9
RP-WMR5XX-Hood Neck Covers	• Top Cover Hood Neck (x1) • Bottom Cover Hood Neck (x1) • Label, Warmer, Zero Indication (x2)	7,8
RP-WMR-Heater Reflector Assembly	• Heater Reflector Assembly (x1)	2
RP-WMR-Swivel Sensor Kit	• Sensor Hood Swivel (x1) • Screw M3x18, SST,Phillips (x2) • Spacer Limit Switch (x2)	6
RP-WMR-Ceramic Heater-FSR- 650W, 230VAC	• Heater Holder Assembly (x1)	12
RP-WMR-Heater Hardware Kit	• Wire Mesh (x1) • Insulator Reflector Short (x2) • Insulator Reflector Long (x2) • Ceramic Terminal (x1) • Insulator Reflector Sheet (x1) • Heat Insulator (x1)	3,4,5
RP-WMR-Hood Assembly Covers	• Topcover Hood (x1) • Front Cover Hood (x1) • Label, High Voltage (x1)	1, 11
Observation Light Replacement Kit	• LED and Bracket ASM (x1) • LED Switch ASM • LED Lens	13,14, 15

Cart Assembly

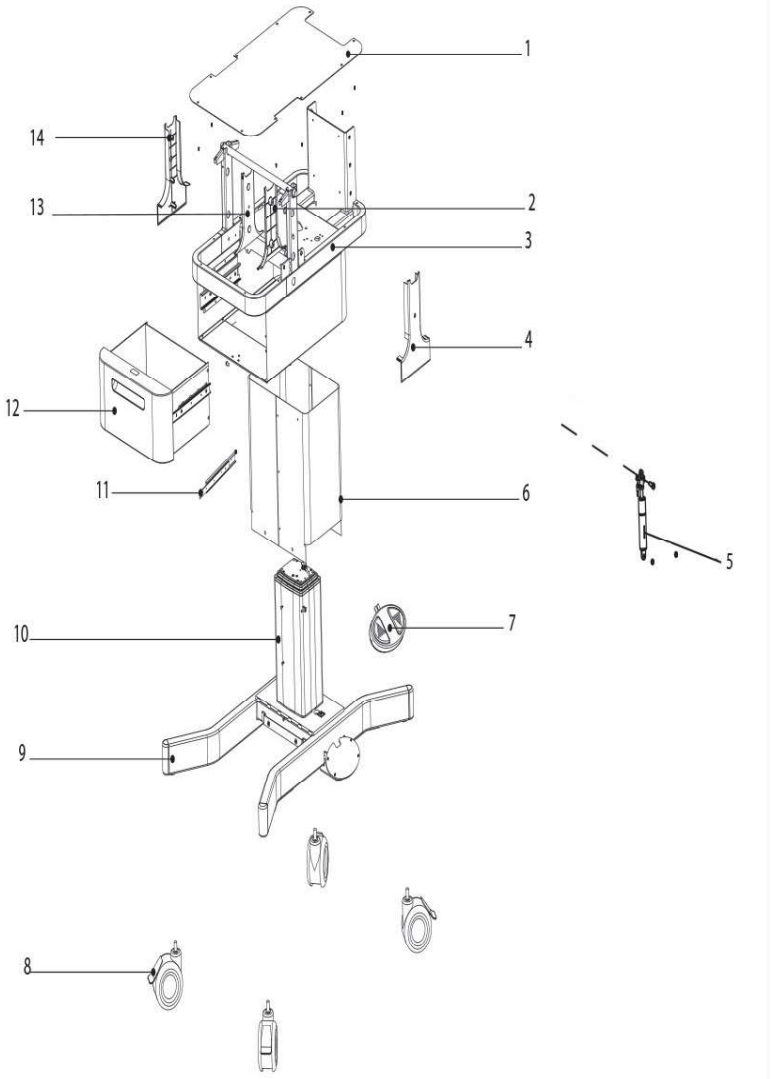


Figure 2. Cart Assembly

1	Cart top cover	8	Caster
2	Cart cover inner gas spring side	9	Pedestal
3	Cart structure	10	Vertical height adjustment (VHA)
4	Cart cover outer gas spring side	11	Storage drawer slide kit
5	Gas springs	12	Storage drawer
6	VHA enclosure	13	Cart cover inner
7	Footswitch	14	Cart cover outer

RP Kit Name	Kit Contents (x Quantity)	Label as in Figure 2
RP-WMR-INC-Castor Set of 4	• Caster (x4)	8
RP-WMR-INC-VHA Assembly	• VHA Three Column (x1) • VHA Screw, DG 80x60 WN 1552 (x8) • Washer M8, (x8) • VHA Cable (x1)	10
RP-WMR-INC-Footswitch Assembly	• Footswitch (x1) • Washer M3, Flat (x4) • Screw M3x13 Self Tapping, SST (x4)	7
RP-WMR-INC- Drawer Assembly	• Screw M4x6, BTN, SST(x4) • Storage Drawer Assembly (x1)	12
RP-WMR-Bed Tilt Gas Spring Set	• Gas Spring Lockable Assembly (x2) • Shoulder Dia 8 M6 X 25L Hex Screw (x1) • Nylock Nut M6 Gas Spring (x3)	5
RP-WMR5XX-Cart Aesthetic Covers	• Outer Cover Cart Pillar (x2) • Inner Cover Cart Pillar GS (x1) • Inner Cover Cart Pillar (x1) • Plug Cover Cart (x4) • Insert Foot (x2)	2,4,13,14
RP-WMR-INC-Drawer Slide Kit	• Storage Drawer Slide (x2) • Screw M4x6,BTN, SST (x10) • WRM-Drawer Stopper (x1)	11

