Microprocessor Board Replacement Procedure

Blanketrol® III 233-115V &
Blanketrol® II 222S

Safety Warnings

Always unplug the unit before accessing internal components during service. **Failure to unplug the unit could result in electric shock.**

The repair, calibration, and servicing of the BLANKETROL should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the BLANKETROL system and patient injury.**

Working with electronic boards, plugs and cables requires delicate handling. Proper **electrostatic discharge (ESD)** procedures should be followed during replacement of any electric board. **Failure to do so may result in damage to the board.**

BEFORE returning the BLANKETROL to patient use **after repairs**, the SYSTEM TEST ROUTINE of the Blanketrol Operation and Technical Manual must always be performed. **Improper repair and inadequate maintenance can result in damage to the BLANKTEROL system and patient injury.**

Tools

- Phillip's screwdriver
- Needle nose pliers
- 5/16" wrench
- Spatula or non-marry prying tool
- ESD Mat(s), ESD Wrist Strap, ESD Monitor

1. Remove the Top Cover

Refer to Operation and Technical Manual

1. Carefully remove the screw caps from both sides of the unit (four caps total), Fig 1.
2. Remove the four Phillips-head screws securing the top cover.
3. Lift the front edge of the top to expose the stainless-steel reservoir divider cover. The microprocessor board is attached to the underside of the top assembly.
4. Take care to prevent water from dripping onto any electrical components.

Fig. 1

2. Disconnect the Microprocessor Board Cables

Refer to Operation and Technical Manual

1. Tilt the front edge of the top assembly, rotate, and stably rest the top so that the fill lid is on the stainless-steel reservoir cover.

NOTE: Do not bend connector terminals.

Suggestion: *Disconnect the main power connector (Fig.2) from the microprocessor board by pressing the locking tabs. This will provide you with better access and visibility to the board.*

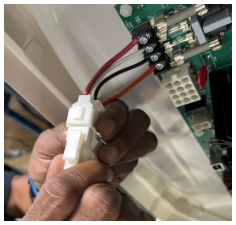

Fig. 2

2. Locate and disconnect the connectors from the microprocessor board by pressing the locking tabs as required. See Fig. 4.

Connector	J Position
White 12-position connector	J1 position

White 2-position connector	J4 position
USB cable	J6 position
Red 9-position connector	J8 position
Black 2-position connector	J12 position
Red 3-position connector	J3 position
Red 2-position flow switch connector	J9 position
Blue 11-position membrane ribbon cable connector	J7 position

3. If desired, remove the red/yellow wires from the J8 connector to separate the lid assembly from the unit. This may improve access while replacing the board.
4. Disconnect the J5 black 2-position friction-fit connector located near the center of the board. Needle-nose pliers may be required.

NOTE: Do not pull on the wires to remove J5. Grasp the connector body.

5. Loosen the terminal screws and remove the four power supply wires.
6. The top assembly can now be completely separated from the base.

3. Replace the Microprocessor Board

1. Place the top assembly face down on a protected work surface.
2. Using a 5/16" wrench remove the six nylon mounting nuts around the edge of the board.
3. Carefully lift and remove the existing microprocessor board.
4. Install the replacement microprocessor board in the same orientation.
5. Connect the membrane ribbon cable to the 11-pin connector at J7 position (see Fig. 4).
6. Reinstall the six nylon mounting nuts.

NOTE: Do not overtighten nylon nuts

4. Reassemble the Unit

1. Reposition the top assembly onto the base unit.
2. Reconnect all cables and connectors by reversing the removal steps.
3. Reconnect the four power supply wires according to Fig. 3

NOTE: Wires go in order from left to right: Red, White, Black, Orange, Fig 3.

4. Verify that all connectors are fully seated and properly routed.
5. Secure the top cover with the four Phillips-head screws.
6. Reinstall the screw cap.

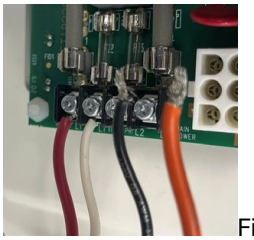

Fig.3

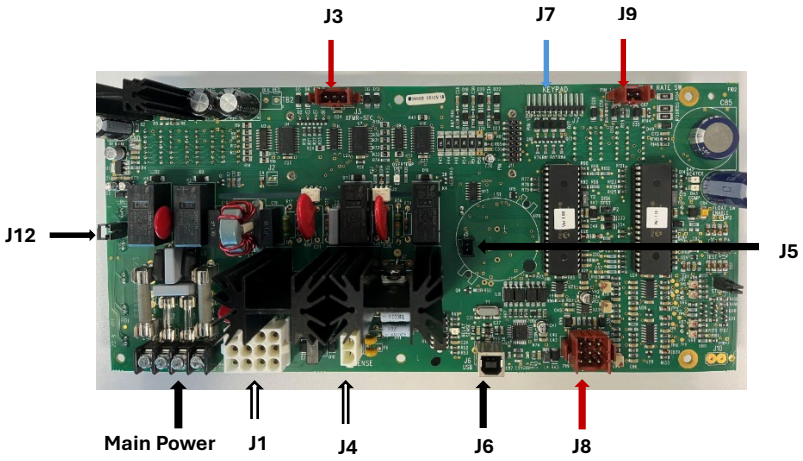

Fig. 4 – Board Overview

Verify Proper Installation

Once reassembly is complete, perform the following PCB Installation Test Routine to verify proper microprocessor board operation and confirm that all electrical connections were restored correctly during installation. This routine is a basic functional verfication only and does not replace the complete System Test Routine or any other post-service requirements described in the Blanketrol Operation and Technical Manual.

