3M
Bair Hugger™
Model 750 Warming Unit

Service Manual

GB **Bair Hugger Model 750 Warming Unit Service Manual**

For information on operating the Model 750 temperature management unit, please refer to the Model 750 Operator's Manual.

Please forward to Biomedical Engineering Department

FR **Manuel d'entretien du module de réchauffement Bair Hugger, modèle 750**

Pour de plus amples informations concernant le fonctionnement de l'unité de régulation thermique, modèle 750, veuillez consulter le manuel de l'utilisateur du modèle 750.

## Merci de transmettre au service d'ingénierie biomédicale

DE **Bair Hugger Erwärmungsgerät, Modell 750 - Wartungshandbuch**

Informationen zum Betrieb des Temperaturmanagementgeräts Modell 750 finden Sie im Betriebshandbuch für das Modell 750.

Bitte an die Abteilung für biomedizinische Technik weiterleiten
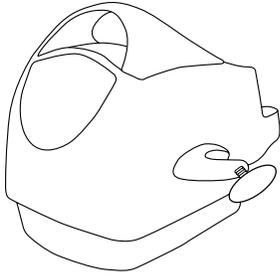
Bair Hugger™

Total Temperature Management™ System

3M
Bair Hugger
Model 750 Warming Unit

Service Manual

Table of Contents

Introduction

Description of the Total Temperature Management™ System

The 3M™ Bair Hugger™ brand Total Temperature Management system consists of a Model 750 forced-air temperature management unit (with optional rolling stand, and other accessories) and disposable components, including Bair Hugger forced-air blankets, the 3M™ 241™ blood/fluid warming set, and may be used with the 3M™ Bair Paws™ patient warming gowns.

The Bair Hugger warming unit is attached to the blanket or gown by means of a flexible hose. Warm air is generated in the unit and flows through the hose and into the blanket or gown. Depending on the model, the blanket or gown is placed either around, over, or underneath the patient. Small perforations on the blanket or gown allow the warm air to be dispersed over the patient. For fluid warming applications, the Model 241 blood/fluid warming set is inserted in the warming unit hose. When the unit is turned ON and a temperature setting is selected, warm air flows over the Model 241 tubing and warmed fluid exits from the distal end of the tubing. For additional information on Bair Hugger blankets, Bair Paws gowns, the 241 blood/fluid warming set, or other accessories visit us online at bairhugger.com or bairpaws.com.

This manual includes operating and service instructions and unit specifications for the Model 750 temperature management unit. You can use the Model 750 temperature management unit in all clinical settings where the patient may become too warm or too cold including the operating room to provide patient temperature management. For information about using Bair Hugger blankets, Bair Paws gowns or the 241 blood/fluid warming set with the Model 750 temperature management unit, refer to the "Instructions for Use" included with each of these disposable components. The Bair Hugger system should only be used by trained medical professionals.

Indications

The Bair Hugger temperature management system is intended to prevent and treat hypothermia. In addition, the temperature management system can be used to provide patient thermal comfort when conditions exist that may cause patients to become too warm or too cold. The temperature management system can be used with adult and pediatric patients.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

3

Definition of Symbols

The following symbols may appear on the product's labeling or exterior packaging.

An equipotentiality plug (grounded) conductor other than a protective earth conductor or a neutral conductor, providing a direct connection between electrical equipment and the potential equalization busbar of the electrical installation. Please consult IEC 60601-1; 2005 for requirements.
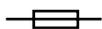
Fuse

Nonexplosion proof

Type BF equipment (patient applied)

Voltage, alternating current (AC)

This system is subject to European WEEE Directive 2002/96/EC.
This product contains electrical and electronic components and must not be disposed of using standard refuse collection. Please consult local directives for disposal of electrical and electronic equipment.

Protective earth ground

No free hosing

Consult operator's manual

Consult instructions for use

Recycle to avoid environmental contamination. This product contains recyclable parts. For information on recycling - please contact your nearest 3M Service Center for advice.

Manufacturer

Attention; see instructions for use

Keep dry

Temperature limits

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4

Bair Hugger Model 750 Temperature Management Unit Service Manual
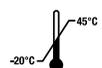
Explanation of Signal Word Consequences

⚠ **WARNING:**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **CAUTION:**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE:

Indicates a situation which, if not avoided, could result in property damage only.

Contraindications

Do not apply heat to lower extremities during aortic cross-clamping. Thermal injury may occur if heat is applied to ischemic limbs.

⚠ WARNING

1. Do not leave patients with poor perfusion unmonitored during prolonged warming therapy sessions. Thermal injury may result.

2. The Bair Hugger temperature management unit has been designed to operate safely ONLY with 3M Patient Warming disposable components. Use with other products may cause thermal injury. (To the full extent permitted by law, the manufacturer and/or importer declines all responsibility for thermal injury resulting from the unit being used in conjunction with product other than 3M Patient Warming products.)

3. Do not warm patients with the temperature management unit hose alone. Thermal injury may result. Always connect the hose to a Bair Hugger blanket or Bair Paws gown before providing therapy.

4. Do not place the non-perforated side of the blanket on the patient. Thermal injury may result. Always place the perforated side (the side with small holes) towards the patient.

5. Do not continue temperature management therapy if the Over-temp indicator light illuminates and the alarm sounds. Thermal injury may result. Unplug the unit, and contact a qualified service technician.

6. Do not continue 241 blood/fluid warming therapy if the Over-temp indicator light illuminates and the alarm sounds. Immediately stop fluid flow, and discard the blood/fluid warming set. Unplug the temperature management unit, and contact a qualified service technician.

7. Do not use a forced-air warming device over transdermal medication. Increased drug delivery and patient injury or death may occur.

8. Do not allow the patient to lie on the warming unit hose or allow the hose to directly contact the patient's skin during patient warming; thermal injury may result.