Bed Assembly

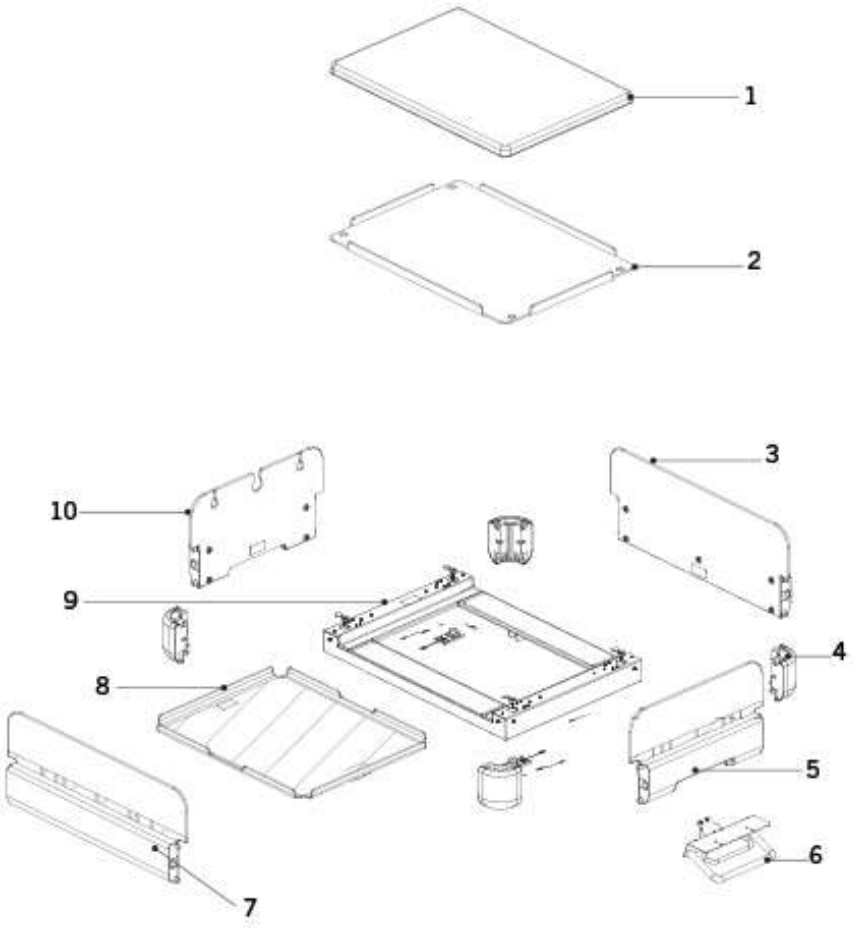


Figure 3. Bed Assembly

1. Mattress
2. Bed acrylic tray
3. Long sidewall
4. Corner block
5. Short sidewall
6. Bed tilt handle assembly
7. Long sidewall
8. X-ray cassette tray (optional)
9. Bed structure
10. Short sidewall with tubing slots

RP Kit Name	Kit Contents (x Quantity)	Label as in Figure 3
RP-WMR-Bed Tilt Handle Assembly	• Handle Bed Assembly (x1)	6
RP-WMR5XX-Corner Block Assembly	• Corner Block Bed Assembly (x1)	4
RP-WMR5XX-Bed Side Wall(short-Slotted)	• Side Wall North Assembly (x1)	10
RP-WMR5XX- Bed Side Wall(Short)	• Side Wall South Assembly (x1)	5
RP-WMR5XX- Bed Side Wall(Long)	• Side Wall E/W Assembly (x1)	3, 7
RP-WMR5XX- Bed Frame	• Structure Bed (x1) • Holder Bed Structure (x2) • Anti Squeak E/W (x2) • Anti Squeak N/S (x4) • Screw M5x10, BTN, SST (x4) • Washer M5, SST (x4) • Washer, M5 Spring SST (x4)	9

