BURDICK 8300 AND BURDICK 8500 SERVICE MANUAL

70-00844-02 B

CARDIAC science™

AT THE HEART OF SAVING LIVES®

This document contains instructions for both the Burdick 8300 and Burdick 8500. Information in this document is subject to change without notice. Names and data used in the examples are fictitious unless otherwise noted.

CE Mark Declaration

The CE marking of conformity indicates that the device having this symbol on its immediate label meets the applicable requirements of the European Medical Device Directive.

Trademark Information

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TO RESPONSIBLE SERVICE PERSONNEL:

The contents of this document are not binding. If any significant differences between the product and this document are encountered regarding service work, contact Cardiac Science Corporation for more information.

Cardiac Science Corporation recommends the use of authorized Cardiac Science Corporation personnel for the maintenance and repair of all Burdick equipment. Cardiac Science cannot warrant the operation of the equipment if other than Burdick genuine replacement or exchange parts are used in the service or repair of this equipment, and if such service or repair is performed by non-authorized personnel.

This product has been carefully designed to provide a high degree of safety and dependability. However, we can not guarantee against the deterioration of components due to aging and normal wear.

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Rx ONLY

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Contents

1 General Information

Contents

For a complete list of warnings and cautions see the *Burdick 8300 and Burdick 8500 Product Information and Safety* manual.

DANGER! Explosion hazard

Do not use this device in the presence of flammable anesthetics.

Caution: Restricted device

Federal law restricts the sale, distribution, or use of this device to, by, or on the lawful order of a health professional.

Caution: Possible data corruption

Some procedures require you to access the Service Functions menu. The Service Functions menu is intended for qualified Service personnel. If you have any question, please contact Technical Support.

About the Burdick electrocardiographs

The Burdick electrocardiograph is a multichannel electrocardiograph with a thermal printer. The device includes ECG interpretation and network connectivity.

System description

The Burdick ECG device has the following main subsystems:

1. Mainboard contains the host and front end.
2. Power Supply Board: Receives input power from the external power supply or battery pack, supplies power to the ECG device, and recharges the battery pack when connected to external power.
3. Paper Drive Assembly: Includes the printhead, queue sensor to correctly position the paper, and the paper drive motor to feed the paper.
4. The Top Cover Assembly: Contains the keyboard and video display.

2 Service & Maintenance

Contents

When to perform service procedures

Perform the following procedures as indicated:

1. *Functional checkout* on page 2-3: Used to verify normal operation. Must be performed before returning the ECG device to the user.
2. *Electrical leakage current tests* on page 2-6: Used to verify ECG device electrical safety. Must be performed after any internal repair (i.e., the case is opened), or to check for possible damage (e.g., the ECG device is dropped).
3. *Queue sensor calibration* on page 2-8: Used to ensure paper feeds correctly. Must be performed if:
   a. The paper tray assembly is removed or replaced
   b. The queue sensor board is replaced
   c. The power supply board is replaced
   d. The mainboard is replaced.

Functional checkout

Use this procedure to verify normal operation before returning the ECG device to the user.

Required equipment

- Patient Simulator

Functional checkout procedure

If necessary, turn off the ECG device and disconnect the AC power cord.

1. Plug the AC power cord into a wall outlet. Wait until **Press On/Standby** to power on the unit displays on the **Battery Charging** screen.
2. Press the **On/Standby** key to power on the ECG device.

   Verify the ECG device boots up to the **Home** screen without errors.
3. Remove any paper, if installed, and note the printhead resistance in the battery compartment.
4. Press **Setup**.
5. Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and press **Select** twice.
6. Scroll to **Printhead Resistance** and verify the resistance matches the printhead resistance label in the battery compartment.

   Note: If the mainboard is replaced, the printhead resistance must be re-entered.

   If the paper tray assembly is replaced, a new printhead resistance must be entered and the label in the battery compartment must be changed (both should match the printhead resistance written on the printhead).
7. Reinstall the paper and verify the paper type.
   a. Press **Setup**.
   b. Select **System | Paper Type**.
8. Press **Setup** scroll to **Service Functions** and press **Select** twice.
9. Scroll to **Printer Test Sequence**.

   The ECG device prints 3 pages of test characters. Verify all characters print evenly across the page.

   Note: The test characters may appear lighter or darker, depending on the type of paper used, but the printing should still be clear and even across the page.
10. Press the **Home** key.
11. Turn on the patient simulator.
12. Connect the patient simulator to the ECG device.

On the **Home** screen, verify:

- The patient name and ID number or **No Name,** (**No Id**) display

Note: The patient name and ID number display when patient demographic information has already been entered.

- The **SENSORS OK** message displays.
- **AC** displays

13. Disconnect the AC power cord for 1 minute and verify the ECG device continues to operate normally (**AC** will change to **BAT**).

    Note: If the ECG device shuts down immediately after disconnecting the AC power, ensure the battery is installed and securely connected.

14. Reconnect the power cord and verify **BAT** changes back to **AC**.
15. Press the **ECG** key to acquire and print out an Auto ECG.

    The printout will consist of a 12 lead formatted ECG. Verify the following:

    a. Correct printing of the lead waveforms.
    b. Stat ID number entered in the ID field.
    c. Correct date and time when the ECG was acquired.
    d. Interpretation indicates Normal ECG.

16. Press the **Home** key.

17. Press the **Directory** key to verify the ECG is saved in the patient directory.

18. Press the **Home** key.
19. Disconnect the patient simulator.

Calibration pulse check procedure

Cardiac Science recommends performing a calibration pulse (cal pulse) check procedure annually to test the sensitivity of the system.

To perform the cal pulse check, apply a cal pulse individually to Leads I, II, and V1-V6 (C1-C6) and verify they reproduce a 1 mV within a tolerance of ±5% of the input signal.

You can perform a cal pulse check using a commercial ECG simulator (described here) or you can use a test circuit as described in IEC 60601-2-51 (2005)

Commercial ECG simulator method

The ECG simulator must have a 1 mV (±0.01 mV) cal pulse with rise time of not greater than 5 ms.

