3 Maintenance

Introduction

Recommended Maintenance

Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required.

⚠WARNING

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 and possible health hazards. 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.

M15287-5E

Preventive Maintenance Inspection Report

To help you establish a systematic maintenance routine, we recommend that, every six months, you perform the maintenance checks and test procedures on the "Preventive Maintenance Inspection Report," included at the end of this chapter.

Required Tools and Supplies

In addition to a standard set of hand tools, you will need the items listed below.

Table 3-1. Tools and Supplies

Item	Part Number
#10 TORX driver	
Leakage current tester	MT-1216-02AAMI (for 220V) MT-1216-01AAMI (for 110V)
Multifunction micro-simulator	MARQ 1
Precision dust remover	
Lint-free soft cloth	TX609
PS2 style keyboard (Japan only)	

Inspection and Cleaning

Visual Inspection

Perform a visual inspection of all equipment and peripheral devices daily. Turn off the unit and remove power before making an inspection or cleaning the unit.

- Check the case and display screen for cracks or other damage.
- Regularly inspect all cords and cables for fraying or other damage.
- Verify that all cords and connectors are securely seated.
- Inspect keys and controls for proper operation.
  - Toggle keys should not stick in one position.
  - Knobs should rotate fully in both directions.

Exterior Cleaning

Clean the exterior surfaces monthly, or more frequently if needed.

1. Use a clean, soft cloth and a mild dishwashing detergent diluted in water.
2. Wring the excess water from the cloth. Do not drip water or any liquid on the equipment, and avoid contact with open vents, plugs, or connectors.
3. Dry the surfaces with a clean cloth or paper towel.

Interior Cleaning

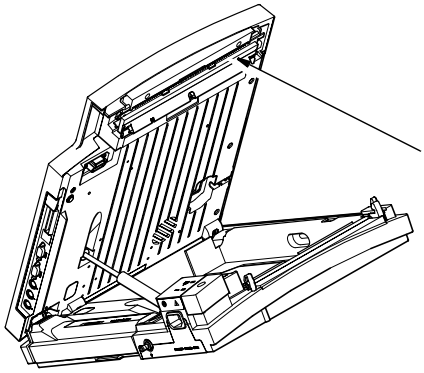
General

Check for dust buildup on the surfaces of the interior circuit boards, components, and power supply. Use commercially available compressed air to blow away the accumulated dust. Follow the manufacturers directions.

Thermal Printhead

Clean the thermal printhead every three months or more often with heavy use. A build-up of thermal paper coating on the printhead can cause light or uneven printing.

Use a solution containing alcohol on a nonwoven, nonabrasive cloth such as Techni-Cloth to wipe off the printhead. Do not use paper toweling, as it can scratch the printhead.

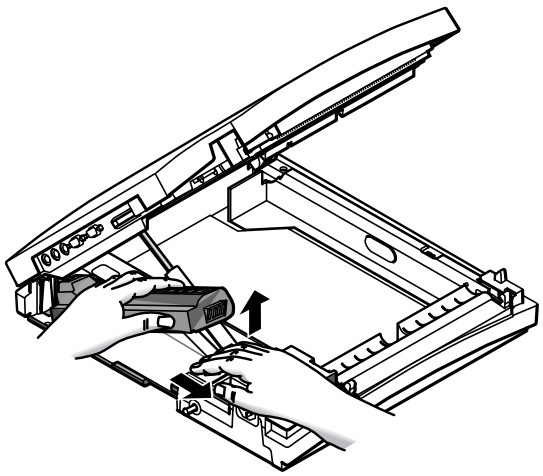


MD1322-004A

Battery and Patient Cable Replacement

Battery Replacement

1. Press the internal access button to open the unit.
2. Slide the battery release button in the direction of the arrow and lift the battery out.