9. Reusable blankets made from woven fabric, or blankets without discrete, visible holes, can cause the safety system of this unit to fail, which may result in serious thermal injury. This warming unit has been designed to operate safely ONLY with Bair Hugger blankets and Bair Paws gowns.

10. Do not connect a Bair Hugger blanket, 241 blood/fluid warmer, or Bair Paws gown to the warming unit if it has been cut or damaged; thermal injury may result.

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Bair Hugger Model 750 Temperature Management Unit Service Manual   5

11. Do not use a Bair Hugger blanket to transfer or move the patient; injury may result.

12. To reduce the risks associated with hazardous voltage and fire:

- keep power cord visible and accessible at all times. The plug on the power cord serves as the disconnect device. The wall socket outlet shall be as close as practical and shall be easily accessible.

- use only the power cord specified for this product and certified for the country of use.

- do not allow the power cord to get wet.

- do not use the warming unit when it appears the warming unit, power cord or any component is damaged. Contact 3M Patient Warming technical support at 1-800-733-7775.

- this equipment must only be connected to a supply mains with protective earth.

13. To reduce the risks associated with exposure to biohazards always perform the decontamination procedure prior to returning the warmer for service and prior to disposal.

14. Do not retain the patient using a warming blanket alone, as injury may result. Use a draw sheet, safety strap, or other means to retain the patient.

15. Do not modify this equipment without authorization of the manufacturer.

16. To ground this Bair Hugger warming unit, only connect to receptacles marked "Hospital Only" "Hospital Grade," or a reliable grounded outlet.

⚠ CAUTIONS

1. Except for specific blanket models, Bair Hugger blankets are not sterile and are all intended for single patient use ONLY. Placing a sheet between the Bair Hugger blanket and the patient does not prevent contamination of this product.

2. Monitor the temperature and cutaneous response of patients who are incapable of reacting, communicating and/or who are without a sense of feeling every 10-20 minutes or according to institutional protocol. Monitor the patient's vital signs regularly. Adjust air temperature or discontinue therapy when the therapeutic goal is reached or if vital sign instability occurs. Notify physician of vital sign instability immediately.

3. Do not leave pediatric patients unattended during therapy.

4. Do not initiate temperature management therapy unless the temperature management unit is free from mechanical damage and is safely placed on a hard surface or securely mounted. Otherwise, injury may result.

5. To prevent tipping, clamp the Model 750 temperature management unit to an IV pole at a height that provides stability. We recommend clamping the unit no higher than 44" (112 cm) on an IV pole with a minimum 28" (71 cm) diameter wheelbase. Failure to do so may result in IV pole tipping, catheter site trauma, and patient injury.

6. Electrical shock hazard. Do not disassemble the temperature management unit unless you are a qualified service technician. There are electrically live parts with in the unit when it is connected to a power source, even when the unit is in *Standby* mode.

7. To reduce the risks associated with environmental contamination follow applicable regulations when disposing of this device or any of its electronic components.

NOTICES

1. The Bair Hugger temperature management unit meets medical electronic interference requirements. If radio frequency interference with other equipment should occur, connect the unit to a different power source.

2. Federal law (USA) restricts this device to sale by or on the order of a licensed healthcare professional.

3. To avoid Bair Hugger warming unit damage:

   - do not immerse the Bair Hugger warming unit or warming unit parts or accessories in any liquid or subject them to any sterilization process.
   - do not use solvents such as acetone or thinner to clean the warming unit; avoid abrasive cleaners.
   - clean warming unit exterior with soft cloth using plain water or a mild, all-purpose or nonabrasive cleaner.

Proper Use and Maintenance

3M Patient Warming assumes no responsibility for the reliability, performance, or safety of the temperature management unit if the following events occur:

- Modifications or repairs are performed by unqualified personnel.
- The unit is used in a manner other than that described in the Operator's or Service Manuals.
- The unit is installed in an environment that does not meet the appropriate electrical and grounding requirements.

Read Before Servicing Equipment

All repair, calibration, and servicing of the Bair Hugger model 750 temperature management unit requires the skill of a qualified, medical equipment service technician who is familiar with good practice for medical device repair. If service does not require the manufacturer's attention, the Model 750 Service Manual provides the technical information needed to service the unit, or 3M Patient Warming will provide that information on request. Perform all repairs and maintenance in accordance with the instructions in the Service Manual.

Safety Inspection

Perform a safety inspection after making repairs to the Bair Hugger temperature management unit and before returning the unit to service. A safety inspection should include calibrating the operating temperature settings and testing the over-temperature detection function as described in this service manual as well as testing for leakage current and continuity check on safety ground.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

7

Overview

When you connect the Model 750 temperature management unit to a grounded power source, the unit automatically performs the power-on-reset operation described below. Following the power-on-reset operation, the unit will enter the *Standby* mode. You can select any operating mode by pressing the appropriate button on the unit's control panel. See Figure 1.

Alternative Mode button
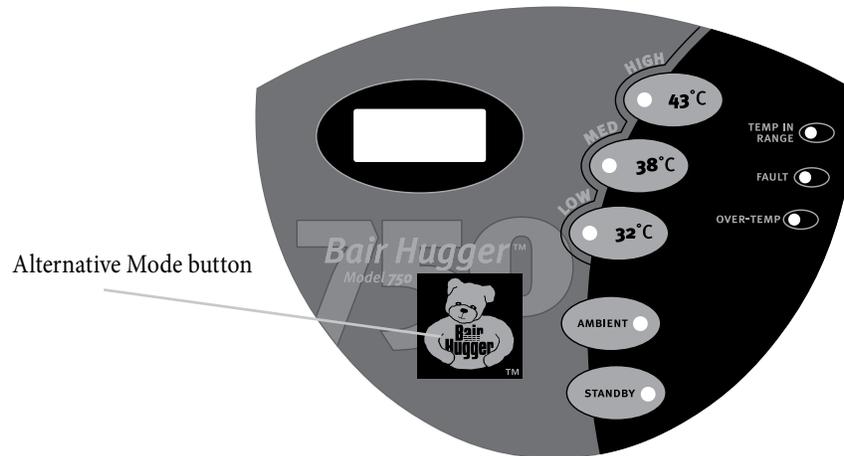
Figure 1. Control panel

Unit Power-On-Reset

The Model 750 temperature management unit performs the following power-on-reset sequence after you connect the unit to a grounded power source:

- Performs all self-test functions.