1. Consult the user manual for the ECG simulator to determine the correct way to hook the simulator to the ECG recorder and to perform a cal pulse test.
2. Measure the output of each lead to be tested by connecting the patient electrode wire to the input of the appropriate cal pulse connector while all other patient electrode wires are connected to their appropriate connection points.
3. Follow the instructions for the ECG simulator to verify that the resultant cal pulse amplitude for each lead is reproduced with no more than ±5% error.

Electrical leakage current tests

Use these tests to verify ECG device electrical safety. All leakage tests must be performed after any internal repair (i.e., the case is opened), or to check for possible damage (e.g., the ECG device is dropped).

The ECG device is Class II (ungrounded equipment). The exposed metal on the ECG device is not likely to become energized by internal live circuitry. (All exposed metal is double insulated from the internal live circuitry and does not become energized even under single fault conditions.) Therefore it is safer not to connect the exposed metal to the internal chassis or to the functional earth of the ECG device. This method of protection is recognized by all national and international consensus standards and safety agencies.

The exposed metal in the ECG device cannot become energized by internal live circuitry nor by differences in the ground potential, so there is no reason to provide voltage equalization.Use the equipotential ground contact (ground lug) to interconnect the chassis and functional earth of the ECG device, via the equipotential ground system, to other electrical noise sources in a room. This reduces electrical noise that might appear on the output of the ECG.

Required equipment

1. Dynatech Nevada 235A Safety Analyzer

Note: The Dynatech Safety Analyzer is recommended for this procedure, if a different safety analyzer is used, consult the user manual for proper setup and testing procedures.

Patient leakage current procedure

Note: Ensure that the Kelvin cable is not connected.

1. Plug the safety analyzer into the 264 VAC line voltage.
2. Plug the ECG device power cable into the test receptacle on top of the safety analyzer.
3. Connect a patient cable between patient input connector on the ECG device and the appropriate patient terminals on the top of the safety analyzer.
4. Press the **Enable** button for the **ECG leads** group on the safety analyzer.
5. Turn the **Select** knob to select **All**.
6. Verify the leakage current is less than 10 µA for these conditions:
   a. Polarity Normal, ECG device power on
   b. Polarity Normal, Open Ground, ECG device power on
   c. Polarity Normal, Open Neutral, ECG device power on
   d. Polarity Reversed, ECG device power on
   e. Polarity Reversed, Open Ground, ECG device power on
   f. Polarity Reversed, Open Neutral, ECG device power on

Patient sink current procedure

WARNING! Shock hazard.
This test applies AC Line Voltage to the patient cable.

Note: Ensure that the Kelvin cable is not connected.

1. Turn the **Select** knob to select **Isolation** in the **ECG leads** group and wait for the numbers to display.
2. Press the **ISO test** button and verify that the highest measured value is less than 50 µA.

Queue sensor calibration

Use queue sensor calibration to measure and record queue sensor voltages based on queue sensor characteristics and internal physical alignment. Required when:

- The paper tray assembly is removed or replaced
- The queue sensor board is replaced
- The power supply board is replaced
- The mainboard is replaced

If this calibration fails twice, contact Technical Support.

Note: This procedure is not required if the paper door is replaced or after minor adjustments.

Calibration procedure

Caution: Equipment damage

Use only Assurance® or Heartline™ standard paper. Using any other paper may damage the ECG device and void the warranty.

1. Insert paper into the paper drive so that the print head is approximately half-way between the perforations of the paper.

2. Power on the ECG device and verify the ECG screen displays (press the **Home** key.)

3. Press **Setup**.

4. Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select**.

   The system displays a warning regarding assessing the service functions.

5. Press **Select**.
6. Scroll to **Queue sensor calibration** and press **Select**.
7. Press **Select** to start the calibration.

   The DAC value should be approximately 100.

8. Press **Home**.

9. Press the **Form Feed** key and verify the paper queues correctly.
10. Select **Setup | Waveform Preferences | Speed | 12.5mm/s**.

11. Press the **Manual Rhythm** key and print 3 pages of ECG data.

    Verify additional headers are not printed on the pages.

12. Press **Stop**.

    Verify the paper queues correctly.

13. Select **Auto Rhythm**.

    Verify a one page report prints and the paper correctly queues.

14. Repeat for waveform speeds of 25 mm/s and 50 mm/s.

3 Troubleshooting

Contents

Preliminary checks

Before using the troubleshooting chart below, check the following:

1. Ensure users are correctly following instructions listed in the *User's Guide*.

   Verify proper skin preparation, lead placement, lead integrity, etc.

2. Check the ECG device settings (**Setup | Print Setup Report**) to ensure the ECG device is configured as expected.

3. Verify external cables are undamaged and securely connected.

   Swap out the power cable, external transformer, and patient cable with known good cables.

4. Check for any other visible damage such as cracks in the case, broken or cracked cable connectors, or rattling when the ECG device is moved.

Troubleshooting chart

Table 3-1: Troubleshooting chart

Problem	Solution
Artifacts or noise on ECG trace	Check the following for general problems (refer to the Operating Instructions Troubleshooting section for specific problems and solutions).: **1.** Try to prevent unnecessary patient movement. **2.** Ensure all leads are clean, secure, and properly placed. **3.** Ensure the skin is properly prepared and unbroken. **4.** Ensure all cables are securely connected. **5.** Check cables for damage, including nicks, cuts, wear, or bulging. **6.** Position the ECG device as far from other electronic equipment as possible.
Message *Waiting for Data* is displayed	This message is normally displayed for about 15 seconds after beginning an ECG acquisition. If it does not go away after about 15 seconds: **1.** Check the screen for a lead fail indication, and then fix that lead. **2.** Check all the ECG leads. **3.** Troubleshoot for noise (see *Artifacts or noise on ECG trace*). **4.** Refer to the *Operating Instructions* for additional troubleshooting information.
AC power indicator is off (Green LED on back panel)	**1.** Ensure both ends of the power cord are securely connected. **2.** Ensure green LED on external power supply is on. **3.** Disconnect the ECG device from the external power supply and see if the external power supply LED is on. **4.** Ensure the power outlet is working. **5.** Replace power cord. **6.** Replace the external power supply.
	This solution must be performed by qualified service personnel: **1.** Replace power supply board.