Vertical Pillar Assembly

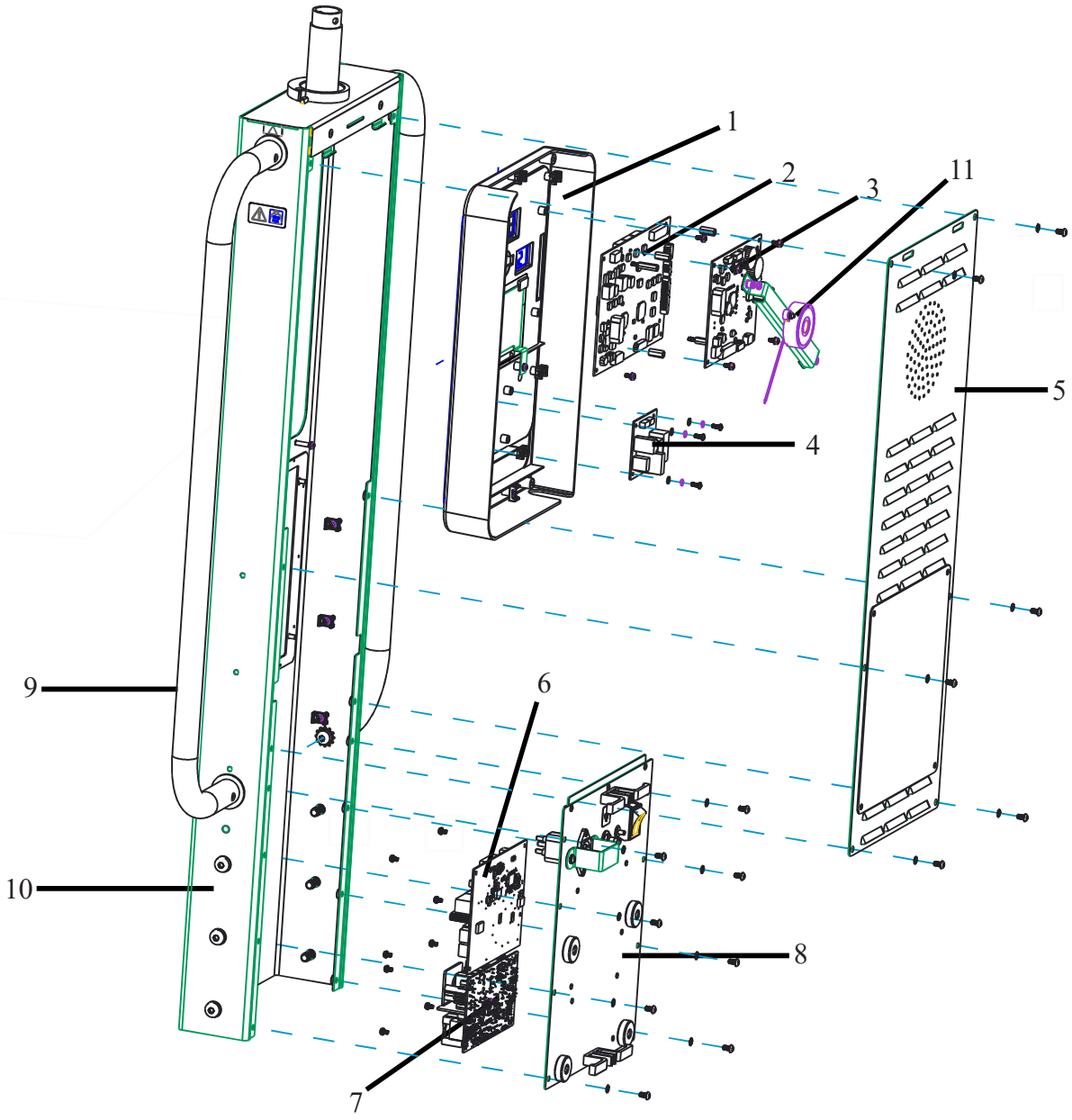


Figure 4. Vertical Pillar Assembly

1. Display housing
2. Display PCB
3. Controller PCB
4. VHA control PCB
5. Vertical pillar cover
6. AC circuit PCB
7. Main power supply
8. Power input panel
9. Accessory rail
10. Vertical pillar structure
11. Alarm speaker assembly

RP Kit Name	Kit Contents (x Quantity)	Label as in Figure 4
RP-WMR5XX-Display PCB	• Display PCB WMR Software Integrated (x1)	2
RP-WMR5XX-Control PCB	• Microcontroller PCB WMR Software Integrated (x1)	3
RP-WMR-AC Circuit PCB	• AC Circuit Board (x1)	6
RP-WMR-INC-VHA Power Supply Main	• Power Supply Main (x1)	7
RP-WMR-INC-VHA Control PCB	• PCB-VHA (x1)	4
RP-WMR-INC-Power Input Assembly	• Power Supply Assembly (x1) • Bracket IEC- Inlet (x1)	8
RP-WMR5XX-Keypad	• Display Front(Keypad) (x1) • PCB Holder Vertical Pillar (x1)	1
Alarm Assembly	• Speaker Bracket (x1) • Speaker Assembly (x1)	11

Cable Harness

RP Kit Name	Kit Contents (x Quantity)
RP-WMR5XX-Power Harness Kit	• Inlet_fuse_line_wire (x1) • Equipotential Earth (x1) • ACCKTBRD_heater_WRHNS (x1) • Cblock_heater_WRHNS (x1) • Heaterhood_earth_WRHNS (x1) • Equipotential_earth_inlet (x1) • ACCKTBRD_powersupply_AC_WRHNS (x1) • ACCKTBRD_powersupply_DC_WRHNS (x1) • Switch-ACCKTBOARD-Line-Wire (x1) • Switch_ACCKTBRD_pfail_WRHNS (x1) • Main fuse (x5)
RP-WMR5XX- Signal Cable Kit	• Controllerbrd_swivelsw_WRHNS (x1) • Displaybrd_ACCKTBRD_wireharness (x1) • Displaybrd_controllerbrd_WRHNS (x1) • Skinsensorconn _WRHNS (x1) • Swivelsw_vpillar_WRHNS (x1)
RP-WMR5XX- VHA Harness KIT	• VHA Cable • ACCKTBRD_VHAPS_WRHNS (x1) • VHAPS_VHACTRLBRD_WRHNS (x1) • FS_VHACTRLBRD_WRHNS (x1) • FS_CART_WRHNS (x1) • VHA_VHACTRLBRD_WRHNS (x1) • Displaybrd_VHACTRLBRD_WRHNS (x1)

Small Parts

RP Kit Name	Kit Contents (x Quantity)
RP-WMR-Fasteners,Standard Hardware Kit	• Screw Caps (x10) • Insert Foot (x10) • Screw M3x8, PH Crss, Sst (x10) • Washer M3, Spring (x10) • Washer M3, Flat (x10) • PCB Spacer M3x16 (x10) • Screw M8x20 , BTN,SST (x5) • Washer M8, Spring (x5) • Washer M8, Flat (x5) • Screw M4x6,BTN, SST (x6) • Grommet Footswitch (x1) • Washer M5 SST (x4) • Washer M5 Spring SST (x4) • Screw M5x10, BTN, SST (x4) • Cable Tie Mount, M3 (x10) • Cable Tie (x20) • Cable Tie Mount (x10) • Screw M4x8, CSK, SST (x10) • Washer M4, Flat (x10) • Washer M4, Spring (x10) • Screw M4x8,BTN, SST (x10) • Finishing Washer 16 mm (x20) • Screw M4x12,BTN, SST (x10) • Screw M4x16, BTN, SST (x6) • Plug Cover Cart (x4) • M4 Washer Serrated (x10) • Washer M6 SST (x5) • Washer M6 Spring SST (x5) • Screw M6x20, BTN, SST (x5)