- Illuminates all indicator lights and all pixels in the alphanumeric display momentarily.

- Displays the text "MD 700's" and the software revision level in the alphanumeric display.

- Produces 3 chirping sounds.

- Enters the *Standby* mode.

If the temperature management unit loses power for less than 1 second, the unit's software will remain in the operating mode you selected prior to the power loss. If the unit loses power for longer than 1 second, the unit's software will reset when you restore power. The unit will then enter the *Standby* mode.

Operating Modes

The Model 750 temperature management unit has 4 operating modes: *Ambient, 32°C, 38°C, 43°C.*

To select the *32°C, 38°C, 43°C,* or *Ambient* mode, press the corresponding button. The temperature management unit will operate within the specified temperature range, shown in the table below.

Temperature Mode	Temperature of Delivered Air
32°C	32°C ± 1.5°C
38°C	38°C ± 1.5°C
43°C	43°C ± 1.5°C
Ambient	Unit will supply air that is slightly warmer than room temperature

After you select a temperature mode, the following events occur:

- Corresponding indicator light illuminates.

- Blower operates.

- Heater activates except in *Ambient* mode.

- Temperature mode timer and hour meter activate.

- Temperature at the blanket-end of the hose appears in the alphanumeric display.

- *Temp in Range* indicator light illuminates when the temperature at the blanket end of the hose is within ±1.5°C* of the selected setting; this indicator light does not illuminate in the *Ambient* mode.

Standby Mode

To place the unit in *Standby* mode, press the **Standby** button. When in *Standby* mode, the following events occur:

- *Standby* indicator light illuminates.

- Blower and heater turn off.

- Alphanumeric display deactivates.

- Temperature mode timer pauses.

- Alarm and fault detection functions remain active.

* Within ±3°C in units with < Rev L software. The Rev version appears in the display window upon connection to a power source.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

9

Fault Conditions

The Model 750 temperature management unit's software recognizes several nonhazardous fault conditions including:

- Sensor failures
- Heater failures
- Computer failure
- Software failure
- Keypad failure
- Power supply failure
- Blower motor failure
- Forced over-temperature test failure

When a fault condition exists, the following events occur:

- Fault indicator light flashes.
- Audible alarm sounds.
- Blower heater turns off.
- Fault code appears in the alphanumeric display.
- Up to 5 fault codes are stored in memory.

When the audible alarm sounds, press any button on the keypad to temporarily silence it. The temperature management unit must be unplugged before it can be restarted. See *Viewing the Fault Code Log* and the *Fault Code Table* for more information about specific fault codes.

Over-Temperature Condition

When an overtemperature condition exists, the following events occur:

- Over-temp indicator light flashes.
- Audible alarm sounds.
- Blower and heater turn off.
- Fault code appears in the alphanumeric display (see *Fault Code Table*).

When the audible alarm sounds, press any button on the keypad to temporarily silence it. The temperature management unit must be unplugged before it can be restarted.

* Up to 3 fault codes in units with < Rev L software. The Rev version appears in the display window upon connection to a power source.

Alternative Modes

The Model 750 temperature management unit has 5 *Alternative* modes that allow access to the service and calibration utilities of the unit.

Alternative Modes	Description
AltMode0	*Hour meter*
AltMode1	*Calibration*
AltMode2	*Fault code log*
AltMode3	*System information*
AltMode4	*Over-temperature detection test*

The *Hour Meter* mode displays the cumulative amount of operating time (in *Ambient, Low, Medium,* and *High* modes) the temperature management unit has accrued since the initialization of EEPROM. The time is displayed in whole hours only.

The *Calibration* mode allows a technician to check and adjust the hose end sensor calibration. This should be done as part of routine maintenance and always after servicing the temperature management unit or replacing the hose. The hose end sensor temperature can be altered a maximum of ±3.0°C by adjusting the calibration offset value. In the *Calibration* mode, the temperature management unit operates in the *Ambient* temperature mode, and the alphanumeric display shows the current hose end sensor temperature and calibration offset with 0.1°C precision.

The *Fault Code Log* mode sequentially displays the last 5* fault codes stored in system memory. Please refer to the Fault Code Table on page 17 for more information about a particular fault code.

The *System Information* mode allows the technician to view important system information including the firmware, system identification, serial port baud rate, 5V power supply status, and the control board serial number.

The *Over-temperature Detection Test* mode allows the user to test the operation of the independent over-temperature shutdown system.

* The last 3 fault codes in units with < Rev L software. The Rev version appears in the display window upon connection to a power source.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