Table 3-1: Troubleshooting chart (continued) (continued)

Problem	Solution
ECG device unexpectedly reboots (crashes)	The ECG device will shut off if both AC and battery power are interrupted at the same time. The ECG device **must** have a battery installed during normal operation. **1.** If operating from the battery, ensure the battery is charged and the cable securely connected. **2.** If operating from AC power, ensure the battery is installed and AC power is available **3.** After a crash, insert a USB flash drive and select **Setup**.  **4.** Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select** twice.  **5.** Scroll to **Copy crash dump to USB** and press **Select**. The ECG device writes a text file that can be sent to Technical Support for analysis.
Video Display **1.** No display **2.** Display is too dark or too light **3.** Display is unstable	**1.** Ensure a battery is installed and check the green power LED on the back panel to verify AC power is available. **2.** Try adjusting the brightness (**Shift** + **Next** or **Shift** + **Previous**).  **3.** Press and hold the **On/Standby** key for 8 seconds to power off and then press **On/Standby** again to restart the ECG device.
	These solutions must be performed by qualified service personnel: **Note:** When opening this unit for troubleshooting, DO NOT unplug the video cable from the logic board unless you are replacing the top assembly. The video cable is fragile. **1.** Ensure keyboard cable is securely connected. **2.** Ensure the display cable is securely connected. The graphic below shows the Video Display cable improperly connected--the cable is not fully inserted into the jack and the right tab is not fully engaged to lock in the cable. **3.** Replace the top cover assembly. **4.** Replace the power supply board. **5.** Replace the mainboard.

Table 3-1: Troubleshooting chart (continued) (continued)

Problem	Solution
Keyboard **1.** No response from one or more keys **2.** Key sticks	To verify the keyboard operation: **1.** Select **Setup**. **2.** Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select** twice. **3.** Select **Keyboard Test** to verify keyboard operation. **a.** If **On/Standby** key does not work, ensure the battery is installed and check the green power LED on the back panel to verify AC power is available. **b.** Restart the ECG device. **c.** Clean the outside surface keyboard with isopropyl alcohol.
	These solutions must be performed by qualified service personnel: **1.** Verify the keyboard cable is securely connected. **2.** Clean the underside of the keypad and the keypad contacts with isopropyl alcohol. **3.** Replace the keyboard cable. **4.** Replace the top cover assembly. **5.** Replace the mainboard.

Table 3-1: Troubleshooting chart (continued) (continued)

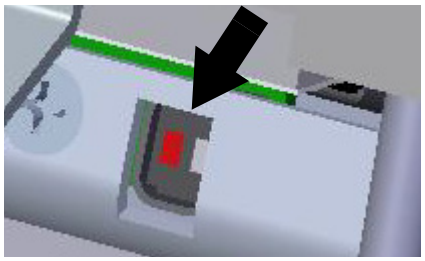
Problem	Solution
Printing • Paper does not feed • Paper feeds but does not print • Printing too light or too dark • Out of Paper message in error	To verify the printer operation: 1. Select **Setup**. 2. Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select** twice. 3. Select **Printer Test Sequence**. **a.** Verify paper type in **System Settings** matches the paper installed. **b.** Ensure Burdick paper is used (Assurance® or Heartline™). **c.** Check paper door gear for damage and then ensure paper door is properly seated. **d.** Take paper out and reinstall. Follow paper installation instructions in the *User's Guide*. **e.** Clean queue sensor. See illustration below. Paper dust may collect on the sensor--clean the queue sensor by wiping with a soft cloth.  ***Figure 3-1:*** **Queue sensor** These solutions must be performed by qualified service personnel: To verify the printer operation: 1. Select **Setup**. 2. Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select** twice. 3. Select **Printhead resistance**. Verify the printhead resistance entered matches the resistance entered on the printhead. 4. Ensure cables from the paper tray assembly to the power supply board are securely connected. 5. Replace cables from the paper tray assembly to the power supply board. 6. Replace queue sensor. 7. Replace paper tray assembly. 8. Replace power supply board.

Table 3-1: Troubleshooting chart (continued) (continued)

Problem	Solution
Battery ECG device will not operate when disconnected from AC power or only operates for a short time.	Normal battery life is about 3 hours depending on how the ECG device is used (if the battery lasts less than half that time or is more than two or three years old, it should be replaced). To conserve Battery life, do not turn on the ECG device until the patient is prepared and the leads are connected. **1.** Ensure green LED on external power supply is on. **2.** Check the green power LED on the back panel to verify power is available when charging the battery. **3.** Ensure the battery is installed and the battery cable is securely connected. **4.** Ensure the battery has been charged for at least four hours. **5.** If the ECG device has not been used for an extended period (several months), the battery may be fully discharged and will only accept a minimal charge. Try disconnecting AC power and then charge the battery again.
	This solution must be performed by qualified service personnel. **1.** Replace the power supply board.
Additional patients cannot be added to the patient directory	Normally, when the directory reaches the maximum number of patients, the oldest records will be deleted as new records are added. However, this only happens if the records have been printed or sent. If none of the records have been printed or sent, additional patients cannot be added to the directory. The system may require adding demographics to patients at requisition. **1.** Print or send old records.
Date and time inconsistent or cannot be set	These solutions must be performed by qualified service personnel: **1.** Replace 3V button cell on mainboard. **2.** Replace mainboard assembly.
Communications Errors	See the *Communications Troubleshooting Help* pages (**Alt** + **H**) for a list of specific errors. General checks include: **1.** Ensure the serial, phone, network, or USB cables are securely connected to the correct jack. **2.** Check the communications settings. **3.** For network problems, check with the network administrator to ensure the destination is available To display the IP Address of the ECG device: **a.** Select **Setup**. **b.** Use the arrow keys (**Next** and **Previous**) to scroll to **Service Functions** and then press **Select** twice. **c.** Select **Get IP Address**

4 Component Replacement

Contents

This section contains instructions for removing, ordering, and replacing the ECG device sub assemblies.

