

4 Maintenance

For your notes

Required Service Equipment

- Multi Parameter Test Kit: MARQIII-KIT
- Masimo Test Kit: 2021087-001
- Oxymax Simulator: 2007650-002
- ECG simulator (DNI model 214B or equivalent)
- ECG cable (PN 412931-001, 411203-001, 411202-001)
- SPO₂ simulator (BIO-TEK SPO₂ simulators)
- SPO₂ adapter cable and sensor (Masimo: 2016041-002, Nellcor: DOC-10)
- NIBP analyzer (DNI Nevada "CuffLink" or Meriam Instrument Smart Manometer Model 350 DM2000 or equivalent)
- Adult Cuff (Critikon REF 2203)
- Adult Hose (DASH type: 414873-001)
- Adult mandrel, end block and spacer blocks (DNI PN 5215-0268, 5215-0269) (Lead test)
- Inflation bulb and associated tubing
- Manometer Digital 0-600 mmHg range or equivalent
- Temperature probe simulator (Alaris® PN TE1811)
- Temperature probe, oral (Alaris® PN 3887)
- Oscilloscope (capable of measuring ECG signal @ 0.75 Hz, 1 V amplitude)
- 1/8" stereo plug (Radio Shack PN 274-284C)
- Safety Tester (DNI Nevada 235A or equivalent)
- DMM (Fluke 8842 or equivalent)
- Serial communication cable
- Test plug assembly with 470 W resistor
- Dash 2500 software download tool
- Screw driver for Phillips cross head 1 and 2 screws

Maintenance Schedule

Manufacturer Recommendations

To ensure the Monitor is always functional when required, qualified service personnel should perform the following regular maintenance.

- **Visual Inspection:** Perform a visual inspection upon receipt of the equipment, every 24 months thereafter, and prior to servicing the unit.
- **Cleaning:** Clean the unit every 24 months thereafter, and each time the unit is serviced.
- **Conditioning the Batteries:** Condition the batteries once every month or as needed.
- **Calibrating the NIBP Software:** Calibrate the software upon receipt of the equipment, every 24 months thereafter, and each time the unit is opened for service.
- **Electrical Safety Tests:** Perform safety tests upon receipt of the equipment, every 24 month thereafter, and each time the unit is serviced.
- **Checkout Procedure:** Perform the checkout every 24 months thereafter, and each time the unit is serviced.

Manufacturer Responsibility

CAUTION

Failure on the part of all responsible individuals, hospitals or institutions, employing the use of this device, to implement the recommended maintenance schedule may cause equipment failure. The manufacturer does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

Visual Inspection

The Monitor and its components should be carefully inspected prior to installation, once every 24 months thereafter and each time the equipment is serviced.

- Carefully inspect the equipment for physical damage to the case, the display screen, and the keypad. Do not use the Monitor if damage is determined. Refer damaged equipment to qualified service personnel.
- Inspect all external connections for loose connectors or frayed cables. Have any damaged connectors or cables replaced by qualified service personnel.
- Inspect the display face for marks, scratches, or other damage.
- Safety labels and inscription on the device are clearly legible.

Cleaning

Cleaning the Monitor

Monitor Exterior

The exterior surfaces of the Dash 2500 Monitors may be cleaned with a dampened, lint-free cloth. Use one of the following approved solutions:

- Mild soap (diluted)
- Commercial diluted bleach solution or bleach wipe, such as Dispatch® Brand Hospital Disinfectant with Bleach Single-Piece Towels
- Commercial diluted ammonia solution
- Wipe off cleaning solutions with a clean, dry cloth

Never use the following cleaning agents:

- Abrasive cleaners or solvents of any kind
- Acetone
- Ketone
- Alcohol-based cleaning agents
- Betadine
- Quaternary ammonium disinfectants such as Virex®, Sani-Wipes®, Ascepti-Wipes®, or products containing similar active ingredients to these should be avoided.
- Cleaning solutions containing wax
- Never pour or spray water or any cleaning solution on the equipment or permit fluids to run behind switches, into connectors, into the recorder, or into any ventilation openings in the equipment.

Display

To clean the display screen, use a soft, clean cloth dampened with a glass cleaner. Never spray the glass cleaner directly onto the display, and never use alcohol or hospital disinfectants like Cidex or Betadine.