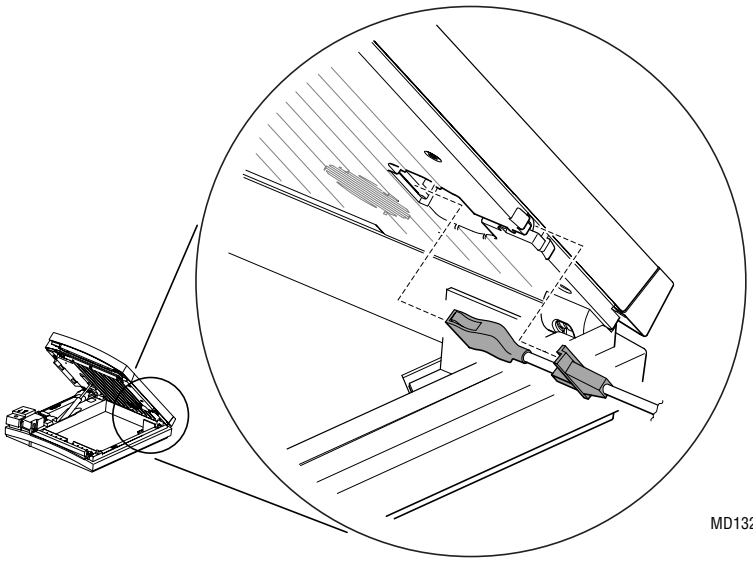


MD1325-112B

3. Install a new battery and close the unit.

Patient Cable Replacement

1. Press the internal access button to open the unit.
2. Press connector release tabs and pull the connector loose.
3. Pull the cable from the retaining tabs.



MD1322-006

4. Reassemble the cable by reversing the above steps.

Disassembly Guidelines

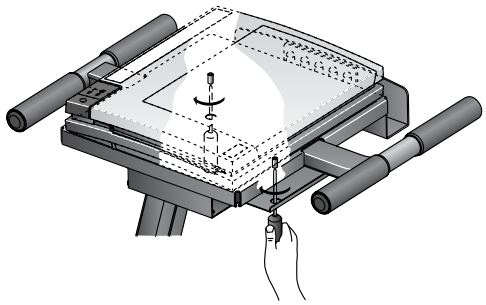
Preliminary Steps

Prior to disassembly, perform the following:

- If possible, process any ECGs remaining in storage.
- If possible, print out set-up for future reference.
- Disconnect the unit from the AC wall outlet and remove the power cord from the unit.
- Remove the battery.
- Remove the chart paper.
- Take strict precautions against electrostatic discharge damage.

