Baxter

Welch Allyn

ELI 280

Resting Electrocardiograph

Service manual

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Notices

Manufacturer's Responsibility

Baxter is responsible for the effects on safety and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out only by persons authorized by Baxter.
- The device is used in accordance with the instructions for use.

Responsibility of the Customer

The user of this device is responsible for ensuring the implementation of a satisfactory maintenance schedule. Failure to do so may cause undue failure and possible health hazards.

Equipment Identification

Baxter equipment is identified by a serial and reference number on the bottom of the device. Care should be taken so that these numbers are not defaced.

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Other Important Information

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Preventive Maintenance

WARNING

Servicing of this device should only be performed by Baxter authorized service personnel. Baxter recommends preventive maintenance to be performed on an annual basis.

Caution

- Turn off the device before inspecting or cleaning.
- Do not immerse the device in water.
- Do not use organic solvents, ammonia-based solutions, or abrasive cleaning agents which may damage equipment surfaces.

Recommended Tools and Supplies

Device Cleaning / Consumables:

- Clean lint free cloth
- Mild detergent
- Isopropyl Alcohol (80-99%)
- Cyanoacrylate Adhesive (e.g., Loctite 444 or equivalent product)
- Anaerobic Threadlocker (xxx grade)
- Smart Thermal Paper
- 10% Household bleach and water solution (Sodium Hypochlorite solution consisting of a minimum 1:500 dilution and maximum of 1:10 dilution for disinfecting use only)

Preventive Maintenance / Conformance Testing

- Multi-Meter
- ECG Simulator (10 Lead)
- **AM**12 Patient Input Module (9293-048-5X)
- **WAM** Patient Input Module (30012-019-5X)
- **WAM**/**AM**12 Lead Wire Set (9293-046-70)
- Patient Cable Snap Adapter Set (9281-002-50)
- **Phillips** #2 Screwdriver
- 10 Lead Shorting Block (or equivalent)
- Lead Test Failure Box (or equivalent)
- FAT 32 USB Memory Device
- PC with **ELI** Link v3.10 or later
- USB Cable Type A to B (6400-012)
- Phone Cable (6400-004)
- PC with **ELI** Link or **E-Scribe** and Modem (or equivalent)
- PC with NIC and **ELI** Link v4.5 or later
- Wireless Router 802.11 (a, b, g, n)

- Electrical Safety Analyzer

Preventive Maintenance Procedure

Inspection

1. Turn off the device before inspecting.
2. Print the device configuration (attach to the Preventive Maintenance Report).
3. Remove the top housing per Unit Disassembly Section of this manual.
4. Perform a visual inspection of the following items:
5. Enclosure/Housing – Look for damage or cracks in the external housing or enclosure that could possibly expose the device to the introduction of foreign objects or fluids. Attention should also be paid to areas that could expose an operator or patient to internal circuitry of the device.
6. Contamination – Look for any contamination that may have occurred over time that could not be seen with the housing in place.
7. Fluid damage (perhaps caused during device cleaning)
8. Debris on or behind display shield
9. Battery leakage
10. Internal Cabling – Look for cracked, pinched or partially disconnected cable connections.
11. Fuse Ratings – Verify PCB mounted fuses (F1 and F3) are properly rated at T1A, 250VAC.
12. Markings and Labeling – Verify all labels and device markings are clearly visible and legible to the device user and have not been worn off or rendered unreadable through the use of harsh cleaning agents.
13. Integrity of Mechanical Parts – Verify the following items are properly secured to the device and have not become loose or damaged through usage over time.
14. AC Inlet
15. Patient Input Connector
16. Communication ports and antenna
17. Writer mechanics/latching mechanism

Device Testing

Power Testing

- Ensure battery is fully charged before performing these tests, voltage and current limits are based on a fully charged battery.
- Ensure there is no power connected to the UUT AC inlet.
- Turn the unit over and remove the battery plate (see Unit Disassembly section "Battery Removal"). To gain better access to the terminals, pull the battery out of the compartment. Disconnect the red battery cable from the red terminal.

  NOTE: Based upon customer usage and age of battery, replace as needed.

Note battery age (if possible)
This information can be found on the white "date code" sticker located on the battery (use the earliest date that is not crossed out). Record date on Preventative Maintenance Report (PMR) .

Battery (open circuit)
Measure battery voltage using a voltage meter; verify the meter reads greater than 12.5vdc. Record result on PMR.

Battery (load)
Measure the battery voltage using a volt meter and a power resistor load (10ohm, 20watt) in parallel with the battery. After approximately 5 seconds, verify the meter reads greater than 11.7vdc. Record result on PMR.

Off current
Connect a current meter in line with battery. With the UUT power off, verify the current meter reads less than 250 uA. Record result on PMR.

On current
Turn on the unit (DC) and verify the current meter reads less than 1.1A. Record result on PMR.

AC charging current
With the current meter still connected, apply AC power to the unit and verify that the current draw from the battery reverses polarity and the value starts decreasing as time increases. Record result on PMR.