11

Accessing the Alternative Modes

To access the *Alternative* modes, you must press the **Alternative Mode** button that is located on the front panel of the temperature management unit but is unlabeled. Press the text on the Bair Hugger logo when the instructions direct you to press the **Alternative Mode** button.
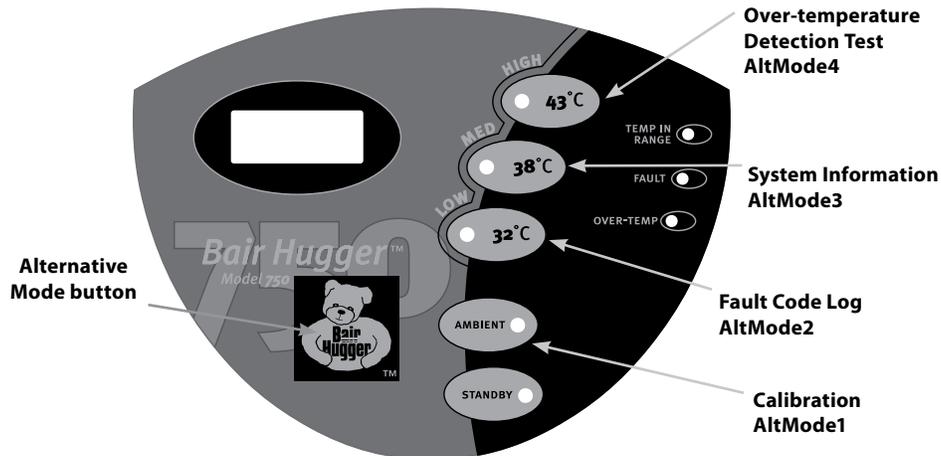
Figure 2. Location of Alternative Mode button

To enter one of the *Alternative* modes, press the **Alternative Mode** button in combination with one of the operating mode buttons, also located on the front panel. Figure 2 indicates which keys must be pressed to enter each of the 5 *Alternative* modes. When the correct combination of keys is pressed, the display reads "Hold for AltModeX," where "X" represents the selected *Alternative* mode from the list above.

Exiting an Alternative Mode

Exit the *Alternative* modes by pressing the **Alternative Mode** button or by waiting for 60 seconds. You will need to access the *Alternative* modes for several of the service procedures described in this manual.

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12   Bair Hugger Model 750 Temperature Management Unit Service Manual

Service Procedures

CAUTION

Auto tester must not interrupt the voltage during unit on power reset or an error 053/054 may result.

Calibrating the Operating Temperatures

CAUTION

Perform all temperature testing of the temperature management unit with a 3M Patient Warming Model 22110 Temperature Test Unit.

3M Patient Warming assumes no responsibility for the reliability, safety, or performance of the Bair Hugger system if temperature tests or adjustments are made in any manner other than those described here. Improper measurement or adjustment of the temperature management unit's normal operating temperature could result in patient exposure to temperatures outside of the indicated range and may lead to patient injury.

Service frequency

Every 6 months or 500 hours of use, or whenever service is performed.

Tools/equipment

Model 22110 Temperature Test Unit

NOTES:

- The Model 22110 Temperature Test Unit simulates the operating characteristics of Bair Hugger blankets when used with Bair Hugger temperature management units.

- When using the Model 22110 Temperature Test Unit, take temperature readings using a calibrated thermometer that can accept a male, subminiature connector and read a "K" style thermocouple (e.g., a Fluke Model 52 K/J Thermometer). If the test unit's connector does not fit your thermometer, remove the connector from the test unit and attach a connector that fits your meter. Be certain to observe polarity.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

13

Method

NOTE: If the temperature management unit has been stored at a temperature lower than 20°C, allow it to reach ambient temperature before beginning the calibration procedure.

1. Attach the Model 22110 temperature test device to the end of the temperature management unit hose.

2. Connect the temperature management unit to a grounded power source. The unit performs a self-test and automatically proceeds to *Standby* mode.

3. Press the **Ambient** button to place the unit in *Ambient* mode. Allow the unit to run in *Ambient* mode for at least ten minutes to equalize the temperature of the unit's internal components.

4. Press the **Alternative Mode** button (see Figure 2) and the **Ambient** button simultaneously for 3 seconds. The temperature management unit is now in *Calibration* mode. In this mode, the temperature management unit performs the following tasks:

   - *37* °C and *38* °C indicator lights flash.

   - Blower activates.

   - Heater elements deactivate.

   - The text "TMP" and the temperature in °C (0.1°C resolution) at the end of the hose appear in the alphanumeric display.

   - The text "OS" and the current calibration offset value (0.1°C resolution) appear in the alphanumeric display.

5. Compare the temperature shown on the alphanumeric display and the temperature on the independent, temperature calibration device.

   - If the temperatures match, press the **Alternative Mode** button to return the temperature management unit to *Standby* mode.

   - If the temperatures do not match, adjust the temperature management unit's displayed temperature:

     a. Press the *32°C* button to decrease the temperature or the *38°C* button to increase the temperature by 0.1°C. You can adjust the temperature of the temperature management unit a maximum of ±3°C.

     b. Continue to press the *32°C* or *38°C* button(s) until the temperature in the alphanumeric display matches the temperature on the calibration device.

     c. Press the **Alternative Mode** button to store the calibration offset value and return the temperature management unit to *Standby* mode.

NOTE: If it is necessary to enter an offset value greater than ±3°C, there may be a defect in the hose end sensor. Remove unit from service until a new hose assembly can be substituted.

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14   Bair Hugger Model 750 Temperature Management Unit Service Manual

Testing the Over-Temperature Detection System

WARNING

Do not perform the over-temperature detection system test while the temperature management unit is being used for temperature management therapy. Thermal injury may result.

CAUTION

Connect each warming unit being tested to a separate power source.

Service frequency

Every 6 months or 500 hours of use, or whenever service is performed.

Tools/equipment

Model 22110 Temperature Test Unit

Method

NOTE: If continuing from previous section (Calibrating the Operating Temperature) skip to step 4.

NOTE: If the temperature management unit has been stored at a temperature lower than 20°C, allow it to reach ambient temperature before beginning the test.

1. Connect the temperature management unit to a grounded power source. The unit performs a self-test and automatically proceeds to *Standby* mode

2. Connect the temperature test kit to the hose of the temperature management unit.

3. Press the **Ambient** button and allow the temperature management unit to run for five minutes.

4. Press the **Alternative Mode** button (See Figure 2) and the **43 °C** button simultaneously for three seconds. The temperature management unit is now in a *Forced Over-temperature* mode. In this mode, the temperature management unit performs the following tasks:

    • Blower activates.