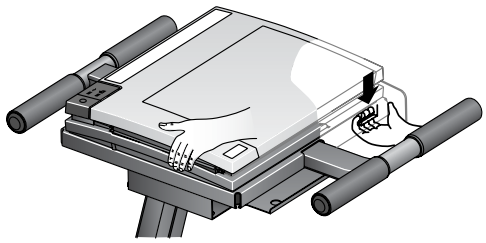
Trolley Disassembly

1. Loosen the two captive screws located under the trolley.



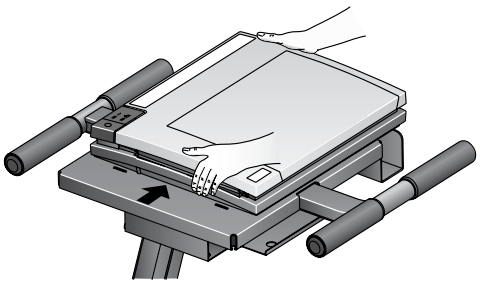
MD1325-212A

2. Pull release tab then slide the MAC 5000 to the right.



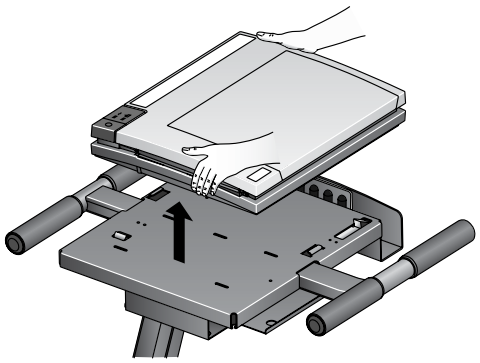
MD1325-173A

3. Slide the MAC 5000 to the right.



MD1325-174A

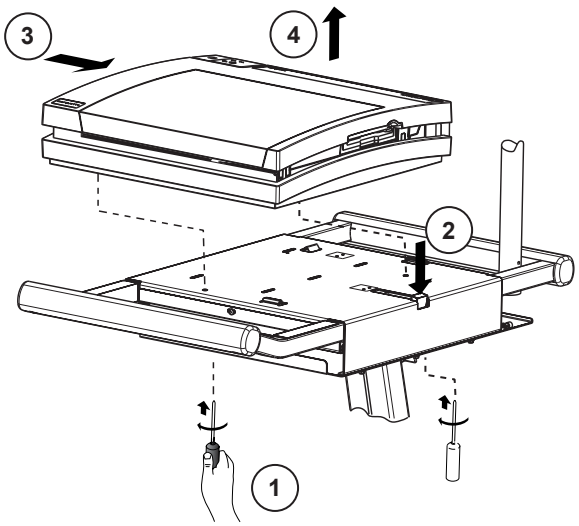
4. Lift the unit from the trolley.



MD1325-175A

Type-S Trolley Disassembly

To dismount the MAC 5000 from the Type-S trolley, follow the steps shown in the illustration below.



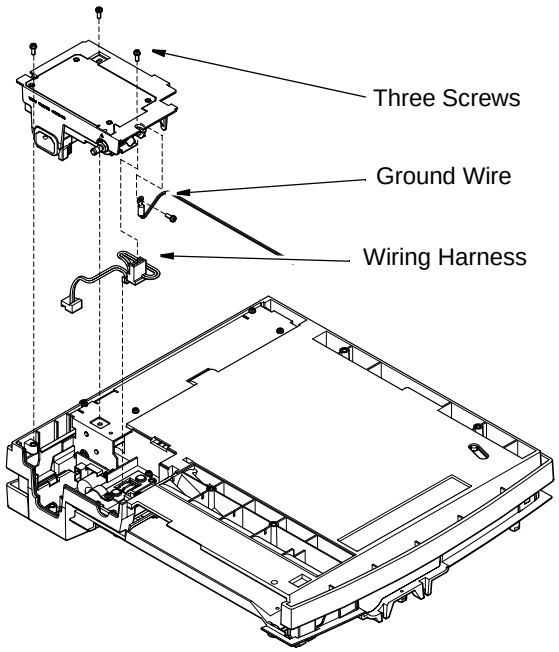
Power Supply

NOTE

A #10 TORX driver is required for disassembly and assembly.

Removal

1. Turn the unit over so the bottom side is up.
2. Using a #10 TORX driver, remove the three screws holding the power supply in place.
3. Lift the power supply to expose the wiring harness and ground wire.
4. Remove P2 from J2 on the power supply assembly and the ground wire connection from the power supply chassis.



Reassembly

Reassemble the power supply reversing the steps for removal. Before replacing the screws, ensure that the ground wire is routed through the notch in the plastic and not pinched.

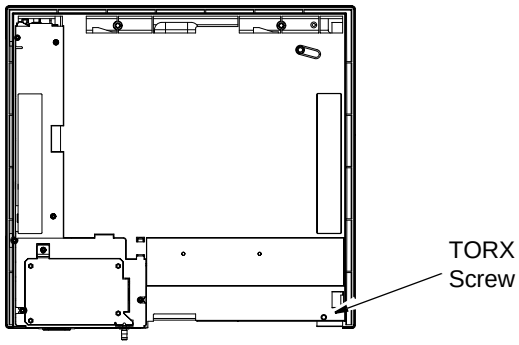
Top Cover

Removal

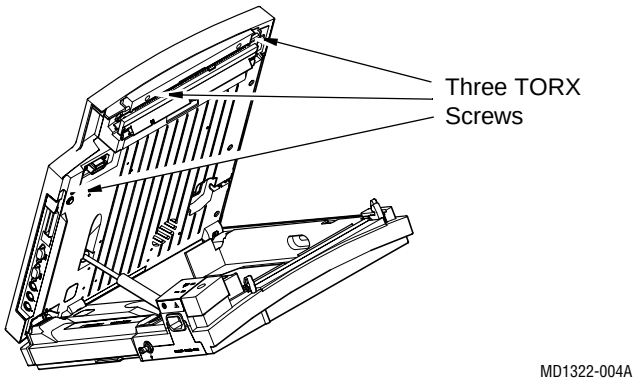
NOTE

It is not necessary to remove the power supply prior to removing the top cover.