Battery charger output voltage
Disconnect the current meter and measure the battery charger output voltage between the red disconnected battery cable and the negative terminal on the battery. It should read between 13.0vdc and 14.7vdc. Record result on PMR.

Reconnect the red battery cable to the red terminal and reinstall the battery and cover plate.

NOTE: The touch screen will need to be recalibrated and the date/time will need to be reset every time the battery is disconnected.

Functional Testing

The MAIN SCREEN is displayed when the unit is first turned on.

The LCD will timeout and go dark if there is no ECG or user input after 5 minutes. Touch the screen to re-activate or press the power button momentarily.

Service Screen

1. To access the SERVICE SCREEN begin at the MAIN SCREEN.
2. Press the GEARS icon (lower right).
3. Press the ADVANCED icon, then enter the Admin password.
4. Press the SERVICE icon.

Configuration Screen

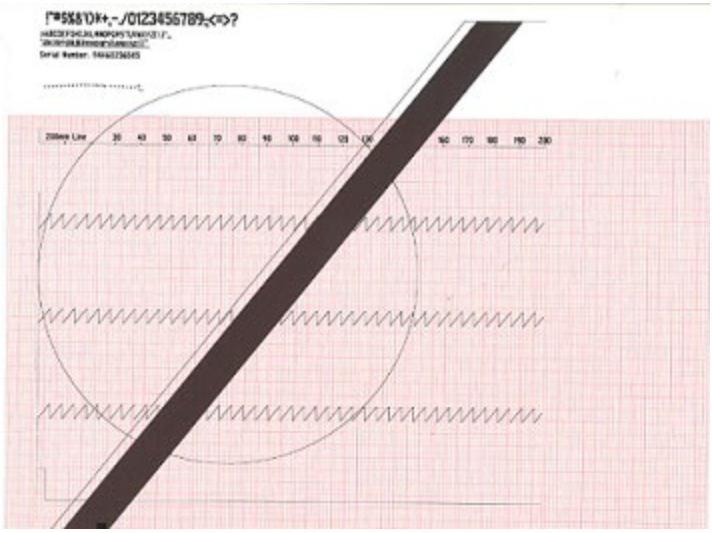
1. To access the CONFIGURATION SCREEN begin at the MAIN SCREEN.
2. Press the GEARS icon (lower right).
3. Press the ADVANCED icon, then enter Admin password.

AC LED/Display

1. Connect the AC power cord to the unit and verify that the green AC LED (located directly below the power button) illuminates continuous.
2. Press the ON button and verify the text on display is clear and legible and there are no flickering or missing lines/pixels.

Auto/Writer Test

1. From the Service Screen, select the Auto Test icon. Verify the auto test completes one cycle without an error.
2. Open and close the writer door to verify smooth operation. Verify that the door unlatches without sticking and that it latches completely.
3. From the Service Screen, select the Writer Test icon. Verify that a test page is printed and the writer stops on the cue mark. The perforation of the paper should line up with the tear edge on the writer. Assure there are no gaps in the printing and the print darkness is uniform across the entire page (example shown below).
4. Verify the writer gears do not skip and paper is tracking properly (you may need to print multiple pages to observe this).



ECG Test

1. Connect an ECG simulator to the **AM**12 or **WAM** patient interface. Set the simulator to a known heart rate and amplitude.
2. From the Main Screen, select the ECG icon to capture an ECG. Enter "TESTECG" in the last name field. Verify there is an audible beep with each key press.
3. Verify that 12 ECG traces print correctly and assess the overall printout quality. Ensure uniform darkness across entire printout.

Communication options

Verify successful transmission of all applicable communication options by transmitting the ECG record stored earlier to a compatible receiving device.

- USB host (USB memory device needed)
- USBD
- Modem
- LAN
- WLAN

Calibration

Touch Screen Display Calibration

The touch screen display requires calibration upon initial use and at regularly scheduled preventive maintenance intervals as prescribed in the service manual. To initiate a calibration, press and hold the power button for 20 seconds. Once initiated, the **ELI** 280 automatically begins the calibration

sequence (detailed below). Through on-screen prompts, the user will touch strategically placed crosshairs to calibrate the display's touch point accuracy.

1. Initiate the calibration sequence by touching the + symbol in the upper left corner of the display.
2. Touch the + symbol in the upper right corner of the display.
3. Touch the + in the lower right corner of the display.
4. Touch the + in the lower left hand corner of the display.

Cardiograph Calibration

No calibration is needed for the proper operation of the device, other than the item stated above.

Safety Testing

If the cardiograph housing was opened for repair or inspection work, the following safety tests should be performed in accordance with the IEC 60601-1 or IEC 62353 methods and limits.

The **ELI** 280 is considered a Class 1 Type CF device, intended to only be utilized with the Baxter **AM**12 or **WAM** patient input modules. Defibrillation isolation from the patient is provided by the patient input modules, which are tested separately as part of the manufacturing process (they are considered non-serviceable devices), therefore Hi-pot testing is not required for the **ELI** 280 cardiograph.