Failure to follow these cleaning recommendations may melt, distort, or dull the finish of displays and cases; blur lettering on labels; embrittle cases and lead to cracks and breakage; or cause equipment failures. Use of non-approved cleaning agents is considered abuse and is not covered under warranty.

Cuff Cleaning and Disinfection

General

The cuff must be thoroughly cleaned with the specified detergent before reuse. The additional use of household bleach as described below provides at least intermediate-level disinfection.

- Apply cuff hose plugs before cleaning.
- The following cleansing procedure was repeated 20 times on DURA-CUF® Blood Pressure Cuffs and once on SOFT-CUF® Blood Pressure Cuffs without affecting the performance of the cuff.

- While this procedure is adequate for cleaning/disinfection, it may not remove all stains.
- Do **not** immerse hoses.
- Do **not** immerse cuffs without prior application of cuff hose caps.

Materials

- Enzymatic detergent such as ENZOL[®] enzymatic detergent (US) or Cidezyme[®] enzymatic detergent (UK)
- Distilled water
- 10% solution of household bleach (5.25% sodium hypochlorite) in distilled water
- Soft cloths and soft-bristled brushes
- Spray bottles

Procedure

1. Prepare the enzymatic detergent according to the manufacturer's instructions and the 10% bleach solution, in separate spray bottles.
2. Spray the detergent liberally on device. If the material is dried on, allow the cuff to sit for 1 minute. For soil on the soft part of the closure or the cuff itself, wipe the material off with a soft cloth. For persistent contamination on the soft part of the closure, use a soft-bristled brush to loosen particles. Rinse with copious amounts of distilled water. Repeat until no visible contamination remains. For soil on the hook part of the closure, use a soft-bristled brush to remove the material, and rinse with copious amounts of distilled water. Repeat until no visible contamination remains.
3. Spray the 10% bleach solution on the affected area until the area is saturated. Allow the cuff to sit for 5 minutes.
4. Wipe away any excess solution and rinse the cuff again with distilled water. Allow 2 hours for drying.

The user has the responsibility to validate any deviations from the recommended method of cleaning and disinfection.

For additional information on infection control procedures, contact GE Medical Systems *Information Technologies* Technical Support.

Temperature Devices

Do not immerse predictive temperature probes. The probe can be cleaned with a solution of 10% bleach in water. Use a cloth or sponge—just damp, not wet—and avoid getting any liquid into the interior of the probe.

SpO₂ Sensors

Adhesive sensors are sterile and for single use only. Reusable sensors should be cleaned before reuse with a 70% alcohol solution. If low-level disinfection is required, use a 1:10 bleach solution. Do not use undiluted bleach (5% - 5.25% sodium chlorite) or any cleaning solution other than those recommended here because permanent damage to the sensor could occur. Do not sterilize the

sensor by irradiation, steam, or ethylene oxide. If disposable sensors or their packaging are damaged, they must be disposed of as advised in this section.

To clean or disinfect the sensor:

1. Saturate a clean, dry gauze pad with the cleaning solution. Wipe all surfaces of the sensor and cable with this gauze pad.
2. Saturate another clean, dry gauze pad with sterile or distilled water. Wipe all surfaces of the sensor and cable with this gauze pad.
3. Dry the sensor and cable by wiping all surfaces with a clean, dry gauze pad.

Electrical Safety Tests

General

Electrical safety tests provide a method of determining if potential electrical health hazards to the patient or operator of the device exist.

These instructions are intended for every component in the system.

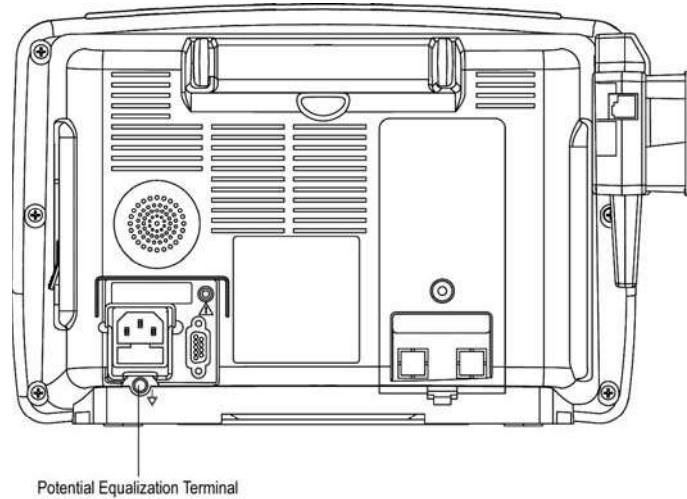
Test Equipment

The recommended test equipment required to perform electrical safety tests is listed below.