1. Turn the unit over so the bottom side is up and remove the TORX screw through the hole on the right rear corner of the unit. (This screw is only visible and accessible with the battery removed.)



2. Turn the unit right side up and press the internal access button and raise the top of the unit.
3. Remove three TORX screws.



4. Lower the top of the unit and lock in place.
5. Raise the display to the vertical position.
6. Gently lift the rear of the top cover free from the unit.

NOTE

The top cover holds the bezel that surrounds the rear panel connectors, so the bezel may fall free at this time.

7. At the front of the top cover, gently pull the thin strip of plastic free from under the keyboard. The entire top assembly is now loose.

> **NOTE**
>
> It may be helpful to rotate the top cover 45 degrees to provide a larger opening to clear the display.

8. Carefully lift the top assembly up and clear of the raised display.

Reassembly

1. Raise the display to the vertical position.
2. Make sure the bezel surrounding the rear panel connectors is in place. Make sure the release mechanism for the Smartmedia card functions properly.
3. Lower the top cover down around the display and set in position.
4. Snap the rear of the top cover in place and then, gently pulling on the thin plastic strip at the front of the top cover, position it in place under the keyboard assembly.
5. Replace the screws removed in disassembly.

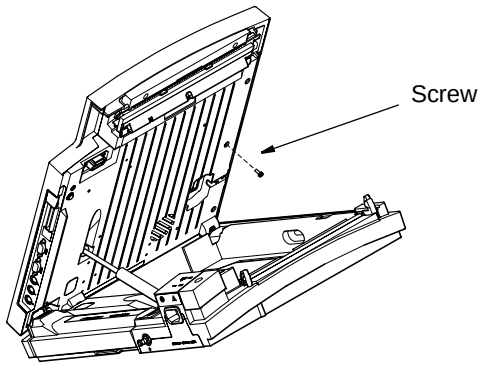
Display/Keyboard Assembly

Removal

1. Remove the top cover following the procedures above.
2. Label the three cables connecting the display/keyboard assembly to the main PCB. Disconnect these cables from the main PCB.

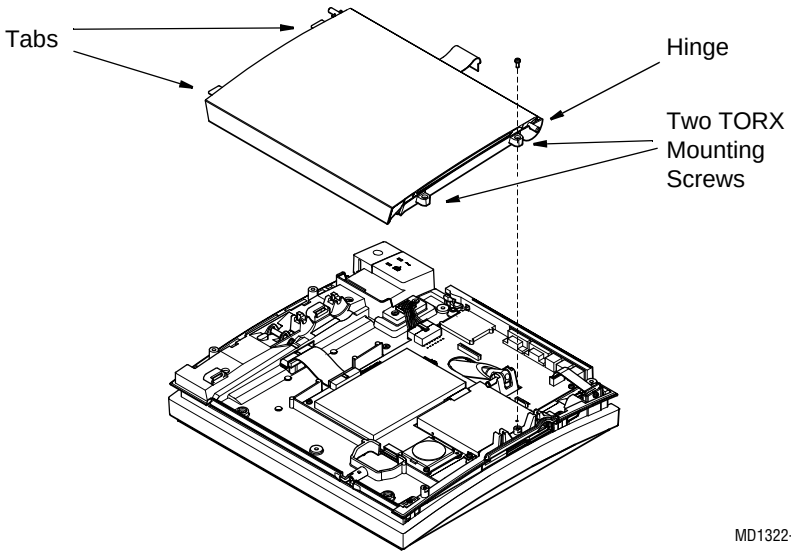
> **NOTE**
>
> Two of these cables have locked connectors that must be lifted up to release the cables.

3. Press the internal access button and raise the top of the unit. Remove one screw on the inside, near the front edge of the top.



MD1322-004B

4. Working from the outside of the top, remove the two TORX mounting screws located on the right side of the assembly.
5. Slide the display hinge (metal rod) to the left to release it from the mounting detent.



MD1322-005

6. Slightly lift up on the right hand side of the display/keyboard assembly, and pull the assembly to the right to free the tabs from their mounting slots. Do not lift the right side of the display too high or the plastic tabs may be damaged.
7. When free from the main unit, the display/keyboard assembly can be separated in to two pieces allowing replacement of either the keyboard or display assembly.