    • Heater elements continuously operate at full power.

    • *43*°C indicator light flashes.

    • Over-temperature timer activates.

    • "OT Test" flashes in the alphanumeric display.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

15

5. Wait for the temperature management unit to perform the over-temperature test. When the test is complete, the temperature management unit performs the following tasks:

- Heater elements deactivate.

- Blower continues to operate. (NOTE: The blower turns off if an over-temperature condition occurs during normal use.)

6. View the alphanumeric display to determine test outcome:

   a. PASS–The unit detected an over-temperature condition within 150* seconds. An alarm sounds for 2 short beeps. The text "PASS" flashes in the alphanumeric display, followed by these messages:

      1. OT Test　　　　OT Test
         PASS-Prx　OR　PASS-Dst

      2. TestTime XX Secs

      3. Unplug To Reset

   b. FAIL–Unit did *not* detect an over-temperature condition within 150* seconds (time-out failure). An alarm sounds and the *Fault* indicator light flashes. The text "FAIL" flashes in the alphanumeric display, followed by these messages:

      1. OT Test FAIL

      2. TestTime 150* Secs

      3. Unplug To Reset

NOTE: Do not place a temperature management unit back into service if it fails the Over-temperature Detection System test. Send the unit back to 3M Patient Warming for repair. See *Returning Units for Service on page 27.*

4. Record the maximum temperature displayed by the test kit. (Use maintenance log on page 32.) If the temperature is >56°C (53°C ± 3°C typical) contact 3M Patient Warming technical service for further instructions.

5. Unplug the temperature management unit to reset it.

*Within 90 seconds in units with < Rev L software. The Rev version appears in the display window upon connection to a power source.

Viewing the Fault Code Log

Service frequency

As often as necessary.

Tools/equipment

None required.

Method

1. If your temperature management unit is already ON, you can access the fault code log from any operating mode. Otherwise, connect the temperature management unit to a grounded power source. The unit performs a self-test and automatically proceeds to *Standby* mode. Then select any operating mode.

2. Press the **Alternative Mode** button (see Figure 2: Alternative Mode button on page 11) and the **32°C** button simultaneously for three seconds. The temperature management unit is now in *Fault Code Log* mode. In this mode, the temperature management unit performs the following tasks:

   a. Continues to operate in current operating mode.

   b. *32°C* and *38°C* indicator light flashes.

   c. Text "FC(n) XXX" appears in the alphanumeric display. "FC" is an abbreviation for the phrase "fault code," "n" represents the numerical order of the fault code in the log, and "XXX" represents the code for the fault condition. See *Fault Code Table on page 16* for a list of fault codes and their meanings.

   d. The time (HH:MM:SS) of each fault appears below "FC(n) XXX" in the alphanumeric display. If the unit reaches 100 or more hours the time only reads hours and minutes.

3. Press either the **32°C** or **38°C** button to view the next fault code in the log. The temperature management unit stores a maximum of 5 fault codes in non-volatile memory.

4. Press the **Alternative Mode** button to return the temperature management unit to its previous operating mode.

Clearing the Fault Code Log

Put the unit in *Fault Code* mode by pressing the **Alternative Mode** button and the **32°C** button simultaneously for three seconds; then, press the **43°C** button.

NOTE

The fault code log should not be cleared unless instructed to do so by a 3M Patient Warming representative.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

17

Fault Code Table

The software will detect and report the following conditions by displaying the corresponding fault code:

Fault Condition	Fault Code
Internal sensor 1 over-temperature condition	001
Hose end sensor 2 over-temperature condition	002
Hose end sensor 3 over-temperature condition	003
Internal sensor 1 shorted	004
Hose end sensor 2 shorted	005
Hose end sensor 3 shorted	006
Hose end sensor 2 open	007
Low wattage heater failure	008
Medium wattage heater failure	009
High wattage heater failure	010
A/D converter timeout	011
A/D startup check failed	012
(Reserved Fault Code)	013
Error in execution loop	014
Timeout on alphanumeric display busy flag clearing	015
RAM corruption in duplicate RAM locations	016
Error in executing a depressed key	017
Stuck key during startup	050
EEPROM is at max # write cycles	051
Non-0 EEPROM byte detected after zeroing	052
EEPROM checksum failure on copy # 1	053
EEPROM compare failure copy #1 to copy #2	054
EEPROM compare failure copy #1 to RAM	055
EEPROM write cycle time out	056
SPI byte transfer time out	057
EEPROM write error when entering standby	059
Real time clock failure	060
Temperature out of range high	070
Temperature out of range low	071
5 V power supply in excess of 5.333 V	100
5 V power supply under 4.667 V	101
Startup test EEPROM error	102
Startup test RAM error	103

Viewing the Hour Meter

Service frequency

As often as necessary.

Tools/equipment

None required.

Method

1. If your unit is already ON, you can begin the test from any operating mode. Otherwise, connect the temperature management unit to a grounded power source. The unit performs a self-test and automatically proceeds to *Standby* mode. Then select any operating mode.

2. Press the **Alternative Mode** button for three seconds (see Figure 2). The temperature management unit is now in *Hour Meter Display* mode. In this mode, the temperature management unit performs the following tasks:

    a. Continues to operate in current operating mode.

    b. "Hours" appears in the alphanumeric display.

    c. Cumulative hours of temperature management unit operation appear in the alphanumeric display.

3. Wait 60 seconds or press the **Alternative Mode** button to return the temperature management unit to its previous operating mode.

Viewing the Operating Timer

To view the amount of time the temperature management unit has been operating in the current temperature mode, press and hold the *Current Temperature* mode button for at least three seconds. The time is displayed in HH:MM:SS format.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

19

Replacing the Air Filter

Service frequency

Every 12 months or 500 hours of use.