Parts list

To locate components, refer to *Disassembly* on page 4-12 and to this parts list:

Table 4-1: Parts list

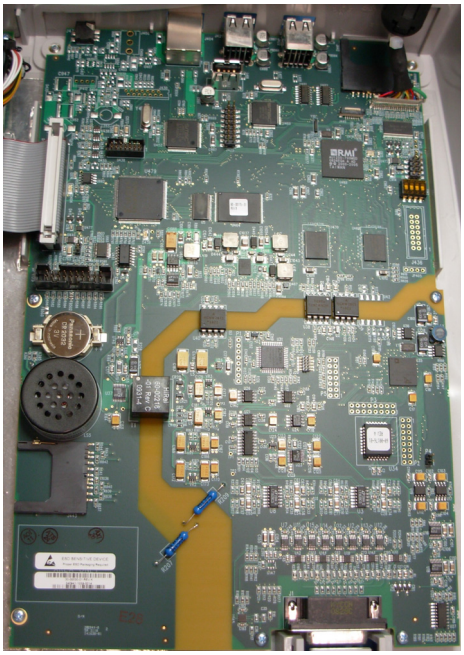
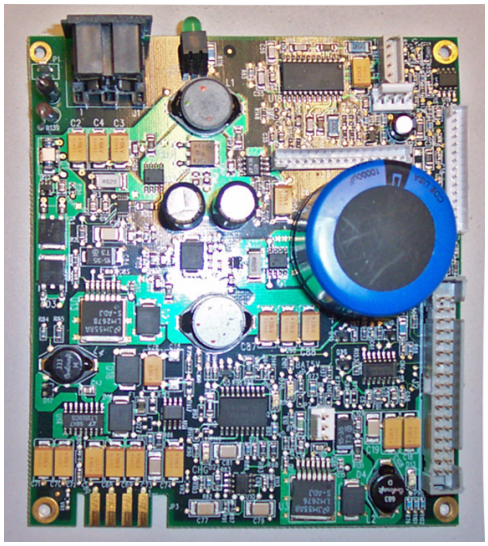
Part	Description and location
	Mainboard Battery, CR2032 **Note:** Mainboard includes CR2032 Battery. .
	Power supply board

Table 4-1: Parts list

Part	Description and location
 	ECG device top cover assembly

Table 4-1: Parts list

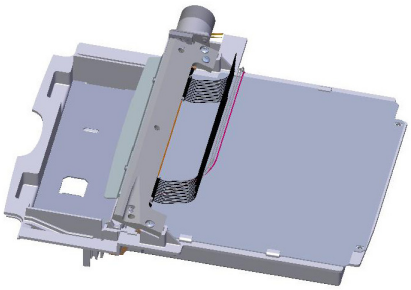
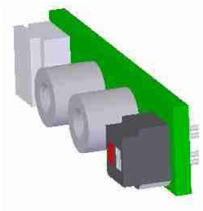
Part	Description and location
	ECG device Top Cover Assembly (with Video Display)
	ECG device Top Cover Assembly
 Paper Tray Assembly	Paper tray assembly Queue sensor
 Queue Sensor	

Table 4-1: Parts list

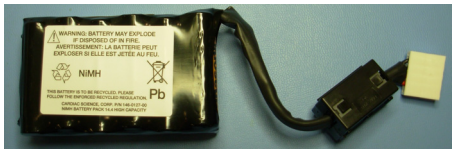
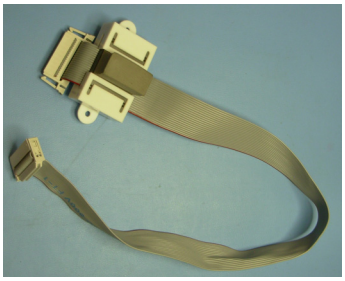
Part	Description and location
	Paper door
	ECG device battery access cover
	(8300) ECG device Battery Pack, 14.4V, NiMH, 1500mAH
	(8500) ECG device Battery Pack, 14.4V, NiMH, High Capacity
	Mainboard to power supply board cable

Table 4-1: Parts list

Part	Description and location
	Keyboard cable with ferrite

Component replacement

WARNING! Shock hazard.

Before opening the case, ensure the ECG device is unplugged and the battery pack is removed. If power must be applied while the case is open, ensure all personnel and equipment are clear of any energized components.

Caution: Static electricity.

Several ECG device components are extremely sensitive to static electricity. Always use an anti-static mat and wrist grounding strap when working on internal components.

Caution: Burn hazard.

Components inside the unit may be hot after use. Use caution when working on internal components.

The following section lists the steps to replace each ECG device component.

Replace the top cover assembly

The top cover assembly includes the top cover (with labels), keyboard assembly, and the video display.

Note: The top cover assembly may be ordered without a video display.

1. Remove the battery pack (see *Remove the battery pack* on page 4-12).
2. Remove the paper door.
3. Remove the top cover assembly *Remove the ECG device top cover assembly* on page 4-15).
   a. Remove the paper drive assembly (see *Remove the paper drive assembly* on page 4-16).
   b. Disconnect the video display cables.
   c. Connect the new video display cable.
   d. Re-install the paper drive assembly.
4. Install the new top cover assembly.
5. Re-install the battery pack.
6. Apply the Burdick label (the new label must be the same as the label on the old top cover).
7. Re-install the paper door.
8. Perform the following tests before returning the ECG device to service:
   a. *Functional checkout* on page 2-3
   b. *Electrical leakage current tests* on page 2-6
   c. *Queue sensor calibration* on page 2-8

Replace the paper drive assembly

1. Remove the battery pack (see *Remove the battery pack* on page 4-12).
2. Remove the paper door.
3. Remove the top cover assembly (see *Remove the ECG device top cover assembly* on page 4-15).
4. Remove the paper drive assembly (see *Remove the paper drive assembly* on page 4-16).
5. Install the new paper drive assembly.