NOTE

Further disassembly of the LCD assembly is not recommended. Replace as a complete assembly.

Reassembly

1. Slide tabs into their mounting slots and set the display/keyboard assembly in place.
2. Replace the two TORX mounting screws on the right side of assembly.
3. Slide the display hinge (metal rod) to the right until it snaps into the mounting detent.
4. Connect the three cables from the display/keyboard assembly to the main PCB. Be sure to lift the locks up prior to attempting to insert the cables into the connectors.

Main PCB

Removal

1. Remove the top cover and display/keyboard assemblies following the procedures above.
2. Disconnect all remaining cable connections to the main PCB. These include cables to the
   - power supply
   - printhead
   - battery connect PCB
   - diskette drive
3. Remove the mounting screws holding the main PCB in place. They are located around the outside edges of the main PCB.
4. Lift the main PCB from the unit.

Reassembly

1. Reassemble the main PCB, top cover and display/keyboard assemblies by reversing the steps for removal.
2. Install the battery and paper, then power on the unit and verify that the
   - serial number and printhead resistance (label on printhead) is correct
   - setup parameters meet user's requirements.

Printhead Replacement

Removal

1. Remove the top cover following the procedure above.
2. Using a Phillips head screw driver, remove the two screws that hold the printhead to the printhead mounting plate.
3. Open the writer assembly, disconnect and remove the printhead.

Reassembly

1. Record the resistance value of the new printhead.
2. Connect the new printhead to the ribbon cable.
3. Hold the new printhead FIRMLY in place against the two metal tabs on the printhead mounting plate, then tighten the two screws.

4. replace the top cover and power up the unit.
5. Go to the Setup menu and enter the new printhead resistance value.
6. Do a Writer Diagnostics test (See 4-19).

Diskette Drive Removal/ Replacement

1. Remove the top cover and display/keyboard assembly following the procedures above.
2. Remove the cable from the diskette drive to the main PCB.
3. Remove two screws holding the diskette drive in place. Loosen, but do not remove two TORX mounting screws holding the mounting bracket.
4. Detach the diskette drive and lift from the unit.
5. Apply the adhesive pad to the replacement diskette drive and position the drive in the unit. Insert and loosely attach the two screws.
6. The mounting screws MUST be tightened in the following order:
   - Tighten the two TORX mounting screws,
   - then tighten the two screws holding the drive to the mounting bracket.
7. Connect cable to the main PCB.
8. Replace the display/keyboard assembly and the top cover following procedures above.

Writer Roller/Carriage Assembly

Removal

1. Remove the power supply assembly following procedures above.
2. Inside the power supply compartment, disconnect the cable that connects to the writer assembly.
3. Open the unit to access the paper compartment. Move the paper size bracket to the A4 position to expose one of the writer assembly mounting screws.
4. Remove the screw and return the paper size bracket to the 8.5 x 11 position.
5. Close the unit and turn it over so the bottom side is up.
6. Remove the four screws located on the underside of the writer roller/carriage assembly and lift the writer from the bottom of the unit.

Reassembly

Reassemble the writer roller/carriage assembly by reversing the above procedures.

Domestic Electrical Safety Tests

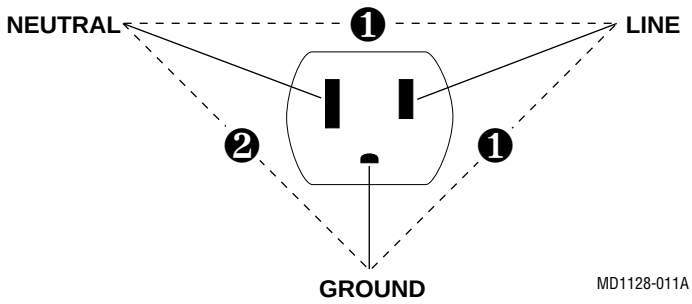
AC Line Voltage Test

This test verifies that the domestic wall outlet supplying power to the equipment is properly wired. For international wiring tests, refer to the internal standards agencies of that particular country.