Chapter 9. Technical Specifications

Parameters/Conditions	Values/Description
230 VAC Power Requirements	• Rating: AC 230 V; peak power consumption (including electrical height adjustment operation) 750 VA; frequency 50/60 Hz • Operating voltage range: AC 230 V ± 10% • Breaker: 10 A, 230 V IEC 60934
115 VAC Power Requirements	• Rating: AC 115 V; peak power consumption (including electrical height adjustment operation) 750 VA; frequency 50/60 Hz • Operating voltage range: AC 115 V ± 10% • Breaker: 10 A, 230 V IEC 60934
Classification	• Type of protection: Class 1 equipment • Degree of protection: Type BF applied part – Not for use in an environment of air and flammable anesthetic gas mixture or an oxygen/nitrous oxide and flammable anesthetic gas mixture. • Mode of operation: Continuous operation – The electrical height adjustment is intended for intermittent operation.
Operating Conditions	• Ambient temperature: 18°C to 30°C • Relative humidity: 30% to 75% • Ambient air velocity: < 0.3 m/s • Atmospheric Pressure: 70 kPa~106 kPa
Packed Storage Conditions	• Ambient temperature: -25°C to 50°C • Relative humidity: 10% to 95% (non-condensing)
Regulatory Standards	• IEC60601-1: General requirements for basic safety and essential performance. • IEC60601-1-2: Electromagnetic compatibility. • IEC60601-1-6: Medical electrical equipment - General requirements for basic safety and essential performance - Collateral standard: Usability • IEC60601-1-8: Medical electrical equipment - General requirements for basic safety and essential performance -- Collateral standard: General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems • IEC60601-1-10: Medical electrical equipment - General requirements for basic safety and essential performance - Collateral standard: PCLC • IEC60601-2-21: Particular requirements for basic safety and essential performance of infant radiant warmers.
Device Operation Modes	Manual temperature control/Skin temperature control/ Standby mode.
Maximum Heater Wattage at 100% Setting	650 W at 230 V or 115 V, 50/60 Hz.

Parameters/Conditions	Values/Description
Maximum Bed Irradiance	• Total Spectrum is less than 60 mW/cm^2 • 760 nm to 1400 nm is less than 10 mW/cm^2
Skin Temperature Display Range	18.0°C to 45.0°C: Resolution 0.1°C, Accuracy ± 0.3°C
Graphic Display Characteristics	• Pixel Resolution: 480 pixels by 272 pixels {10.9 cm (4.3') TFT (Thin Film Transistor)}, 16 M Colors
Skin Temperature Setting Range	33.0°C to 38.0°C (in 0.1°C increments)
Heater Output Setting Range	0% to 100% (in 5% increments)
Heater Output Indication	Numeric display 0% to 100%, resolution 1%
APGAR Timer	10 second beep at 1 minute, 5 minutes, 10 minutes, and 20 minutes.
Observation Light	Variable with intensity range of 0 - 1000 lux (max)
Alarms	Low skin temperature, high skin temperature, check baby, power failure, system failure, skin temperature probe disconnected, and skin temperature probe failure.
Alarm Volume	Max: 69dB Min: 54dB
Mattress Platform Tilting	Continuous horizontal tilt of ± 12°(freely adjustable and lockable)
Dimensions	• Main body: 85(W) x 117(D) cm Height 180 to 200 cm (mattress surface 90 to 110 cm in height) • Mattress: 47(W) x 67(D) x 2.5(H) cm
Maximum Weight Without Accessories	105 kg
Storage	1 storage drawer 5 kg Max load
Bed Load Capacity	Infant weight up to 10 kg
Scale (Optional)	• Measuring Range: 250 g - 8,000g (0.55 to 17.6 lb) • Accuracy: 10 g • Resolution: 10 g

Chapter 10. Accessories

The following International Biomedical accessories are available for use with the NuBorne 500

Name	International Biomedical Part Number
Reusable Patient Probe (x1)	108-4855
Foam Mattress (not available in U.S.)	109-3828
Pressure Diffusing Mattress	736-1120
Acrylic Mattress Platform	110-3829
Acrylic X-Ray Tray	110-3830
IV Pole	110-3833
Monitor Stand	110-3834
Oxygen Cylinder Holder	332-0005
115 V Power Cord NEMA 5-15P	711-0028
230 V Power Cord CEE 7/7	110-3494
UPS Option 115 VAC	017-0048
UPS Option 230 VAC	017-0047

Contact your service provider or International Biomedical representative for the latest accessories list for the NuBorne 500.

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Appendix A. EMC Information

EMC Warnings

When using the device adjacent to or stacked with other equipment, observe the operation of the device and the other equipment to ensure normal operation.

Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm to any part of the device and associated cables. Otherwise, degradation of the performance of this equipment could occur.

Use only parts, accessories, transducers, and cables designated by International Biomedical for use with the device. Cables and accessories other than those supplied by International Biomedical may result in unacceptable operation of the device and will void the equipment warranty.

The use of devices which radiate high intensity electrical fields may affect the operation of the device. Constant assessment of the patient and all life support equipment is mandatory whenever interfering devices are operating on or near patient.

Guidance and Manufacturer's Declaration - Emissions

The device is intended for use in the electromagnetic environment specified below. The customer or user of the device should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	Group 1	The device uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Conducted Emissions CISPR 11	Class B	The device is suitable for use in all establishments, other than domestic, and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonics IEC 61000-3-2	Class A	
Flicker IEC 61000-3-3	Complies	