- Earth Leakage
- Enclosure Leakage
  Non-conductive (fully insulated) chassis testing should be performed utilizing 200 cm2 conductive foil or equivalent, earth ground on AC input is utilized for functional earth (not safety grounding).
- Patient Leakage
  Applied part – patient input (utilize Baxter **AM**12 patient cable)
- Patient Auxiliary Current
  Applied part – patient input (utilize Baxter **AM**12 patient cable)

ELI 280 Preventive Maintenance Report

Unit Serial #: _____

□ Visual Inspection PASS / FAIL (Circle One)

Print device configuration (attach to this report)

□ Power Testing
□ Note Battery Age (If not possible enter N/A) _____/_____ (week/year)
□ Battery (Open Circuit) Voltage _____ V (>12.5 V)
□ Battery (with Load) Voltage _____ V (>11.7 V)
□ Off Current _____ uA (<250 uA)
□ On Current _____ mA (<1.1 A)
□ AC Charging Current PASS / FAIL (Circle One)
□ Battery Charger Output Voltage _____ V (13.0-14.7 V)

** Based upon customer usage and age of main battery, replace as needed.*

□ Functional testing
- □ AC LED/Display Test PASS / FAIL (Circle One)
- □ Auto/Writer Test PASS / FAIL (Circle One)
- □ ECG Test PASS / FAIL (Circle One)

Communication Option(s)
- □ USB host PASS / FAIL / N/A (Circle One)
- □ USDB PASS / FAIL / N/A (Circle One)
- □ ModemPASS / FAIL / N/A (Circle One)
- □ LAN PASS / FAIL / N/A (Circle One)
- □ WLAN PASS / FAIL / N/A (Circle One)

□ Touch Screen Calibration PASS / FAIL (Circle One)

□ Device Cleaning

□ Safety Testing PASS / FAIL (Circle One)
- □ Earth Leakage
- □ Enclosure Leakage
- □ Patient Leakage
- □ Patient Leakage Current

Performed by: _____ Date: _____/_____/_____

Sealed Lead-Acid Battery Performance Information

Battery Storage

Sealed lead-acid batteries will self discharge over time even if the device they are installed in is not in use. The rate of self discharge is primarily based on the temperature of the environment, with lower temperatures yielding longer effective storage duration.

Based on typical room temperature storage conditions (20 degrees C, 68 degrees F), the maximum recommended storage duration without recharging would be 6 months; which would keep the battery at a capacity of 75% or greater during the storage period. The chart below indicates the self discharge rates at various temperatures to assist with determining when the battery capacity would reach 75% and require recharging to avoid possible permanent loss of capacity (inability to reach 100% capacity after recharge) as a result of sulfation.

NOTE: It is recommended that batteries be charged to 100% capacity before storing them for an extended period of time.

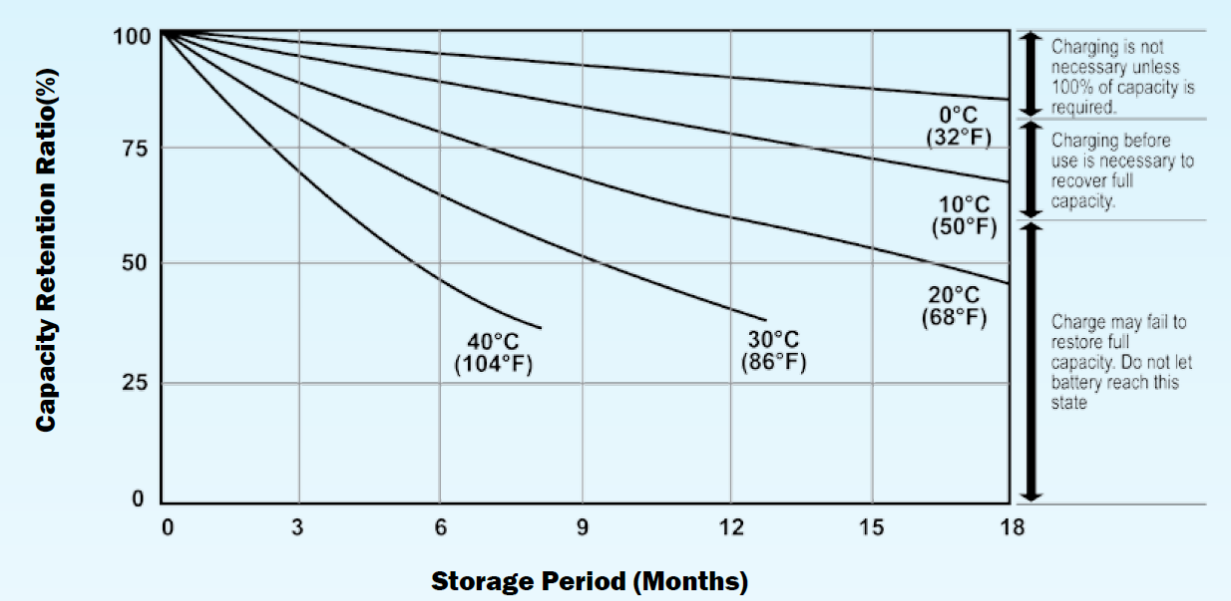


Figure 8: Self Discharge Characteristics

Battery Life

Battery life is defined in terms of cyclic use (or number of cycles) that a battery will be able to be recharged back to at least 60% of its original capacity when new. The number of cycles is dependent upon both ambient temperature and more importantly depth of discharge. The chart below provides information that demonstrates the relationship between battery retention capacity, number of cycles, and depth of discharge at typical room temperatures. As the temperature increases beyond 20-25 degrees C (68-77 degrees F), the effective number of cycles will be reduced.