120 VAC, 50/60 Hz

Use a digital voltmeter to check the voltages of the 120-volt AC wall outlet (dedicated circuit recommended). If the measurements are significantly out of range, have a qualified electrician repair the outlet. The voltage measurements should be as follows:

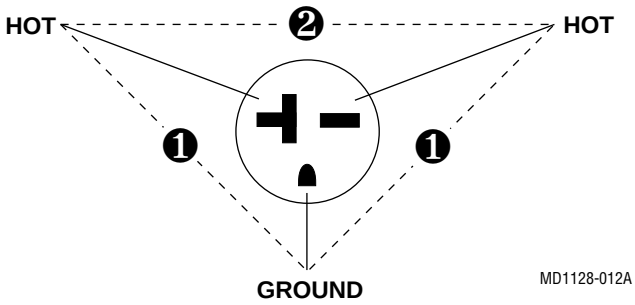
1. 120 VAC (± 10 VAC) between the line contact and neutral and between the line contact and ground.
2. Less than 3 VAC between neutral and ground.



240 VAC, 50/60 Hz

Use a digital voltmeter, set to measure at least 300 VAC, to check the voltages of the NEMA 6-20R, AC wall outlet (dedicated circuit recommended). If the measurements are significantly out of range, have a qualified electrician repair the outlet. The voltage measurements should be as follows:

1. 120 VAC (± 10 VAC) between either “hot” contact and ground.
2. 210 to 230 VAC between the two “hot” contacts.



Leakage Tests

The leakage tests are safety tests to ensure that the equipment poses no electrical health hazards. Use the table below to determine which tests apply to the unit under test and the maximum allowable leakage currents. For international leakage limits, refer to the internal standards agencies of that particular country.

If the unit under test fails the leakage tests, do not allow the customer to use the equipment. Call Tech Support for assistance. (See the "How to Reach Us" page in the front of the manual.)

We recommend that you perform these tests:

- Before applying power for the first time
- Every 6 months as part of routine maintenance
- Whenever internal assemblies are serviced

NOTE

The accuracy of the leakage tests depends on a properly-wired wall outlet. Do not proceed until you verify the integrity of the power source.

⚠WARNING

Total system leakage current must not exceed 300 microamperes.

M15287-76A

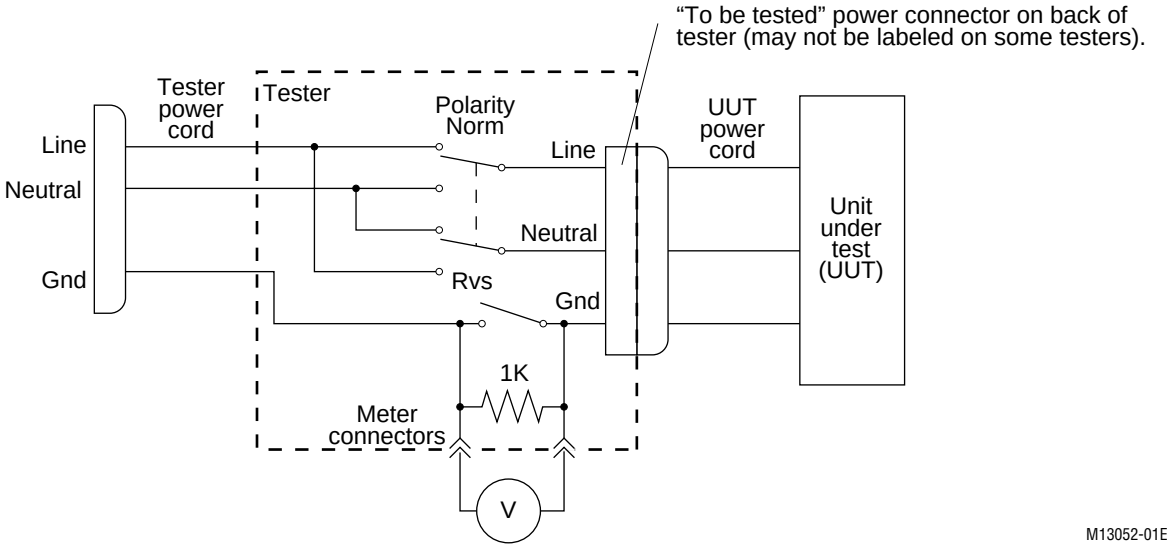
Table 3-2. Leakage Tests and Maximum Allowable Leakage Currents

Test	Maximum Current (μA)
1 Ground-wire-leakage-to-ground	300
2 Chassis-leakage-to-ground	300
3 Patient-cable-leakage-to-ground	10
4 Patient-cable-leakage-into-patient-leads-from-120 V ac	20

Leakage Test Diagrams

These diagrams show only a representation of how a typical leakage current tester functions. Follow the instructions provided with the leakage current tester that you use.

