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Maintenance

Other than daily cleaning and occasional maintenance checks as outlined in this chapter, the acquisition module requires no maintenance.

Only qualified service personnel should attempt to repair components and assemblies internal to the acquisition module. Contact GE Healthcare Customer Support for repair and replacement options.

WARNING:

PROPER MAINTENANCE — Failure on the part of all responsible individuals, hospitals, or institutions employing the use of this device, to implement the recommended maintenance schedule may result in 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.

Maintenance and Repair

Item	Description
Maintenance Frequency	The end user should visually inspect and clean the device daily. Qualified technical personnel should perform routine maintenance checks and test procedures per the Functional Checkout Procedure annually.
Repair Guidelines	Equipment descriptions and service information to repair field replaceable parts are available in this service manual for use by qualified technical personnel.

Visual Inspection

Inspect the acquisition module each time you clean it or if you suspect a problem.

- Check the leadwires and leadwire adapters for wear and loose connections. Replace these parts at the first sign of wear.
- Check the pins that the leadwires plug into. They should not be bent or loose. Contact GE Healthcare Customer Support for any repairs needed.
- Check the acquisition module plastic case for any damage. Contact GE Healthcare Customer Support for any repairs needed.

Cleaning

The exterior and leadwires of the acquisition module should be cleaned daily.

Cleaning and Disinfecting Acquisition Modules

Proper cleaning and disinfecting prolongs the life of acquisition devices. Failure to use the proper cleaning solutions or to follow proper procedures can result in the following:

- Appearance of waveforms when not connected to a patient, resulting in false alarms instead of lead failure alarms
- Brittle and cracked device case
- Melting, dulling, or distortion of the case
- Total device failure, requiring replacement
- Unit malfunction
- Voided warranty

Use the following procedure to clean and disinfect the cables and leadwires.

1. Remove cables, leadwires, and batteries from the device before cleaning.

   Make sure to firmly close the battery door after removing the batteries.

2. To clean, wipe with a lightly moistened cloth.

   Use a mild soap and water solution to moisten the cloth.

   Do NOT use any of the following cleaning products, or products that contain the same active ingredients and solutions, which are known to cause the problems previously listed:

   - Sani-Cloth® Wipes
   - Ascepti® Wipes
   - HB Quat®
   - Clorox® Wipes (they do not contain bleach)
   - Over-the-counter detergents (such as Fantastic®, Tilex®, and so on)

3. To disinfect, wipe with a soft, lint-free cloth moistened with an appropriate disinfectant.

   Use the following solutions, as recommended in the APIC Guidelines for Selection and Use of Disinfectants (1996):

   - Sodium hypochlorite (5.2% household bleach) minimum 1:500 dilution (minimum 100 ppm free chlorine) and maximum 1:10 dilution.
   - Any sodium hypochlorite wipe product that meets the previous guidelines can be used.

4. Allow the cleaning solution/disinfectant to remain on the device for a minimum of one minute, or per hospital guidelines.
5. Wipe off the cleaning solution/disinfectant with a clean, moistened cloth.
6. Dry with a clean cloth or paper towel.

Cautions

- Follow the cleaning instructions exactly.
- Wring excess disinfectant from wipe before using.
- Never immerse the device, cables, or leadwires in any liquid, as this may corrode metal contacts and affect signal quality.
- Do not allow fluid to pool around connection pins. If this happens, blot dry with a soft, lint-free cloth.
- Never use conductive solutions or solutions that contain chlorides, wax, or wax compounds to clean the device, cables, or leadwires.
- Never use solutions or products that contain any type of Ammonium Chloride such as, but not limited to:
  - Dimethyl Benzyl Ammonium Chloride
  - Quaternary Ammonium Chloride solutions
  - Abrasive cleaners or solvents of any kind
  - Acetone
  - Ketone
  - Betadine
  - Alcohol-based cleaning agents
  - Sodium salts
- Never autoclave or steam clean the device, cables, or leadwires.
- Do not use until thoroughly dry.

Storage

Use the following guidelines when storing acquisition modules:

- Always remove the batteries when the device is not in use, even for short periods of time.
- Store in a dry, well-ventilated area.
- Hang the device, using a holder if available.

- If leadwires are attached, they should hang straight.
- Do not coil leadwires or cables around the device.

Built-In Diagnostic Tests

The host equipment generally contains built-in diagnostic tests to verify the operation of the electrocardiograph.

These built-in diagnostic tests verify the operation of the acquisition module, as well. For example, there is a test that records raw ECG data on the thermal paper. This test checks for noise and gain in the acquisition module. Another test is a serial link test that determines if the microprocessor in the host equipment is communicating with the acquisition module.

For details on using these tests, see the field service manual for the host equipment.