   Note: Ensure the cables to the power supply board stay securely connected while installing the paper drive assembly.

6. Write the printhead resistance (written on the top of the printhead) onto the printhead resistance label.
7. Attach the printhead resistance label onto the enclosure bottom in the battery compartment.
8. Re-install the top cover assembly.
9. Re-install the battery pack.
10. Re-install the paper door.
11. Perform the following tests before returning the ECG device to service:
    a. *Functional checkout* on page 2-3
    b. *Electrical leakage current tests* on page 2-6
    c. *Queue sensor calibration* on page 2-8

Replace the ECG device mainboard

To replace the mainboard.

1. Remove the battery pack (see *Remove the battery pack* on page 4-12).
2. Remove the paper door.
3. Remove the top cover assembly (see *Replace the top cover assembly* on page 4-7).
4. Remove the paper drive assembly, (see *Remove the paper drive assembly* on page 4-16).
5. Remove the mainboard (see *Remove ECG device 8300 mainboard assembly* on page 4-17).
6. Install the new mainboard.
7. Re-install the paper drive assembly.

   Note: Ensure the cables to the power supply board stay securely connected while installing the paper drive assembly.

8. Re-install the top cover assembly.
9. Re-install the battery pack.
10. Re-install the paper door.
11. Perform the following tests before returning the ECG device to service:
    a. *Functional checkout* on page 2-3
    b. *Electrical leakage current tests* on page 2-6
    c. *Queue sensor calibration* on page 2-8

Replace the power supply board

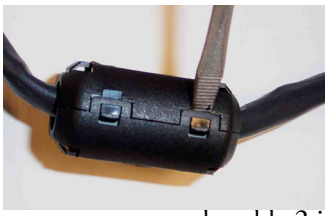
1. Remove the battery pack and cover (see *Remove the battery pack* on page 4-12).
2. Remove the paper door.
3. Remove the top cover assembly (see *Remove the ECG device top cover assembly* on page 4-15 or *Remove the ECG device top cover assembly* on page 4-15).
4. Remove the paper drive assembly (see *Remove the paper drive assembly* on page 4-16).
5. Remove the power supply board (see *Remove power supply board* on page 4-20).
6. Replace the power supply board.
7. Re-install the paper drive assembly.

   Note: Ensure the cables to the power supply board stay securely connected while installing the paper drive assembly.

8. Re-install the top cover assembly.
9. Re-install the battery pack and cover.
10. Re-install the paper door.
11. Perform the following tests before returning the ECG device to service:
    a. *Functional checkout* on page 2-3
    b. *Electrical leakage current tests* on page 2-6
    c. *Queue sensor calibration* on page 2-8

Replace the external power supply

1. Power down the ECG device and disconnect external power.
2. Remove the ferrite from the old external power supply cable by unsnapping fasteners.



3. Place the ferrite around the new power supply cable 2 inches (+/- 1/2 inch), from the 5 pin din connector.

4. Re-install the power supply cable.

Disassembly

The procedures in this section detail removing ECG device components.

Remove the battery pack

WARNING! Fire, explosion, or contamination hazard.

Properly dispose of batteries in accordance with local regulations. Burning, heating, or improper disposal may cause explosion, fire, or contamination.

Caution: Loss of data.

The battery pack must be installed at all times for proper operation. Operating without a battery pack may result in lost or unsaved waveform data.

Caution: Patient injury.

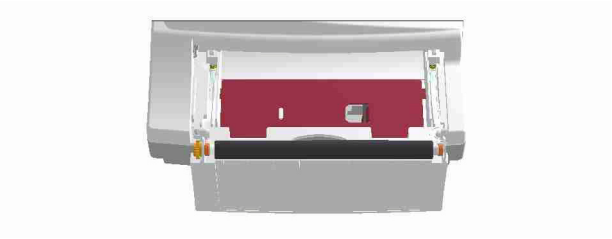
Do not remove the battery pack within the patient vicinity.

1. Disconnect external power.

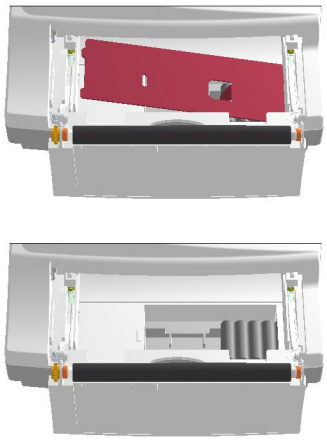
WARNING! Shock hazard.

Verify the external power cord is disconnected before removing or replacing battery pack. A blank display is not a reliable indication of disconnected external power.

2. Pull out the paper door and remove the paper.



3. Remove the battery access cover.
   a. Slide the plate toward the front of the ECG device.
   b. Lift up the back end of the plate to remove.



4. Remove battery pack:
   a. Slide the battery pack out of the battery compartment.

Caution: Equipment damage.
Do not pull on the wires to disconnect the battery pack connector. This may cause the connector to fail. Only pull on the connector to disconnect the battery pack.

   b. Disconnect the battery pack connector.
   c. Remove the ferrite from the old battery pack by unsnapping fasteners.