Guidance and Manufacturer's Declaration - Immunity

This device is intended for use in the electromagnetic environment specified below. The customer or user of the device should ensure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
ESD IEC 61000-4-2	± **8 kV Contact** ± **15 kV Air**	± **8 kV Contact** ± **15 kV Air**	Floors should be wood, concrete, or ceramic tile. If floors are synthetic, the r/h should be at least 30%.
EFT IEC 61000-4-4	±2 kV Mains ±1 kV I/Os	±2 kV Mains ±1 kV I/Os	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 0.5/1 kV Differential ± 0.5/1/2 kV Common	± 0.5/1 kV Differential ± 0.5/1/2 kV Common	Mains power quality should be that of a typical commercial or hospital environment.
Voltage Dips/ Dropout IEC 61000-4-11	100% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25/35 Cycles 100% Dip for 250/350 Cycles	100% Dip for 0.5 Cycle 60% Dip for 5 Cycles 30% Dip for 25/35 Cycles During the 5 Second event, the device will enter power fail.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the device requires continued operation during power mains interruption, it is recommended that the device be powered from an uninterruptible power supply.
Power Frequency 50/60 Hz Magnetic Field IEC 61000-4-8	30 A/m	30 A/m	Power Frequency magnetic fields should be that of a typical commercial or hospital environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz (AC/DC) 6 Vrms (in ISM Bands between 150kHz and 80MHz) 3 V/m 80 MHz to 2.7 GHz	3 Vrms 150 kHz to 80 MHz (AC/DC) 6 Vrms (in ISM Bands between 150kHz and 80MHz) 3 V/m 80 MHz to 2.7 GHz (V1) Vrms (E1) V/m	Portable and mobile communications equipment should be separated from the device by no less than the distances calculated/listed below: D= (3.5)/V_1 √P D= (3.5)/E_1 √P 80 to 800 MHz D= 7/E_1 √P 800 MHz to 2.7 GHz Where P is the max power in watts and D is the recommended separation distance in meters. Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels (V1 and E1). Interference may occur in the vicinity of equipment containing a transmitter.
Proximity fields from RF Wireless Communication Equipment IEC61000-4-3	See IEC 60601-1-2 8.10	See IEC 60601-1-2 8.10	This equipment should be placed no closer than 30cm from the nearest RF Wireless communication device.

Recommended Separation Distances between Portable and Mobile RF Communications Equipment and this Device

The device is intended for use in the electromagnetic environment in which radiated disturbances are controlled. The customer or user of the device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF Communications Equipment and the device as recommended below, according to the maximum output power of the communications equipment.

MAX OUTPUT POWER (WATTS)	Separation (m) 150 kHz to 80 MHz $D= (3.5)/V_1 \sqrt{P}$	Separation (m) 80 to 800 MHz $D= (3.5)/E_1 \sqrt{P}$	Separation (m) 800 MHz to 2.5 GHz $D= (7)/E_1 \sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.67	11.67	23.33

For transmitters rated at a maximum output power not listed above, the recommended separation distance D in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

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

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

Appendix B Product Disposal

Environmental Requirements

International Biomedical is concerned about protecting the natural environment and helps to ensure continued safe and effective use of this product through proper support, maintenance, and training. International Biomedical device is therefore designed and manufactured to comply with relevant guidelines for environment protection. As long as the device is properly operated and maintained, it presents no risk to the environment. However, the device may contain materials which could be harmful to the environment if disposed of incorrectly. Use of such materials is essential for the implementation of certain functions and for meeting certain statutory and other requirements.

Final Disposal

Final disposal is when you dispose of the equipment or system in such a way that it can no longer be used for its intended purpose.

Warning

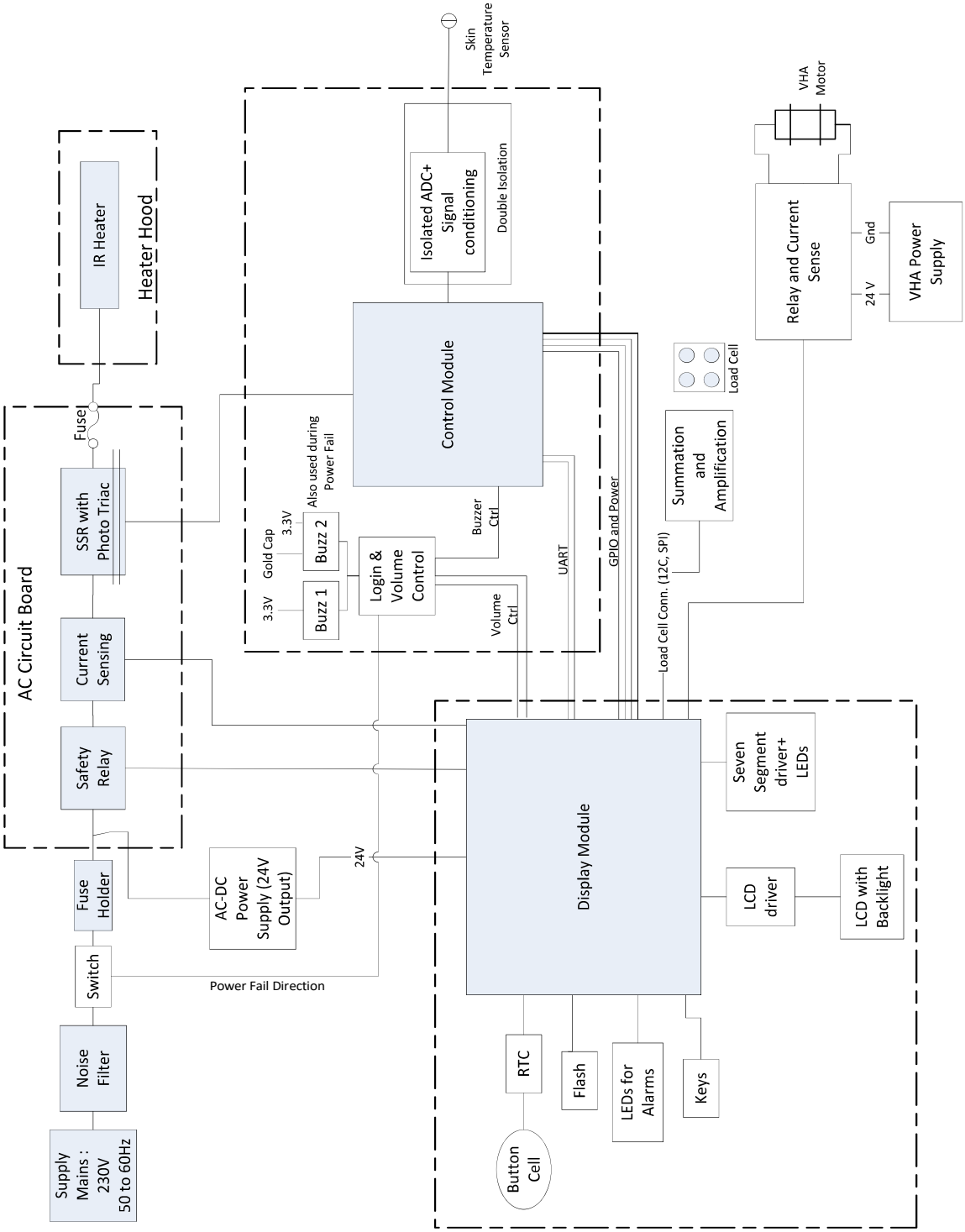
- Never dispose of this product (or any parts of it) in industrial waste or domestic waste. The system may contain materials hazardous substances that can cause serious environmental pollution. The system also contains privacy sensitive information. It is advisable to contact your International Biomedical representative before disposing of this product.