To achieve maximum battery life, batteries should be charged whenever they are not in use and deep discharges should be avoided. Batteries that are discharged 30% or less between charges will deliver approximately five times as many cycles as those discharged to 100%.

NOTE: It is recommended that batteries which cannot be charged to 60% or more of their original capacity be replaced.

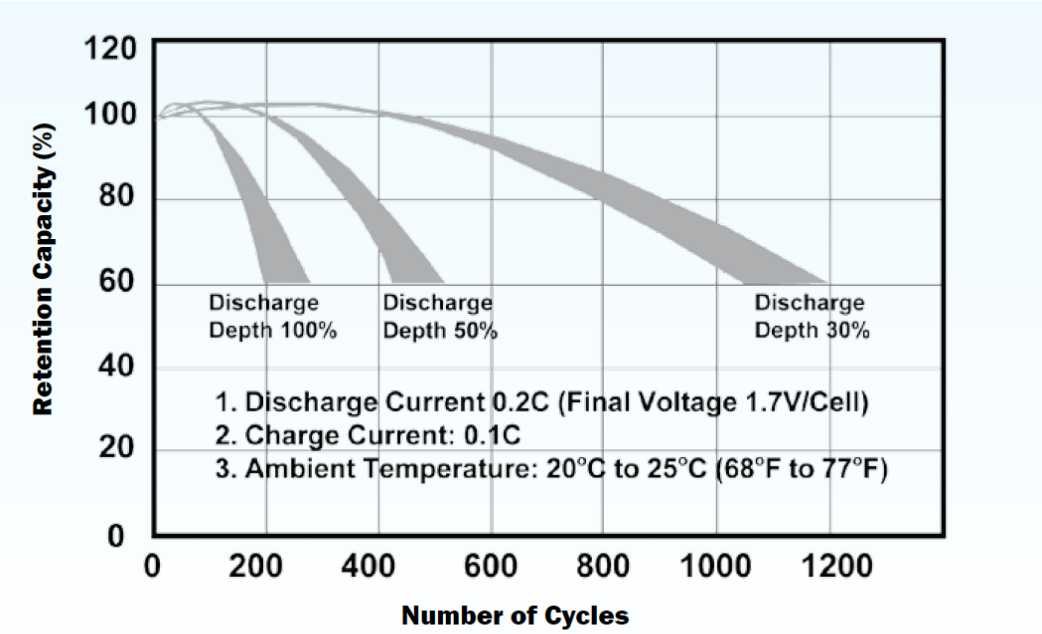


Figure 9: Relationship between depth of discharge and number of cycles as well as increases of capacity during the early cycles.

The following table represents the general voltage levels and corresponding depth of discharge of the main battery when the unit is in an ON state and not printing.

Battery Status	Battery Voltage (unit on)	Discharge Depth (approx)
Good = Green	V >11.7	0 - 69%
Weak = Yellow	11.4 < V < 11.7	70 - 85%
Very Weak = Red	11.0 < V < 11.4	85 - 100%
Self Protection Shut-Off	V < 11.0	

Unit Disassembly

This section describes the methods used to disassemble and repair the **ELI** 280 and the tools required to perform the defined steps.

Cautions and Special Instructions

CAUTION: Risk of Explosion - DO NOT SHORT battery terminals. Leave the protective covers on the battery terminals until assembly into the base unit.

CAUTION: Risk of Shock – Line voltage may be present on the power supply of the device. Use caution when the device housing is removed and AC power is applied.

ATTENTION: PCB assembly contains ESD sensitive devices. Use appropriate precaution when handling electronic assemblies.

ATTENTION: PCB assembly contains mechanically sensitive electrical devices. Handle with extreme care to reduce the stress on solder connections.

ATTENTION: Before applying all adhesive backed materials, clean surface with alcohol to make sure it is clean and oil free.

Tools Required

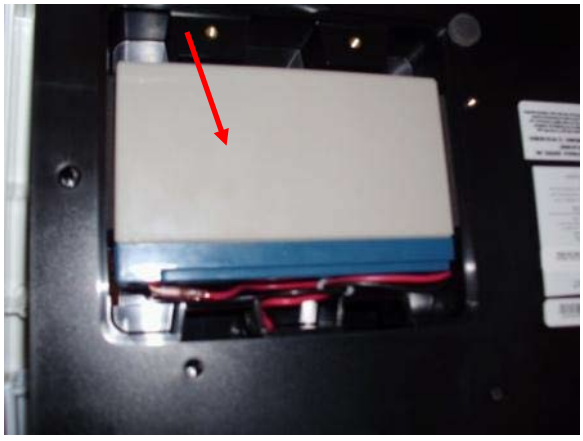
- T10 **Torx** Driver Bit
- Phillips #2 Driver Bit
- Torque Driver (2 in/lbs)
- Torque Driver (3.5 in/lbs)
- Torque Driver (5 in/lbs)
- Needle Nose Pliers
- Phillips #2 Screwdriver
- Torque Wrench 8mm- 9.0 inch-pound hand wrench
- Side Cutters

Battery Removal

CAUTION: Risk of Explosion - DO NOT SHORT Battery Terminals.