PCB Installation Test Routine

After replacing the board, complete the PCB Installation Test Routine:

1. Set Up

1. Collect and arrange the following equipment and supplies:
    a. Hyper-Hypothermia blanket.
    b. Connecting hose with quick-disconnect fittings if using disposable blankets.
    c. Sterile water or water that has been passed through a filter ≤0.22 microns
2. Lift the lid of the water fill opening and fill the device with sterile water or water that has been passed through a filter ≤ 0.22 microns into the reservoir. Stop pouring when the water reaches the strainer visible at the bottom of the water fill opening. Device holds approximately 2 gallons (7.6 liters).

CAUTION:

- Use sterile water or water that has been passed through a filter ≤ 0.22 microns only. Do Not Use distilled water. Do Not Use De-Ionized water. De-Ionized water may cause corrosion to plumbing components. Do Not Use tap water. Mineral and deposits can clog plumbing system components.
- Do not use alcohol. Alcohol may cause blanket deterioration.
- Do not overfill. Overfilling may result in overflow when the water in the blanket drains back into the system when the system turns off.

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3. The Blanketrol and the blanet (applied part) are BF rated as a system. Contact with other parts (i.e. the quick disconnect fittings) at the same time as contacting the patient will negate the type of BF rating.

4. Connect the blanket(s) to the unit by attaching the quick-disconnect female fitting of the connecting hose to a male outlet coupling (on the bottom row) of the unit. Attach the male quick-disconnect fitting of the connecting hose to a female return coupling (on the top row) of the unit. Each blanket must be connected to one outlet and one return.
5. Check that the blanket is laying flat and that the connecting hose to the unit is not twisted or pinched.
6. Check that the power switch of the unit is in the “O” position (unit is off).
7. Connect the plug to a properly grounded hospital grade receptacle.

Note: If the expected condition is not observed during the testing, refer to the Troubleshooting Guide.

2. PCB Installation Test Routine

1. Make sure that the power switch is in the “I” position (unit is turned on).
    a. The switch illuminates green.
    b. The microprocessor board goes through self-test.
    c. The Status Display in the center of the membrane control panel flashes CHECK SETPT.
2. Press and hold the TEST INDICATOR button.
    a. The alarm produces a beep.
    b. The LED's in the corner of the buttons and the low water and power interruption LED’s flash on and then off.
    c. All the displays flash.
3. Press the TEMP SET button.
    d. The microprocessor board beeps.
    e. The LED in the corner of the button illuminates.
    f. The Status Display shows:

SET TEMPERATURE
SETPT 37C

4. Press the **MONITOR ONLY** button.
    g. The LED in the corner of the MONITOR ONLY switch illuminates
    h. An alarm sounds.
    i. The Status Displays CHECK PROBE because no probe is attached.
5. Press the TEMP SET button.
    j. The microprocessor board beeps once and the alarm stops sounding.
    k. The LED in the corner of the button illuminates.
    l. The Status Display shows:
        SET TEMPERATURE
        SETPT 37C
6. Press the **MANUAL CONTROL** switch.
    m. The microprocessor board beeps.
    n. The LED in the corner of the button illuminates.
    o. The WATER display shows the temperature of the water in the reservoir.
    p. The Status Display shows:
        * XXXXXX WATER
        MANUAL SETPT 37C
        Or Status Display shows:
        WATER @SETPT
        MANUAL SETPT 37C
        **("XXXXXX" represents "HEATING" or "COOLING")*
7. The pump is activated.
8. The heater or compressor may be activated.
9. The water flow indicator on the right-side panel begins to move. The water moves from the unit through the blanket and returns to the unit.
10. Check the blanket for leaks. If a leak is found, the blanket cannot be used.
11. Check the couplings at the unit and at the blanket for positive connection.
12. Press the TEMP SET switch
    a. The microprocessor board beeps
    b. The LED in the corner of the switch illuminates.
    c. The indicator light left of the Set point display goes out.
    d. The Blanket/Water display goes blank.
    e. The Status Display shows:
        SET TEMPERATURE
        SETPT 37C
13. The pump shuts down, the heating/cooling stops.

When the TEMP SET button is pressed, the operating mode (e.g. MANUAL CONTROL MODE or any of the Automatic Modes) is cancelled. The operator is once again at the beginning of the mode selection procedure.