International Biomedical gives support for:

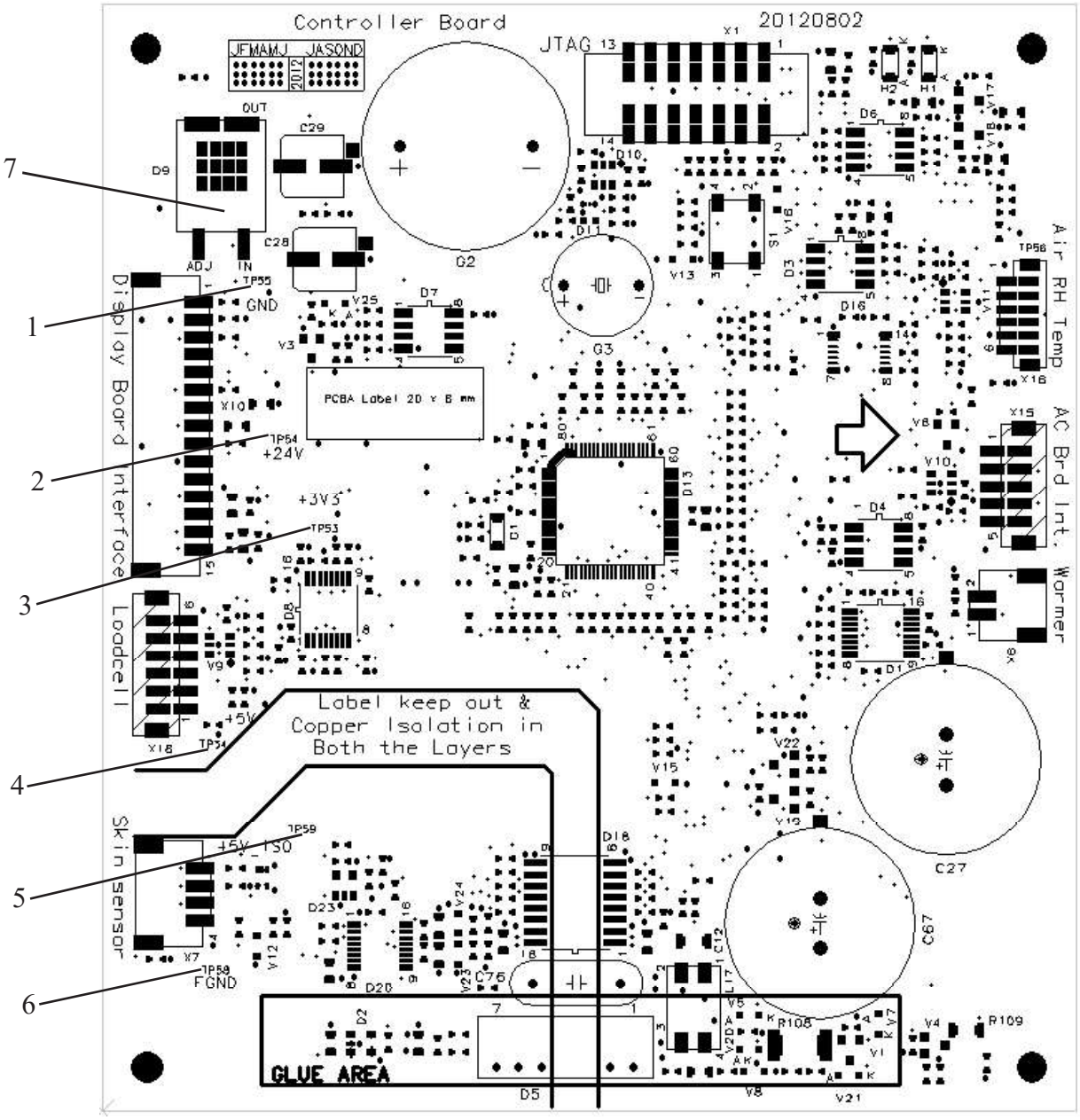
- Recovery of reusable parts
- The recycling of useful materials by competent disposal companies
- Safe and effective disposal of equipment