Tools/equipment

- Replacement air filter
- #2 Phillips screwdriver

WARNING

Do not attempt to clean the air filter as it may contain hazardous microorganisms. Discard the filter in a manner consistent with institutional protocol for biohazardous material.

Method

1. Disconnect the temperature management unit from the grounded power source.

2. Turn the temperature management unit upside down.

3. Remove the 2 screws located in the louvered filter cover.

4. Lift the filter cover off the temperature management unit.

5. Remove the air filter and discard it.

6. Place the new filter in the filter compartment with the gasket toward the filter ledge.

7. Replace the filter cover with the louvers facing the back of the temperature management unit.

8. Replace the 2 screws in the filter cover.

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20

Bair Hugger Model 750 Temperature Management Unit Service Manual

Replacing the Hose

Service frequency

As needed.

Tools/equipment

- Replacement hose
- Phillips screwdriver
- Needle-nose pliers
- Strap wrench (optional)

Method

Detaching Hose

1. Disconnect the temperature management unit from the power source before replacing hose.

2. Unscrew the hose collar.

3. If present, use the Phillips screwdriver to remove the 2 screws that attach the hose to the unit.

4. Slide the hose out of the temperature management unit. The hose will still be attached to the unit by a cable.

5. Using the needle-nose pliers, carefully detach the cable connector from the header plug located inside the hose connector (see Figure 3. Hose replacement).

Figure 3. Hose replacement

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21
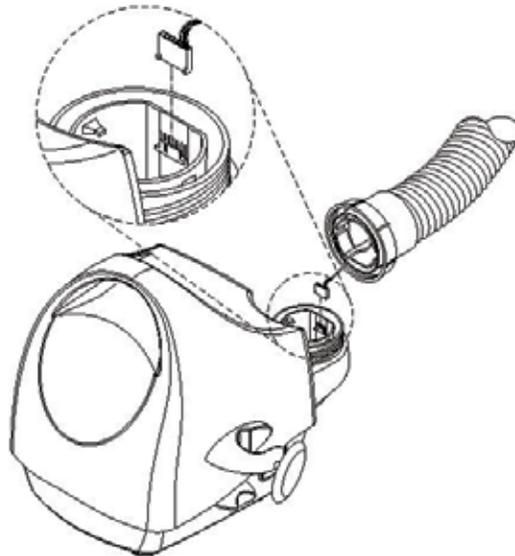
Reattaching Hose

1. Attach the cable connector of the new hose to the header plug, making sure that the protrusions on the connector align with the corresponding slots on the header.

2. Align the flat section of the hose end with the corresponding flat part of the unit's hose connector and slide the replacement hose into the temperature management unit.

3. Screw the hose collar back into place.

4. Reconnect the temperature management unit to a grounded power source.

5. Calibrate operating temperature settings (see page 21 for instructions).

6. Perform over-temperature detection system test (see page 14 for instructions).

Replacing the Fuses

Service frequency

As needed.

Caution

Use proper Electrostatic Discharge (ESD) procedures when performing this maintenance. Failure to use proper ESD preventative measures could cause damage to the control board.

Tools/equipment

- Small Phillips screwdriver
- Medium Phillips screwdriver
- Needle-nose pliers
- ESD strap
- Model 750 Control Board
- Flat screwdriver (optional)

Method

1. Detach the hose (see Detaching Hose on page 20 for instructions).

Disassembling the Temperature Management Unit

1. Using a medium Phillips screwdriver, remove the two screws that attach the IV pole clamp or plug.

2. Turn the unit so the bottom of the unit faces up. Remove the four bottom screws with a medium Phillips screwdriver.

3. Unplug the 2-pin black connector used for the main voltage.

4. Using the medium Phillips screwdriver, remove the two screws that connect the 2 ground wires. Remove the bottom enclosure.

5. Using the medium Phillips screwdriver, remove the four screws that hold the chassis assembly to the top enclosure (Figure 2).
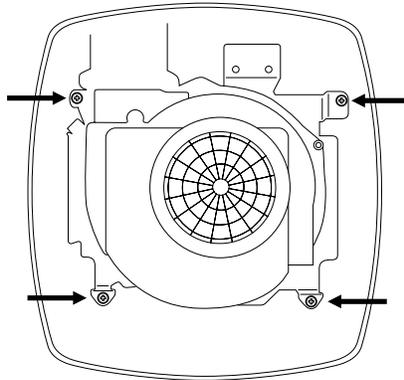
6. Unplug the user interface and LCD connector to remove the top enclosure. If needed, use a flat screwdriver to lift and release the snap-fit LCD connector.

7. Replace fuses.

fuses
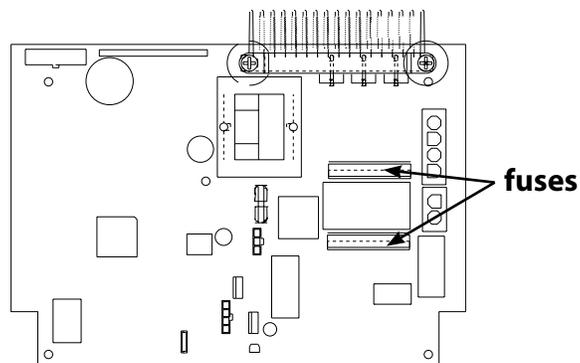
Reassembling the Temperature Management Unit

1. Plug in the user interface and LCD connectors.

2. Attach the chassis assembly to the top enclosure with the 4 screws.

3. Screw in the two ground wires (with the 2 screws).

4. Plug in the 2-pin black connector.

5. Attach the bottom to the top enclosure with the 4 screws.

6. Attach the IV pole clamp or plug (with the 2 pole clamp screws).

7. Reattach the hose (see reattaching the hose on page 21 for instructions).

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24　　Bair Hugger Model 750 Temperature Management Unit Service Manual

General Maintenance and Storage

Cleaning the Cabinet and Hose

Service frequency

As needed.