Item	Specification
Leakage Current Tester	Equivalent to the circuits shown
Digital Multimeter (DMM) (optional based on leakage tester used and locality)	AC volts, ohms
Ground Bond Tester	0-1 ohm
ECG Test Body	All leads together
Masimo SET SPO2 Test Body	2006036-001
GE and Nellcor SPO2 Test Body	2006646-001

Safety Resistance Testing

Using a safety analyzer (Dynatech Nevada Model 235A or equivalent), check the ground resistance of the Monitor. Refer to the **Rear View of Monitor with Safety Connection Exposed** graphic for locations of test points.



Rear View of Monitor with Safety Connection Exposed

Earth-To-Secondary Continuity ? Verify that the resistance between the AC mains ground pin and the potential equalization terminal is less than 0.1Ω .

AC Mains Leakage - Normal Polarity ? 260 VAC is applied at the Monitor's AC Mains input in normal polarity.

No Fault ? Verify that the leakage from line to ground pin is less than $500 \mu\text{A}$.

Open Ground ? Disconnect the Monitor's ground lead from earth ground (for the duration of this test only) and verify that the leakage from line to ground pin is less than $500 \mu\text{A}$.

Open Neutral ? Open the Monitor's neutral lead (for this test only) and verify that the leakage from line to ground is less than $500 \mu\text{A}$.

AC Mains Leakage - Reverse Polarity ? 260 VAC is applied at the Monitor's AC Mains input in reverse polarity (inputs to line pin and Neutral pin reversed).

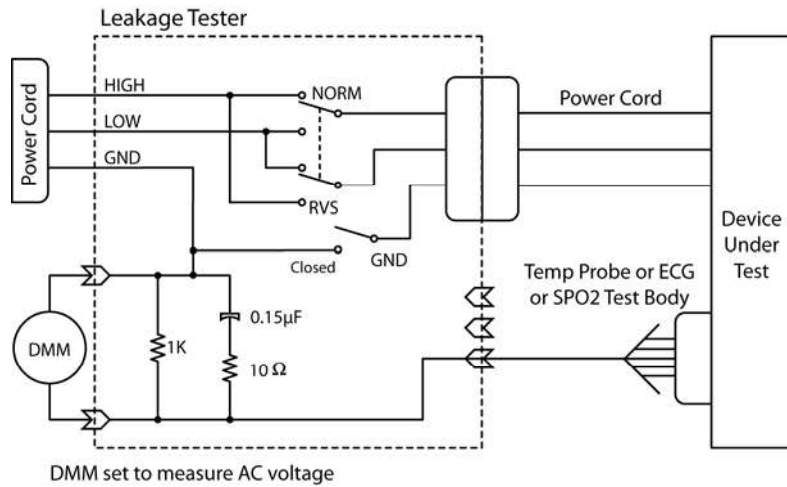
No Fault ? Verify that the leakage from line to ground pole is less than $500 \mu\text{A}$.

Open Ground ? Disconnect the Monitor's ground lead from earth ground (for the duration of this test only) and verify that the leakage from line to ground is less than $500 \mu\text{A}$.

Open Neutral ? Open the Monitor's Neutral lead (for the duration of this test only) and verify that the leakage from line to the ground is less than $500 \mu\text{A}$.

Patient (Source) Leakage Current Test

This procedure measures the leakage current from the ECG/RESP connector or the SPO2 connector or the TurboTemp of the device to ground.



Patient (Source) Leakage – From ECG/Resp connector to Ground

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM.

No Fault - Verify that the leakage current from ECG test body to ground pin is less than 10 μA (0.01 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from ECG test body to ground pin is less than 50 μA (0.05 volts on the DMM).

Reverse Polarity - Change the leakage current switch to the RVS position with GND switch CLOSE.