1. Turn the unit over and remove the (2) pan head screws (Item 22) and remove the battery cover plate.

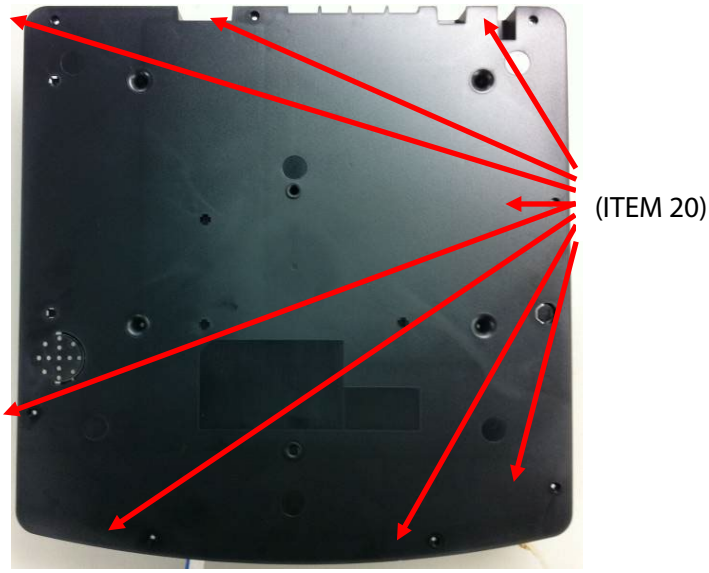
2. Remove the battery (Item 4) and disconnect the wires connected to the battery terminals.



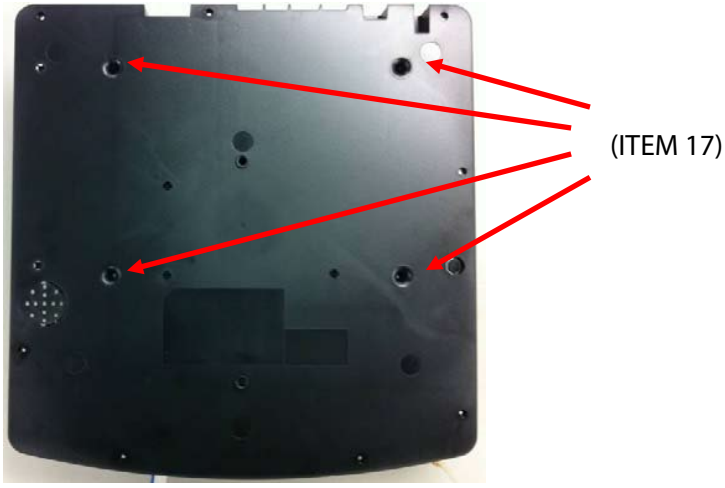
NOTE: Care must be taken when assembling the battery to connect the red wire to the red terminal and the black wire to the black terminal. (Cable Power – Item 6)