Tools/Equipment

- Soft cloth lightly dampened with water

- Mild detergent or antimicrobial spray

- Dry soft cloth

⚠ **WARNING**

Do not immerse the cabinet or hose while cleaning. Moisture will damage the components, and thermal injury may result.

⚠ **CAUTIONS**

- Do not use a dripping wet cloth to clean the cabinet. Moisture may seep into the electrical contacts and damage the components.

- Do not use alcohol or other solvents to clean the cabinet. Solvents may damage the labels and other plastic parts.

Method

1. Disconnect the temperature management unit from the power source before cleaning.

2. Wipe the cabinet and the outside of the hose with a damp, soft cloth and a mild detergent or antimicrobial spray.

3. Dry with a separate soft cloth.

Storage

Store all components in a cool, dry place when not in use.

Bair Hugger Model 750 Temperature Management Unit Service Manual

Troubleshooting

The model 750 software routinely checks unusual operating conditions. If such a condition occurs, the system may trigger a fault condition and alarm. The warming unit can be reset by disconnecting the warming unit from the main power source, allowing 30-60 seconds for the system to reset. If the fault condition reoccurs upon connection to the main power source, the unit may have a hard-fault or permanent error.

Call Technical Support for Replacement Parts at 1-800-733-7775.

	Fault Code	Possible Cause	Solution
Permanent errors—a fault condition always occurs at turn on or after pressing a temperature setting	FC-001 FC-002 FC-003 FC-004 FC-005 FC-006 FC-007	Faulty hose end sensor at patient end. Faulty elbow sensor. Hose disconnected from unit.	Replace hose. Refer to service manual or IFU included with replacement part for instructions. Replace elbow sensor. Refer to IFU included with replacement part for instructions. Reattach hose. Calibrate and return to service.

	FC-008
	FC-009
	FC-010
		Faulty heater element or faulty control board.	• Verify fan runs in ambient.
			• Check continuity of J4 connector on control board.
			  White to black
			  White to blue
			  White to yellow
			  If "open", replace heater. Otherwise, replace control board.
			• Calibrate and return to service.

	FC-050	Defective user interface.	Replace user interface. • Calibrate and return to service.
	FC-053, 054	EEPROM error.	Reset microprocessor. (Press the Bair Hugger logo and **Standby** button at same time while connected to power source. Release buttons when Standby light remains on). Calibrate and return to service.
	FC-070 FC-071	Various	Contact 3M Patient Warming technical service.
	FC-100 FC-101	Defective control board.	Replace control board. Calibrate and return to service.

	Fault Code	Possible Cause	Solution
Cautionary Errors– **Fault condition while unit is in use**	FC-001	Hose end at blanket end occluded.	Disconnect from power source. Remove hose occlusion. Position hose end correctly into hose card (refer to the operator's manual). Wait 30-60 seconds before reconnecting to the main power source. Reconnect to power source. If no fault occurs, unit is ready for use.
	FC-002 FC-003 FC-004 FC-005 FC-006 FC-007	Hose end sensor failure at blanket end. Faulty elbow sensor. Moisture. Intermittent sensor failure. High heat.	Disconnect from power source. Allow unit to cool. Wait 30-60 seconds before reconnecting to the main power source. Reconnect to power source. If no fault occurs, unit is ready to use.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

27

Technical Support and Customer Service

USA, Worldwide

TEL:	FAX:
800-733-7775	800-775-0002
952-947-1200	952-947-1400

When You Call for Technical Support

We will need to know the serial number of your Bair Hugger temperature management unit when you call us. The serial number label is located on the back or side of the unit.

In-Warranty Repair and Exchange

USA

Call 3M Patient Warming customer service if your Model 750 temperature management unit requires factory service. A customer service representative will give you a Return Authorization (RA) number. Please use this RA number on all correspondence concerning your temperature management unit. Your customer service representative will also send a shipping carton to you at no charge, if needed. Call your local supplier or sales representative to inquire about borrowing a temperature management unit while we service your unit.

OUTSIDE THE USA

Contact your local distributor concerning in-warranty repair and exchange.

Returning Units for Service

Tools/equipment

- 3M Patient Warming service carton

- Tape dispenser

- Shipping label

- Marking pen

Method

1. Call Technical Support to get a Return Authorization (RA) number and a service carton.

2. Remove the top foam piece. If the plastic liner is available, use it to enclose the temperature management unit.

3. Lower the temperature management unit carefully into the carton.

4. Place the unit hose on the temperature management unit see (Figure 4).

5. Replace the top foam piece. Observe proper orientation.

6. Lay the unit hose on top of the foam piece around the edge.

7. Seal the carton with tape.

8. Apply the shipping label addressed to 3M Patient Warming.

9. Write the RA number on the outside of the carton.

10. Ship to 3M Patient Warming.

Figure 4. Packing configuration (View: Looking down into box.)

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Bair Hugger Model 750 Temperature Management Unit Service Manual

29

Specifications

Physical Characteristics

DIMENSIONS	12.5" high x 13.5" deep x 10" wide
	31.5 cm high x 34 cm deep x 25 cm wide
WEIGHT	16.3 lb (7.4 kg)
RELATIVE NOISE LEVEL	55 dBA
HOSE	Flexible, compatible with the Bair Hugger brand 241 blood/fluid warming system.
FILTRATION SYSTEM	High efficiency 0.2 µm filter
RECOMMENDED FILTER CHANGE	Every 12 months or 500 hours of use.
MOUNTING	Can be clamped to an IV pole, placed on a hard surface, or mounted to the rolling stand accessory.