Appendix C. Schematics

System Interconnection

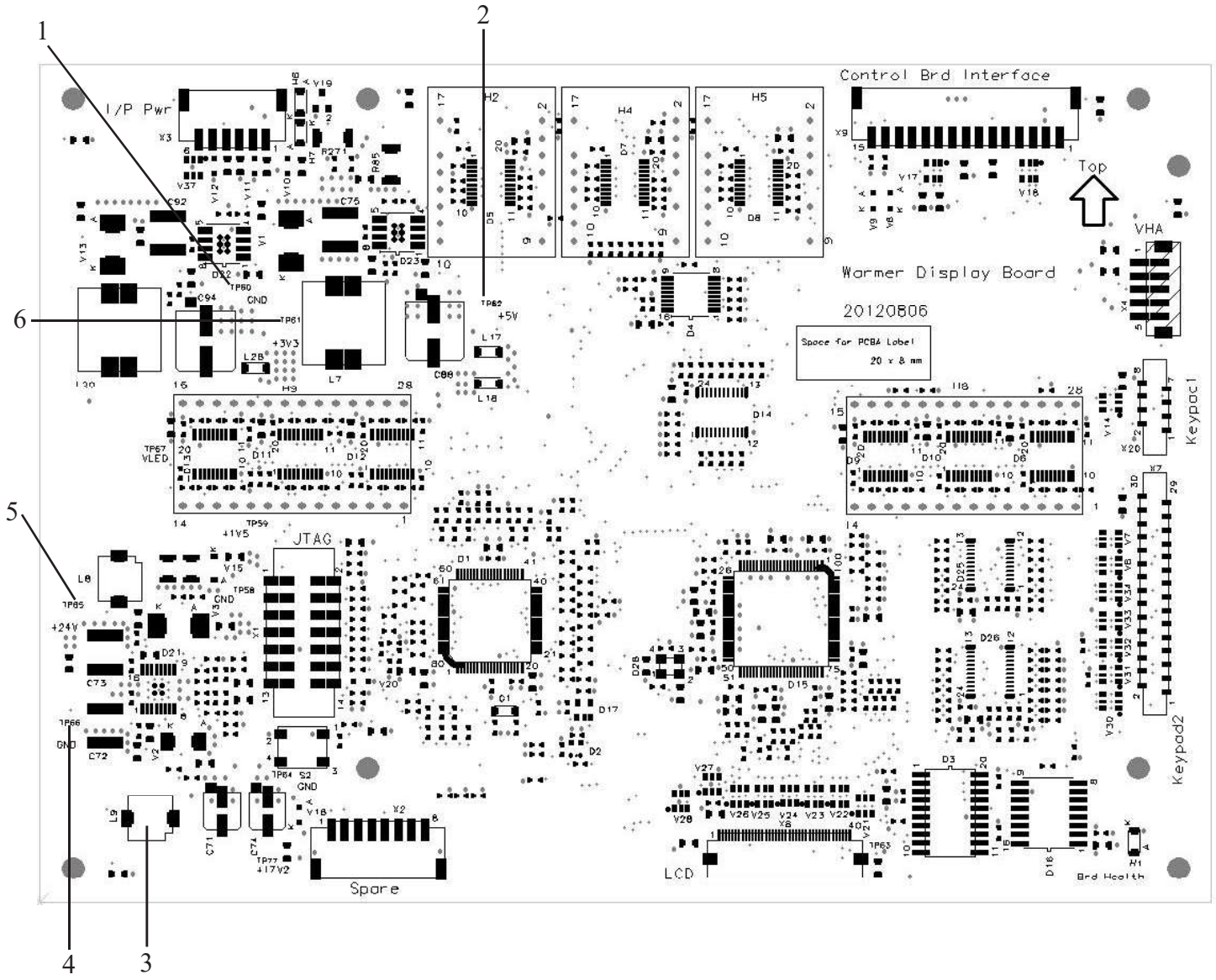


System Interconnect Diagram



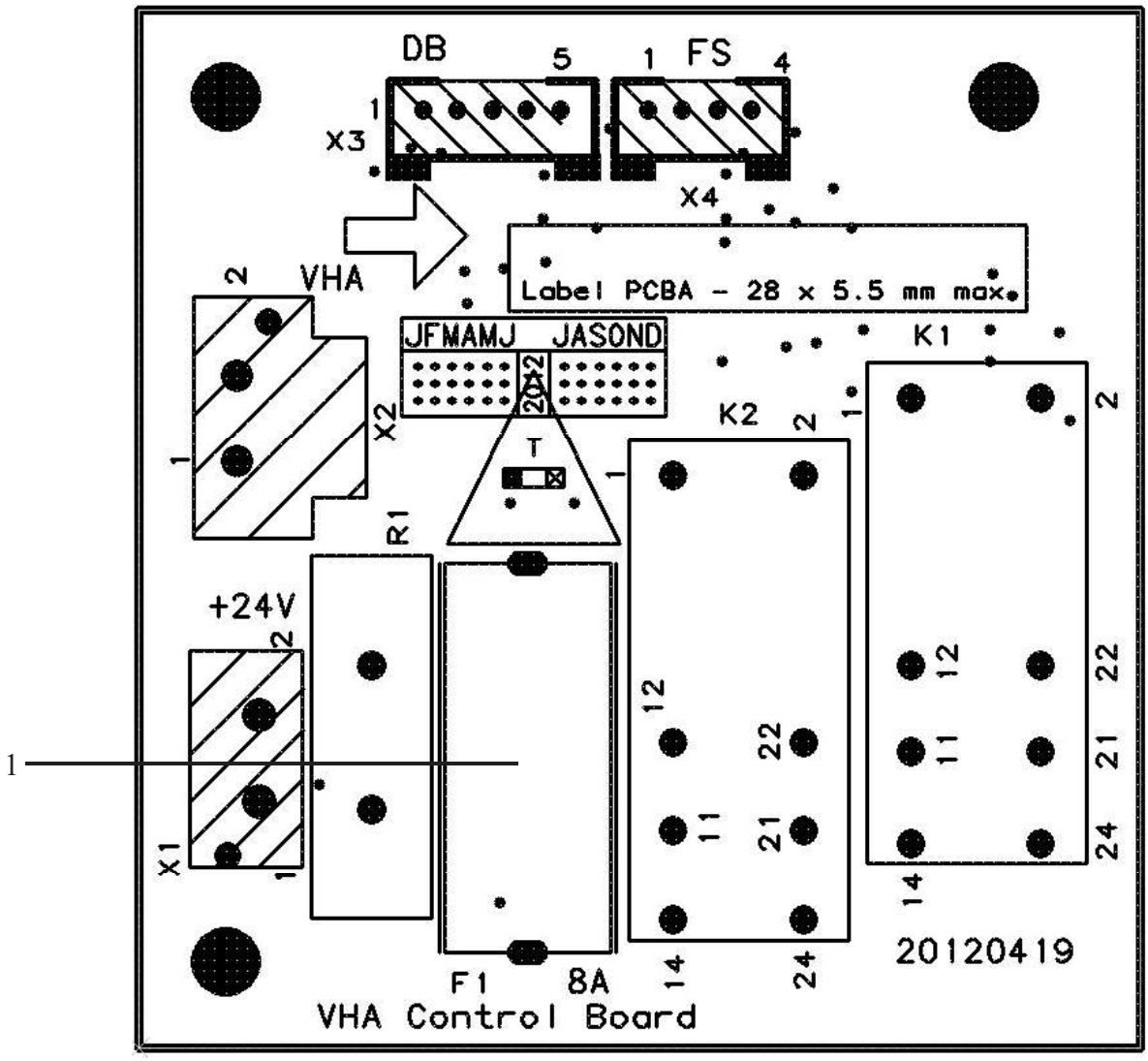
#	Test Points	Measured Voltage
1.	TP 55	GND
2	TP 54	+24 V
3	TP 53	+3.3 V
4	TP 34	+5 V
5.	TP 59	+3.3 V
6.	TP58	(Isolation) GND
7.	D9 (OUT)	+16V