Upper Housing Removal

1. Remove the 8 housing screws (Item 20).

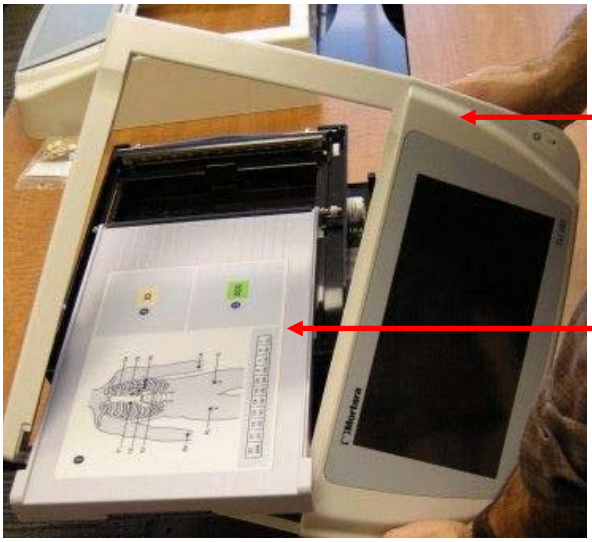


2. Remove the 4 writer screws (Item 17) from the 4 wells of the Lower Housing.

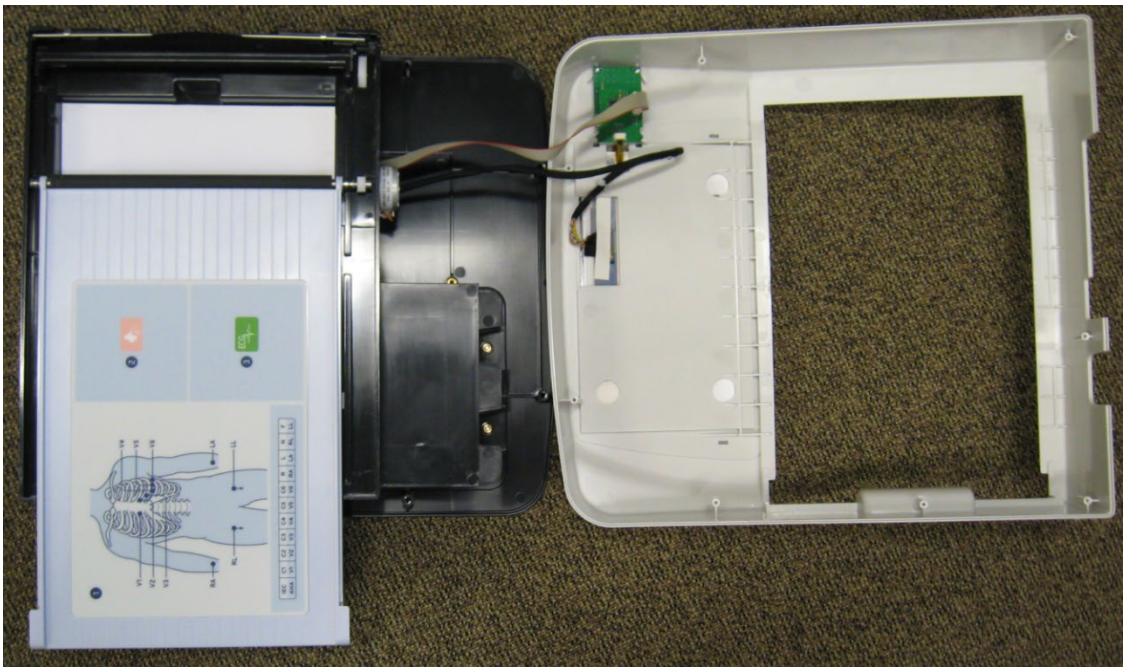


3. Carefully turn the unit over while holding the writer against the Lower Housing.

4. Place the unit on a flat surface, with the left hand side of the unit extending approximately 3cm over the edge of the surface.
5. Open the paper door of the Writer Assembly (Item 16) approximately three quarters of full travel.
6. Lift the Upper Housing Assembly (Item 23) and tilt it as shown, so that the top housing is on a diagonal, then slip the housing over the writer door (the cables are long enough to allow this).



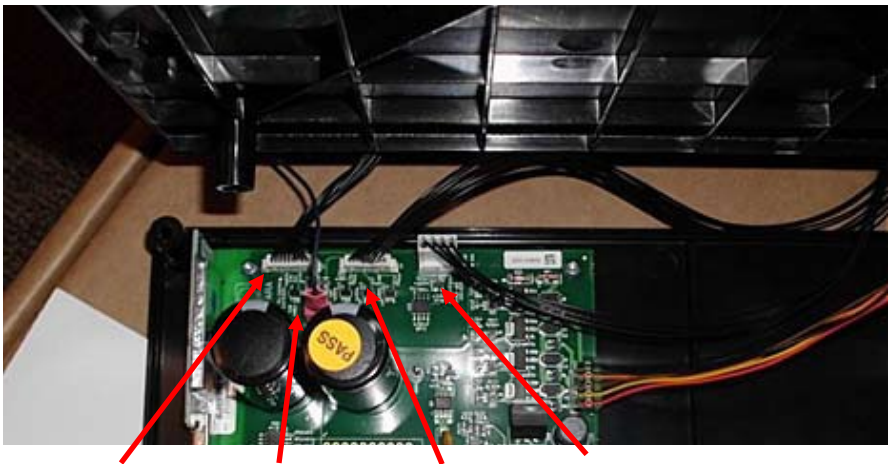
7. Place the Upper Housing gently on the touch screen surface in front of the cardiograph as shown below.



Thermal Writer Removal

1. Lift the Writer Assembly from the left side enough to remove the Motor cable from J11.

2. Continue to lift the Writer Assembly and remove J9, J7, J8 and the writer ground cable.



(J9) (GND) (J8) (J7)

Cue Sensor Calibration

- Required after replacement of motherboard, writer assembly, or cue sensor.
- Not required as part of regular preventive maintenance activity.

To calibrate the cue sensor, follow these steps:

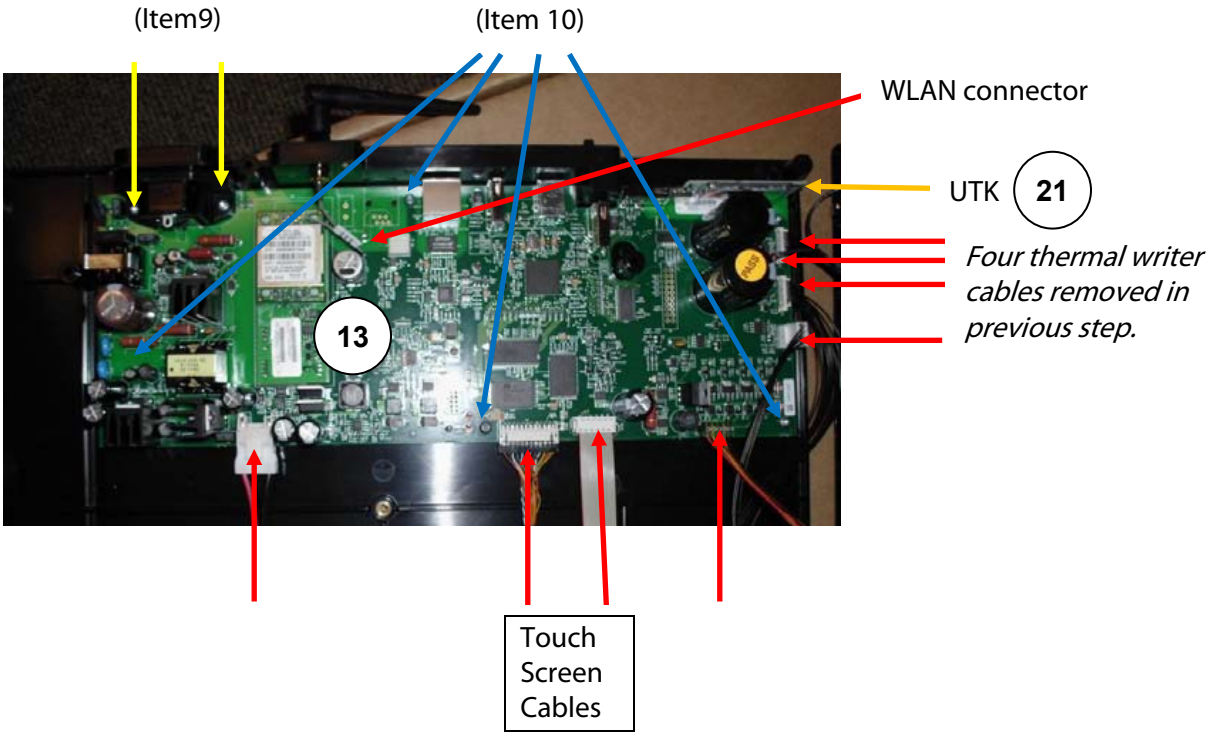
1. From the main screen press the **System Configuration** button.
2. Press Advanced.
3. Enter password.
4. Press **Service**.
    a. Make sure the paper is not stopped at the perforation line by opening the paper tray, pulling out ½ sheet and closing the paper tray.
5. Press Calibrate Cue.

Motherboard Removal

1. Remove all cables connected to the mother board. Care must be used in lifting the cable off of the WLAN module (if option is installed). This connector must be pulled straight upward. Do not pull on the cable to remove this connector.
2. Remove 3/8" screws (Item 9) from 2 locations. Remove 1/4" screws (Item 10) from 4 locations.

   NOTE: If the "Item 10" screws are not present, the PCBA is secured to the housing with RTV and the PCBA cannot be removed from the housing. Replacement of the housing or the PCBA would require the use of additional materials such as screws, rubber feet, and new labeling to complete the servicing activity. Refer to the item identification table for a complete listing of required materials.

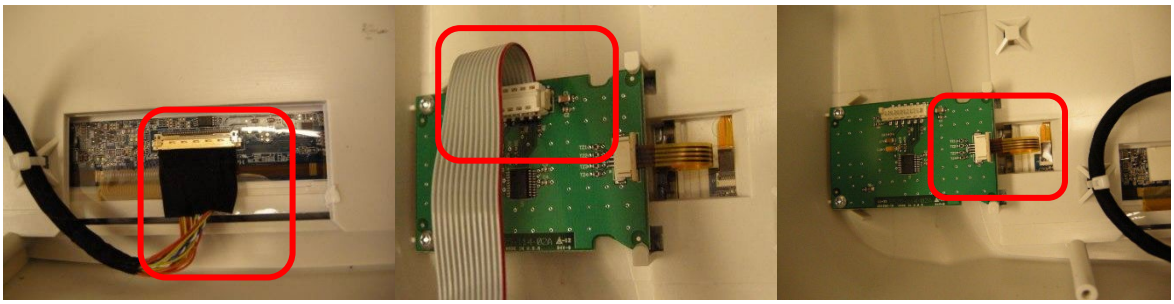
If the unit has a wireless acquisition module (**WAM**) patient interface, the UTK receiver (shown below) must be removed from this board and placed on the new board. The UTK is removed by simply sliding it out of the USB socket, as it is held in place against vibration and impact by the upper housing when reassembled. Refer to the Item Identification Table for the correct item, as there are two versions of **WAM**/UTK pairs that must match (v1 to v1 or v2 to v2) for the wireless interface to operate properly.



ELI 280 Upper Housing and Touch Screen Assembly Removal

ATTENTION: PCB assembly contains ESD sensitive devices. Use appropriate precaution when handling unit.