Figure 4-1: **Example of ferrite removal for the Burdick 8300**

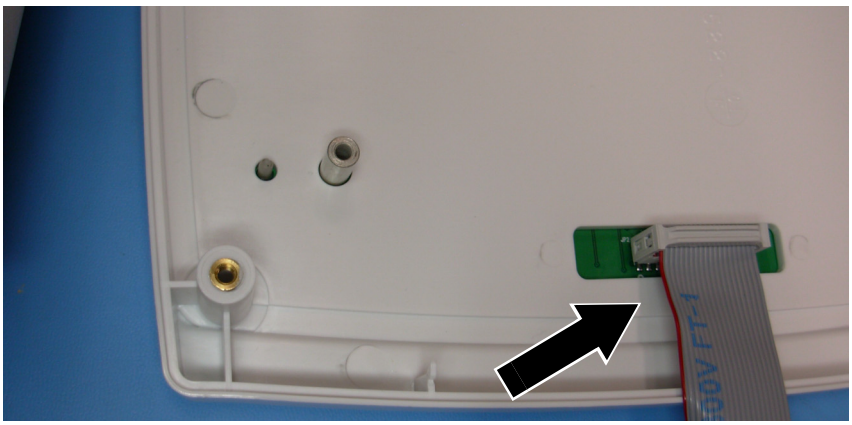
   d. Place the ferrite around the new battery pack cable approximately in the middle of the cable.

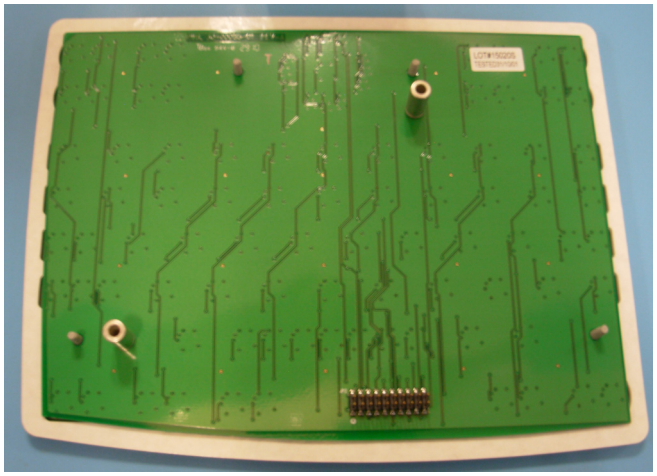
Remove the keyboard assembly

To remove the keyboard assembly:

1. Unplug the AC power and remove the battery pack.(see *Remove the battery pack* on page 4-12)
2. Gently loosen the membrane overlay to access the underlying keyboard PCB.
3. Pry the keyboard up.

   Do not attempt to loosen one side and force it off, this can cause a locating pin form the keyboard to fall inside the unit.
4. Unplug the keyboard ribbon cable noting the polarity of the cable.





Remove the ECG device top cover assembly

Caution: Burn hazard.

Components inside the unit may be hot after use. Use caution when working on internal components.

To remove the top cover assembly:

1. Turn the electrocardiograph over and remove the two bottom assembly screws.

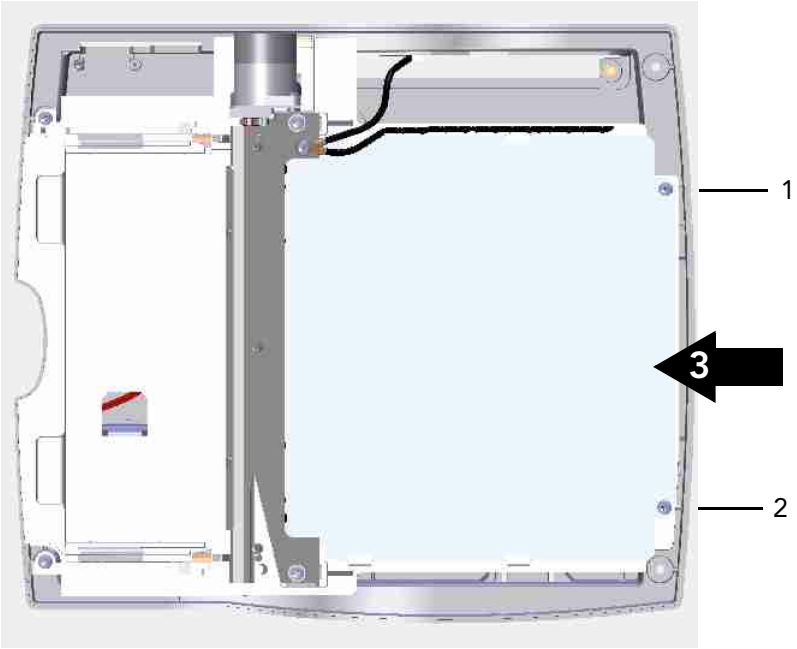
2. Carefully turn the electrocardiograph back over.
3. Remove the paper door and the paper, (see *Remove the paper door* on page 4-21).
4. Remove the two screws and the paper door rails from the paper well.

5. Lift the top cover assembly and disconnect the keyboard cable.
6. Remove the top cover assembly and set upright behind the ECG device.

Remove the paper drive assembly

To remove the paper drive assembly:

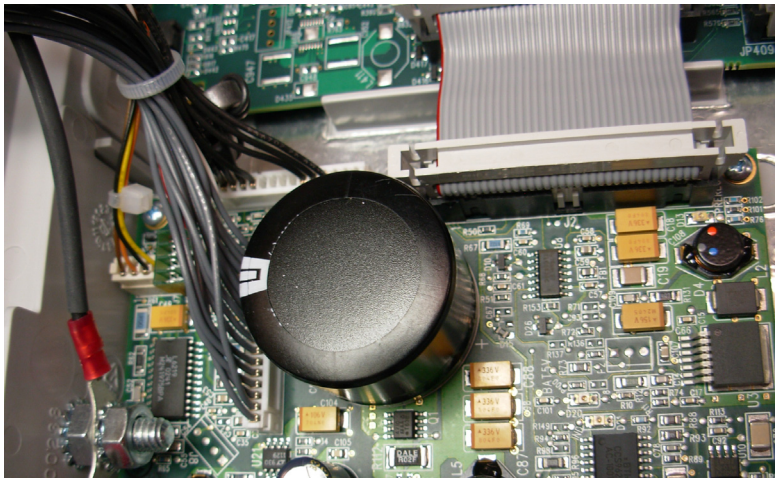
1. Remove the printer assembly screws (1 and 2).