Figure 3. Controller Board



#	Test Points	Measured Voltage
1.	TP 60	GND
2	TP 62	+5 V
3.	L9 (Pin1 or 2)	+17.2V
4.	TP 66	GND
5.	TP 65	+24 V
6.	TP 61	+3.3 V

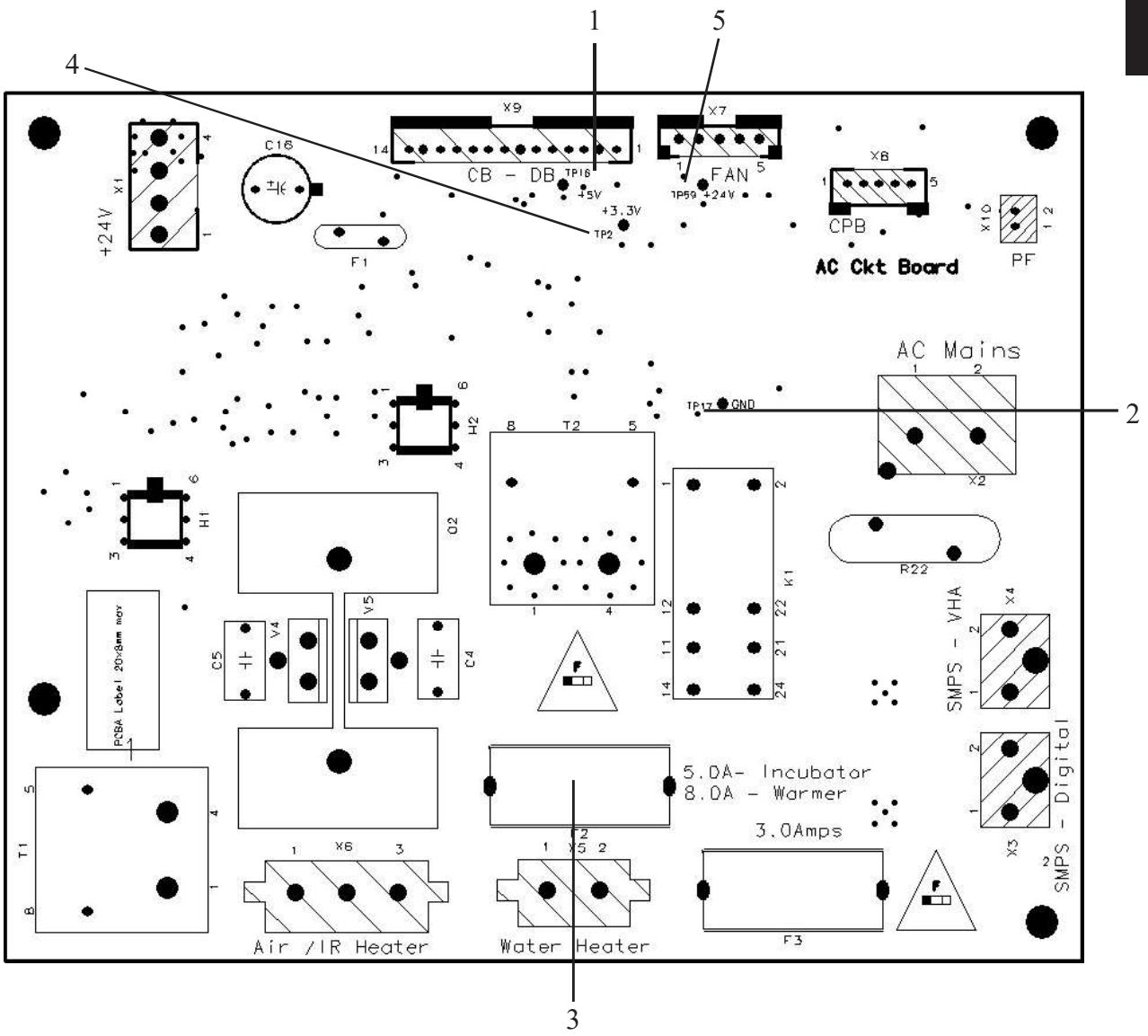
Figure 2. Display Board Test Points



1

#	Fuse Location	Rating
1.	F1 (replacable fuse)	8A, 250V, Timelag, 5mm x 20 mm

Figure 5. VHA Control Board



#	Test Points/Fuse Location	Measured Voltage/Rating
1.	TP 16	+5 V
2.	TP 17	GND
3.	F2 (replacable fuse)	8A, 250V, fast blow, 5 mm x 20 mm
4.	TP2	+3.3V
5.	TP59	+24V

Figure 4. AC Circuit Board

Proprietary Information

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