No Fault - Verify that the leakage current from ECG test body to ground pin is less than 10 μA (0.01 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from ECG test body to ground pin is less than 50 μA (0.05 volts on the DMM).

Patient (Source) Leakage – From SpO2 connector to Ground

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM. Connect the SpO2 Test Body to the blue SpO2 connector of the device under test, using the appropriate SpO2 Test Body.

No Fault - Verify that the leakage current from SpO2 test body to ground pin is less than 100 μA (0.1 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from SpO2 test body to ground pin is less than 500 μA (0.5 volts on the DMM).

Reverse Polarity - Change the leakage current switch to the RVS position with GND switch CLOSE.

No Fault - Verify that the leakage current from SpO2 test body to ground pin is less than 100 μA (0.1 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from SpO2 test body to ground pin is less than 500 μA (0.5 volts on the DMM).

Patient (Source) Leakage – From TurboTemp connector to Ground

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM. Connect the Probe to the TurboTemp connector of the device under test.

No Fault - Verify that the leakage current from TurboTemp Probe to ground pin is less than 100 μA (0.1 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from TurboTemp Probe to ground pin is less than 500 μA (0.5 volts on the DMM).

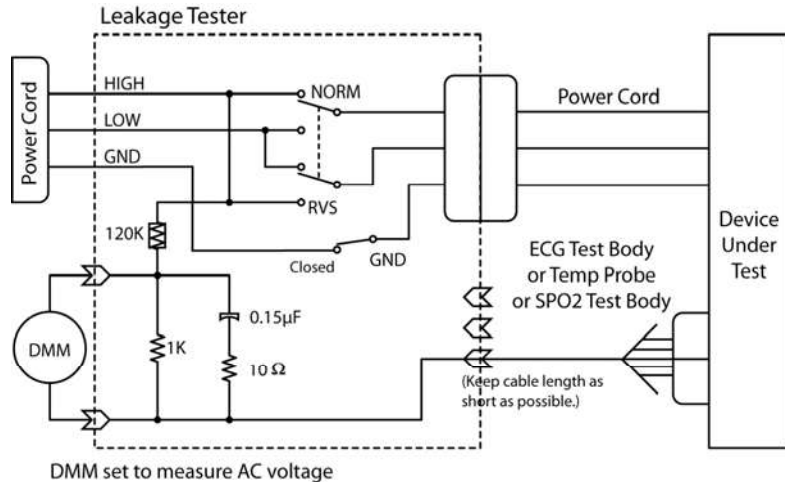
Reverse Polarity - Change the leakage current switch to the RVS position with GND switch CLOSE.

No Fault - Verify that the leakage current from TurboTemp Probe to ground pin is less than 100 μA (0.1 volts on the DMM).

Open Ground - Change the GND switch to the Open position. Verify that the leakage current from TurboTemp Probe to ground pin is less than 500 μA (0.5 volts on the DMM).

Patient (Sink) Leakage Current Testing (Mains Voltage on the Applied Part)

This procedure measures the leakage current from a mains voltage source into the ECG/RESP connector or the SpO2 connector or the TurboTemp connector of the device. .



Patient (Sink) Leakage – From AC mains to ECG/Resp connector

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM. Verify that the leakage current from ECG test body to ground pin is less than 50 μA (0.05 volts on the DMM).

Reverse Polarity - Change the leakage current switch to the RVS position with GND switch CLOSE. Verify that the leakage current from ECG test body to ground pin is less than 50 μA (0.05 volts on the DMM).

Patient (Sink) Leakage – From AC mains to SpO2 connector

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM. Connect the SpO2 Test Body to the blue SpO2 connector of the device under test, using the appropriate SpO2 Test Body.

Verify that the leakage current from SpO2 test body to ground pin is less than 5mA (5 volts on the DMM).

Reverse Polarity - Change the leakage current switch to the RVS position with GND switch CLOSE.

Verify that the leakage current from SpO2 test body to ground pin is less than 5mA (5 volts on the DMM).

Patient (Sink) Leakage – From AC mains to TurboTemp connector

Normal Polarity - Configure the leakage tester like the circuit shown above with GND switch CLOSE and polarity switch NORM. Connect the Probe to the TurboTemp connector of the device under test.

Verify that the leakage current from TurboTemp Probe to ground pin is less than 5mA (5 volts on the DMM).