2. Lift out the paper drive assembly and rotate clockwise 180° to set aside.

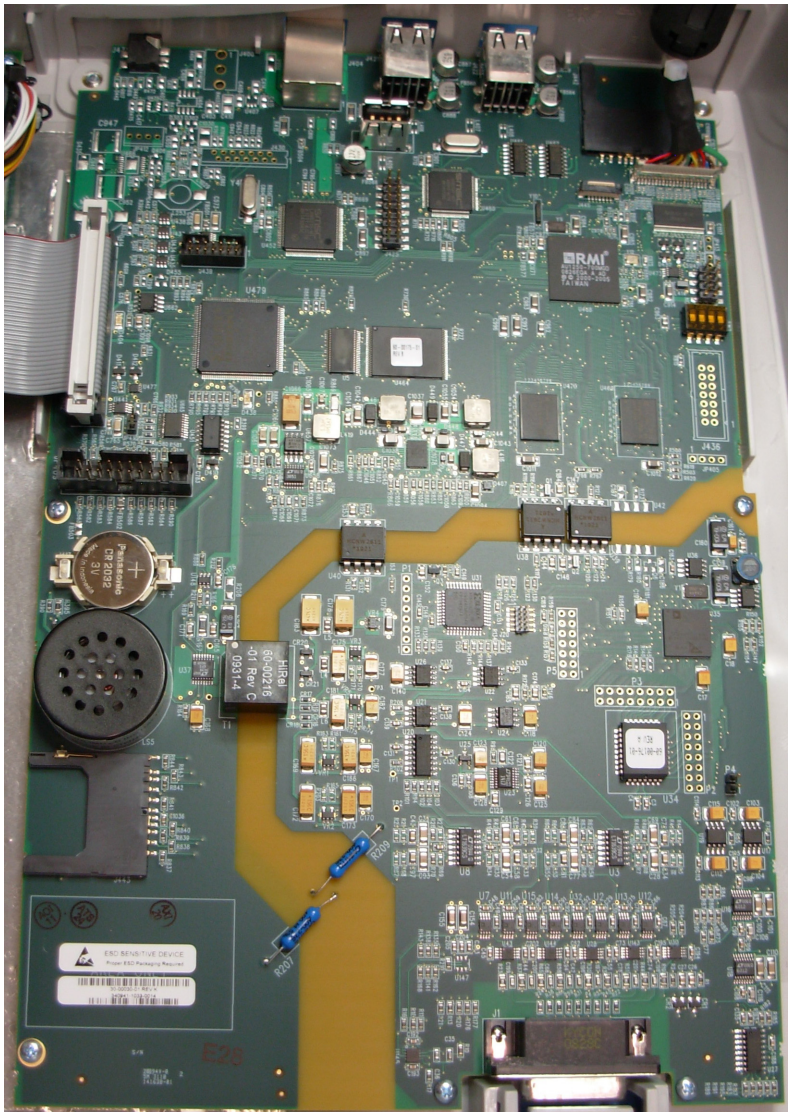
Important: When reinstalling the paper drive assembly, be sure to push the paper cover fully to the position pins on the print head bracket (3) before tightening the screw.

Note: The paper drive assembly power cables remain connected to the power supply board.



3. Disconnect the cable connectors on the power supply board.

Remove ECG device 8300 mainboard assembly

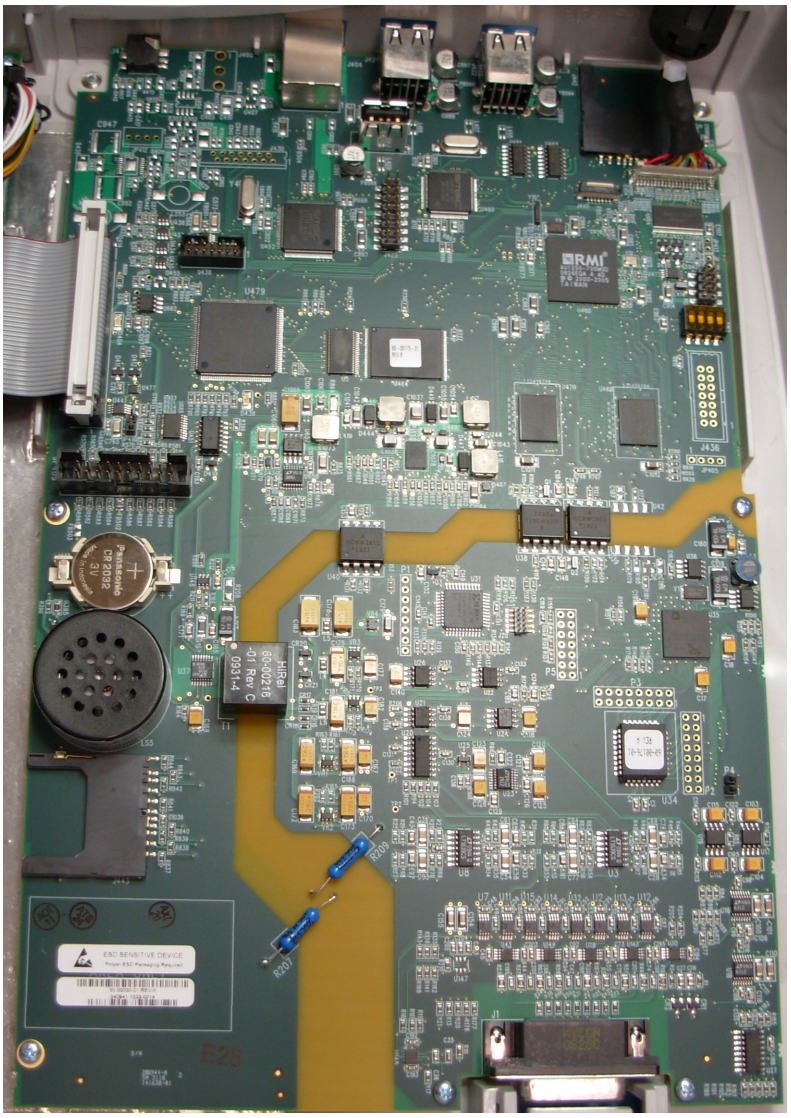


To remove the mainboard:

1. Disconnect the keyboard cable connector.
2. Disconnect the power supply board cable.
3. Disconnect the LCD Display cable located just above the keyboard connector.
4. Remove the screws holding the board in place.