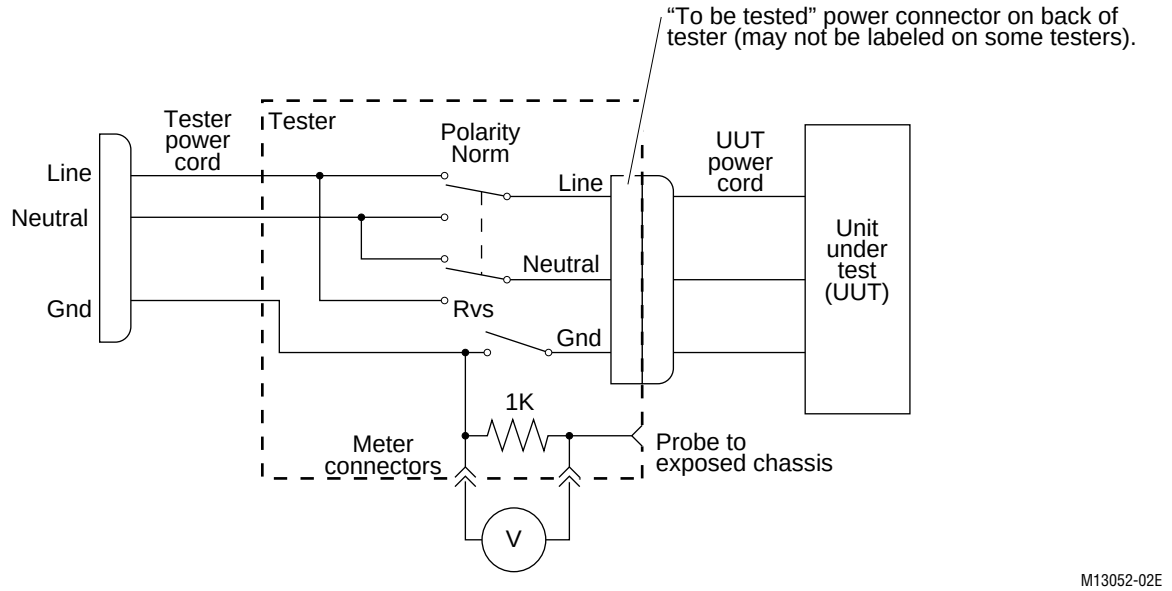
Test #1 Ground-wire-leakage-to-ground



M13052-01E

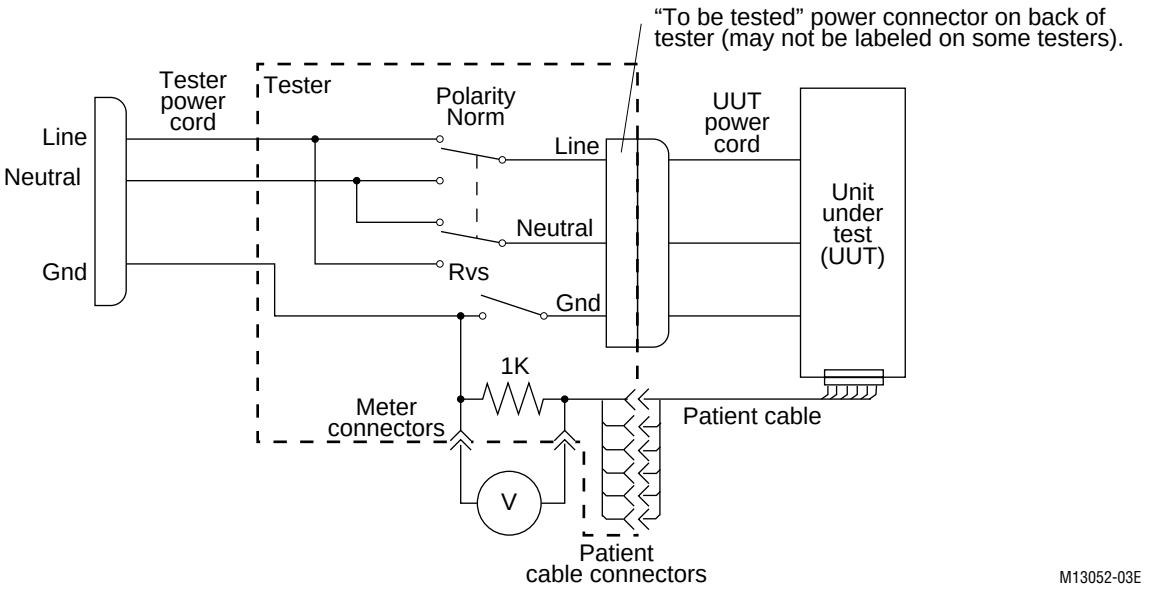
Test #2 Chassis-leakage-to-ground

Apply line voltage to the UUT chassis for this test.



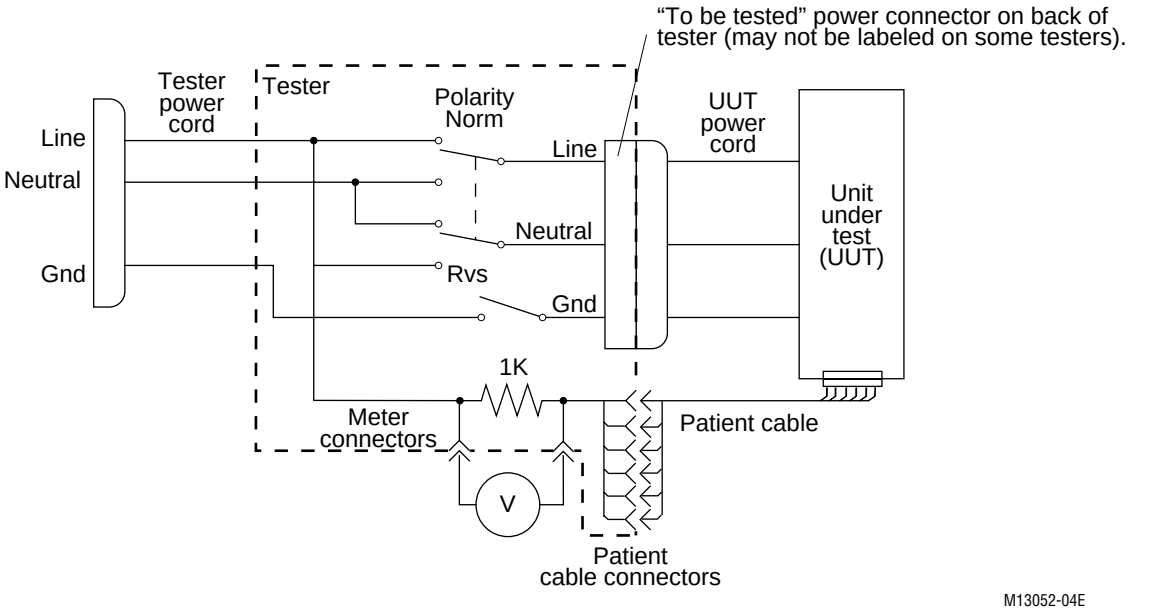
M13052-02E

Test #3 Patient-cable-leakage-to-ground



Test #4 Patient-cable-leakage-into-patient Leads-from 120 VAC

During this test, line voltage is applied to the patient cable connectors. To prevent erroneous readings, do not allow the leadwires to contact conductive materials such as metal handles, and do not place the leadwires on the floor.



Ground Continuity

This test verifies that there is continuity (less than 100 mΩ resistance) between all the exposed metal surfaces, which have the potential to become energized, and the ground prong on the mains AC power cord. If the metal surfaces are anodized or painted, scrape off a small area in an inconspicuous area for the probe to make contact with the metal.

- Use a digital multimeter to check ground continuity from the AC line cord ground pin to exposed metal surfaces. (i.e. rear panel ground lug, ANA/TTL, and EXT. VID.)
- If the measurements are significantly out of range, check for breaks in the power cord or in the internal connections within the unit.