Temperature Characteristics

RECOMMENDED OPERATING ENVIRONMENT	Temperature: 15°C-25°C Humidity: Max relative humidity 80% (up to 31°C) decreasing linearly to 50% relative humidity at 40°C Altitude: Max 2,000m
TEMPERATURE CONTROL	Electronically controlled.
HEAT GENERATED	1644 BTU/hr (average), 482 W (average)
OPERATING TEMPERATURES	Average temperatures at the end of the hose: HIGH: 43° ± 1.5°C 109.4° ± 2.7°F MED: 38° ± 1.5°C 100.4° ± 2.7°F LOW: 32° ± 1.5°C 89.6° ± 2.7°F
TIME TO REACH OPERATING TEMPERATURE	2 - 5 minutes (dependent on blanket model) Time required for the contact surface temperature to heat up from 23 ± 2°C to 37°C (73 ± 2°F to 99°F)
STORAGE/TRANSPORT TEMPERATURE	-20°C to 45°C (-4°F to 113°F) Store all components in a cool, dry place when not in use.

Safety System

THERMOSTAT	Independent electronic circuit; thermal cutoff shuts the heater OFF to ensure hose end air remains below 56°C (53°C ± 3°C typical); back-up over-temperature detection at hose inlet.
ALARM SYSTEM	Over-temperature (≤56°C, 53°C ± 3°C typical): red Over-Temp indicator light flashes, alarm sounds, heater and blower shut down, operating indicator lights turn OFF, control panel becomes unresponsive.
	Fault: amber *Fault* indicator light flashes, alarm sounds.
OVERCURRENT PROTECTION	Dual input fused lines.

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30   Bair Hugger Model 750 Temperature Management Unit Service Manual

Electrical Characteristics

HEATING ELEMENT	1400 W Resistive
LEAKAGE CURRENT	Meets UL 60601-1 and IEC 60601-1 requirements.
BLOWER MOTOR	Operating speed: approximately 4,000 rpm Airflow: up to 48 cfm or 23 L/s
POWER CONSUMPTION	Peak: 1550 W Average: 800 W
POWER CORD	15 ft., SJT, 3 cond., 13 A 15 ft., SJT, 3 cond., 15 A 4.6 m, HAR, 3 cond., 10 A
DEVICE RATINGS	110-120 VAC, 50/60 Hz, 11.7 A, or 220-240 VAC, 50/60 Hz, 7.2 A, or 100 VAC, 50/60 Hz, 15 A

FUSES

Type:	Fast acting ceramic fuses, 250 VAC
Amp rating:	12 A (110 - 120 VAC) 8 A (220 - 240 VAC) 15 A (100 VAC)
Operating speed:	F (Fast Acting)
Breaking capacity:	15 A, 12 A: 750 A @ 250 Vac 15 A, 12 A: 10,000 A @ 125 Vac 8 A: 200 A @ 250 Vac 8 A: 10,000 A @ 125 Vac

CERTIFICATIONS	IEC 60601-1; EN 60601-1-2; UL 60601-1; CAN/CSA-C22.2, No. 601.1, EN 55011; EN 80601-2-35

CLASSIFICATION

MEDICAL — GENERAL MEDICAL EQUIPMENT AS TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY IN ACCORDANCE WITH UL 60601-1; CAN/CSA-C22.2, No.601.1; ANSI/AAMI ES60601-1:2005 CSA-C22.2 No. 60601-1:08; EN 80601-2-35; Control No.4HZ8.

Classified under IEC 60601-1 Guidelines (and other national versions of the Guidelines) as Class I, Type BF, Ordinary equipment, Continuous operation. Not suitable for use in the presence of flammable anesthetic mixtures with air or with oxygen or nitrous oxide. Classified by Underwriters Laboratories Inc. with respect to electric shock, fire and mechanical hazards only, in accordance with UL 60601-1, EN 80601-2-35 and in accordance with Canadian/CSA C22.2, No. 601.1. Classified under the Medical Device Directive as a Class IIb device.

DIAGNOSTICS   A qualified service technician can perform over-temperature detection system testing, temperature output testing, operating temperature calibration, and fault code troubleshooting.

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Bair Hugger Model 750 Temperature Management Unit Service Manual

31

Maintenance Checklist

☐ **Filter inspection**

1.   Remove and inspect the filter.

2.   Return filter or replace as necessary.
Note: Replace every 12 months or every 500 hours (PN 90047).

☐ **Calibrate the hose end sensor**

1.   Attach the Bair Hugger temperature test unit (PN 22110).
a.   Connect temperature sensor to your meter.

2.   Run in *Ambient* mode for 10 minutes.

3.   Enter the *Calibration* **mode**.
a.   Press the **Alt** (Bair Hugger logo) and **Ambient** button, together for approximately 3-seconds.
b.   Temperature measured at end of hose will display on LCD.

4.   Adjust Bair Hugger unit's displayed temperature so it matches test unit sensor (± .1° increments).
a.   32°C button lowers displayed temperature.
b.   43°C button raises displayed temperature.
Note: Unit can only adjust ± 3.0°C. Try a different hose if more adjustment is required and call 3M Patient Warming technical support with results.

5.   Save Settings – Press the **Alt** (Bair Hugger logo) button to save your settings.

☐ **Test over temperature detection system**

1.   Initiate over-temperature test
a.   Press the **Alt** (Bair Hugger logo) and **43°C** button together for approximately 3-seconds.
b.   Wait as unit executes self test.
c.   Two beeps indicate test has completed.

2.   Review Results
a.   Observe max temperature <56°C.
b.   Pass or fail indicated on display.

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32   Bair Hugger Model 750 Temperature Management Unit Service Manual

Maintenance Log

DATE	MAINTENANCE ACTION PERFORMED	HOUR METER

CE 0086

EC | REP 3M Deutschland GmbH, Health Care Business
Carl-Schurz-Str. 1, 41453 Neuss, Germany

3M Health Care, 2510 Conway Ave., St. Paul, MN 55144 USA
TEL 800-228-3957 | www.bairhugger.com

202522A   07/13