Remove ECG device 8500 mainboard assembly

The mainboard assembly includes the video adapter board (A, in the figure below).



To remove the mainboard:

1. Disconnect the keyboard cable connector.
2. Disconnect the power supply board cable from.
3. Disconnect the video display cable and ground.

   Note: When reinstalling the video cable, ensure the connector is fully inserted and the side clips are completely engaged. The figure below shows an incorrectly installed cable:

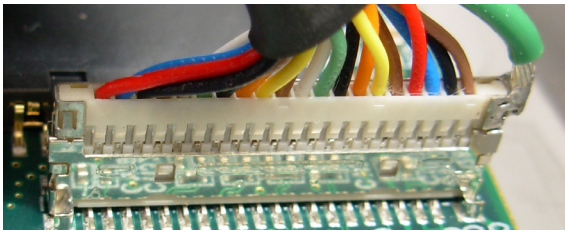


Figure 4-2: **Video cable installation**

4. Remove the screws holding the board in place.

Remove power supply board

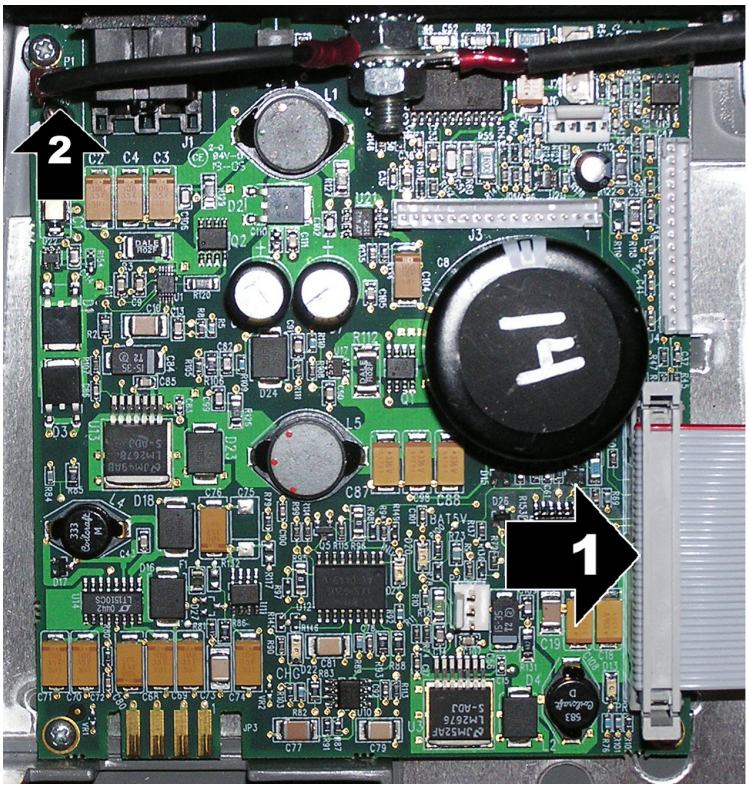


Figure 4-3: **Power supply board removal**

1. Disconnect the ground connector to P1 (2).
2. Disconnect the cable to the mainboard (1).
3. Remove the 4 screws (one in each corner).

   Note: A rubber spacer must be installed under the screw hole near P1 (see the board detail on Figure 4-4). Ensure the other rubber spacer to the right of P1 is left intact. The spacer may adhere to the power supply board or bottom assembly when the board is removed and is easily lost. When reinstalling the power supply board, ensure the spacer is in place to prevent the board from warping when the screw is tightened.

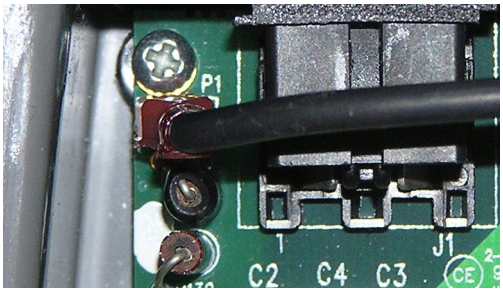
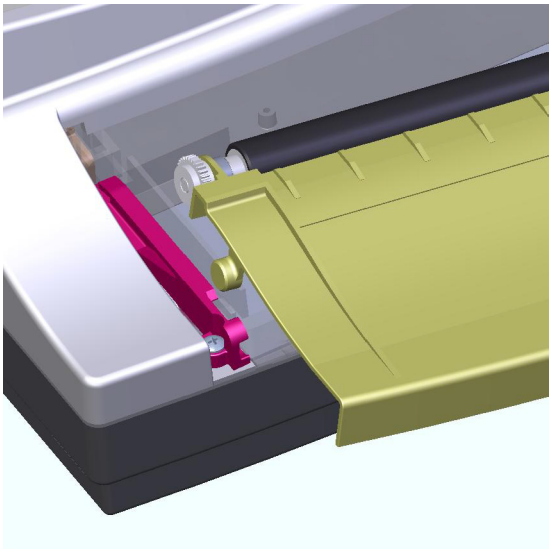


Figure 4-4: **Power supply board detail**

Remove the paper door

To remove the paper door:

- Pull the door out and lift the door through the side rail at the back of the unit.



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