Functional Checkout Procedures

The following table identifies the tools and procedures required to perform a functional checkout after replacing the specified FRU or performing the specified task. To use the table, locate the relevant FRU or task in the first column and note the required Tools, Visual Inspections, Operational Check, and Electrical Safety Check. Then, locate the referenced instructions in the corresponding sections that follow the table.

NOTE:
The field replaceable unit (FRU) checkout procedure for any listed FRU also applies to its internal PCBs and components.

In addition to the following procedures, you should also perform any checkout procedures required by the host system. Refer to the host system's field service manual for the host system's checkout procedures.

Functional Checkout Requirements

FRU Description	Tools	Visual Inspection	Operational Check	Electrical Safety Check
FRU Repairs				
CAM-14	1, 6	1 ,2, 3	1, 2, 3	not applicable
CAM-HD	1, 6	1 ,2, 3	1, 2, 3	not applicable
All internal FRU's/parts, Covers, and fastener replacements	1, 2, 3, 4, 5, 6	1 ,2, 3	1, 2, 3	1, 2
Non-FRU Repairs				
No parts replaced	1,5,6	1,2,3	1,2,3	not applicable
Annual electrical safety checkout	Per Host Device Requirement			

Tools

1. ECG Simulator
2. Standard hand tools including a #6 Torx driver
3. Current leakage tester
4. Hipot tester
5. Anti-static wrist strap
6. Applicable service and/or operator manual as needed for reference

Visual Inspection

Inspect the following for excess wear and/or any visual signs of damage.

1. Inspect for defective or broken patient cable/leadwires or out-of-date electrodes.
2. Review electrode placement, skin prep, and patient related requirements with the ECG Tech.
3. Inspect external surfaces.

Operational Checks

1. Complete power-up self-test.
2. Run a simulated recorded rhythm strip.
3. Run a simulated recorded ECG.

Electrical Safety Checks

1. Conduct current leakage and ground continuity tests.
   Perform electrical safety checks when indicated in the preceding table. All indicated electrical safety checks require a pass/fail indication for the steps performed. Record the measurement values in your debrief. Refer to "Leakage Tests" on page 22 for additional information.
2. Conduct the dielectric withstand test.
   Refer to "Dielectric Withstand Test" on page 24 for additional information.

Leakage Tests

The leakage tests are safety tests to ensure that the equipment poses no electrical health hazards. Use the following table 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 GE Healthcare Customer Support for assistance.

GE Healthcare recommends that you perform these tests with the following frequency:

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

You need a leakage tester to perform the leakage tests.

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 100 microamperes.

Electrical Safety Checks

Step		Condition[1]	UUT — ON[2]	Result		Leakage Current Limits
Patient Leakage Current to Ground						
1.	Forward Polarity	NC	_____ µA	Pass/Fail		10 µA
2.	Neutral open, Forward Polarity	SFC	_____ µA	Pass/Fail		50 µA
3.	Ground open, Forward Polarity	SFC	_____ µA	Pass/Fail		50 µA
4.	Ground open, Reverse Polarity	SFC	_____ µA	Pass/Fail		50 µA
5.	Neutral open, Reverse Polarity	SFC	_____ µA	Pass/Fail		50 µA
6.	Reverse Polarity	NC	_____ µA	Pass/Fail		10 µA
Patient Leakage Current Mains on Applied Part[3]						
1.	Forward Polarity Neutral / Ground Closed	SFC	_____ µA	Pass/Fail		5000 µA
2.	Reverse Polarity Neutral / Ground Closed	SFC	_____ µA	Pass/Fail		5000 µA

1. NC= Normal Condition SFC= Single Fault Condition N/A= Not Applicable
2. UUT= Unit Under Test
3. All SIPs/SOPs grounded

Dielectric Withstand Test

The dielectric withstand test (or hipot test) is a test that verifies that the isolation of a product or component is sufficient.

If the unit under test fails the hipot test, do not allow the customer to use the equipment. Call GE Healthcare Customer Support for assistance.

GE Healthcare recommends that you perform this test whenever internal assemblies are serviced or replaced.

You need a hipot tester and shorting bar to perform this test.

WARNING:
BODILY INJURY — Power down the hipot tester before touching lead wires. With power applied, the hipot voltage will appear on all lead wire connectors

1. Connect the acquisition module to a host device using the interface cable.
2. Connect all of the leadwires together using a shorting bar.
3. Disconnect the host device from AC power and turn off the unit.
4. Attach the red lead of the hipot tester to the shorting bar.
5. Attach the black lead of the hipot tester to the host device's rear equipotential plug.

   Do not attach to the AC socket ground lug.
6. Set the hipot tester cutoff current to 2 µA and the output to 3000 volts RMS AC.
7. Apply the voltage for a minimum of two seconds.

   If the tester does not indicate a failure, the unit passed the test.
8. Power down the hipot tester and disconnect it from the test circuit.