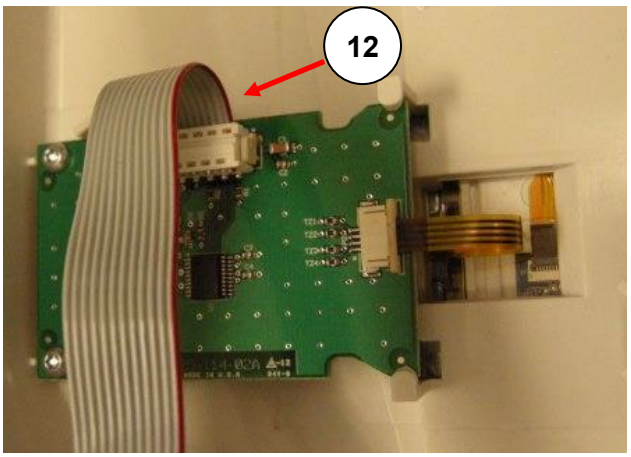
Remove the Touch Screen interconnect cables shown below.



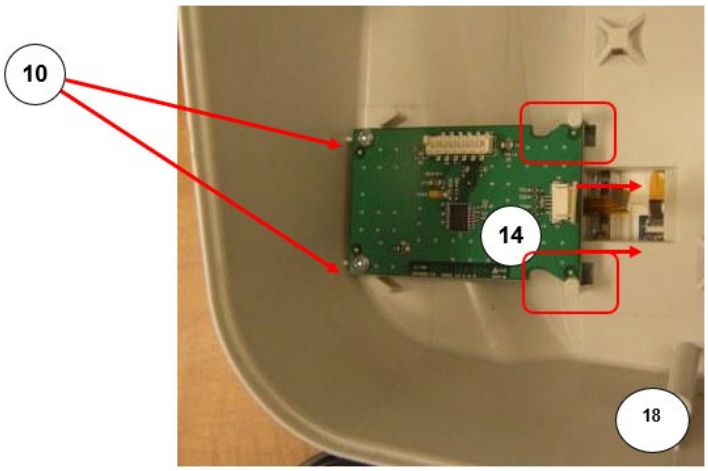
Touch Screen Controller PCA Removal

ATTENTION: PCA assembly contains ESD sensitive devices. Use appropriate precaution when handling unit.

1. Remove the ribbon cable from the controller PCA by lifting the connector directly upward from the plane of the circuit board (do not pull on the ribbon cable to remove).



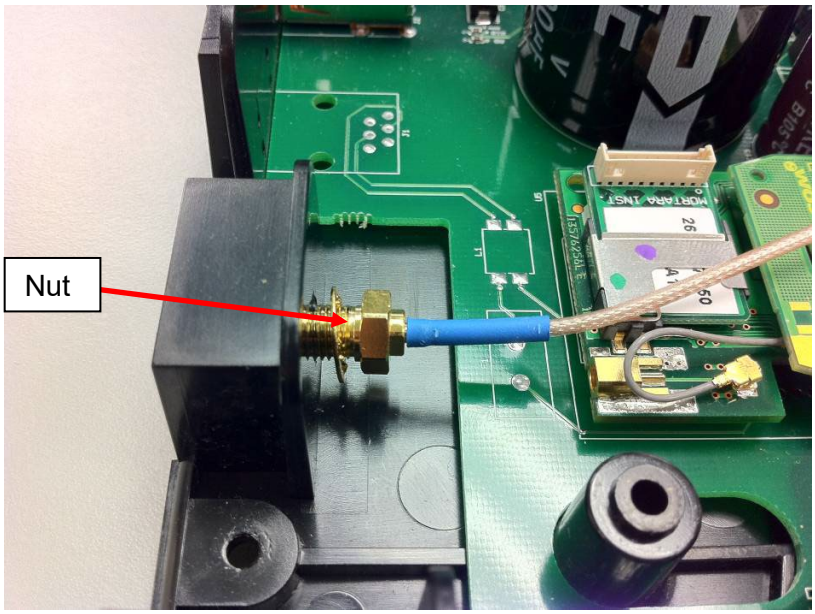
2. Unlock the flex cable connector by sliding the locking mechanism to the outward edge of the PCA (item # 14), then remove the flex cable from the connector.



3. Remove the two T10 screws (item # 10) from the touch screen controller PCA, then slide the PCA over to allow the retaining hooks to pass through the slots in the PCA.

Antenna Mount Removal

1. Carefully remove the connector from the communication module by lifting from the connector end in an upward direction (do not pull on the cable, or remove in a non-upward direction as damage could result).
2. Remove the nut and washer that fastens the antenna mount to the lower housing (Item 1), and remove the antenna mount/cable assembly.

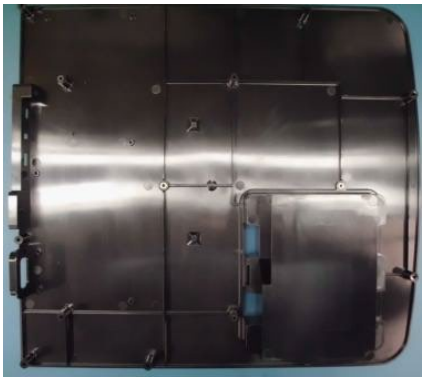
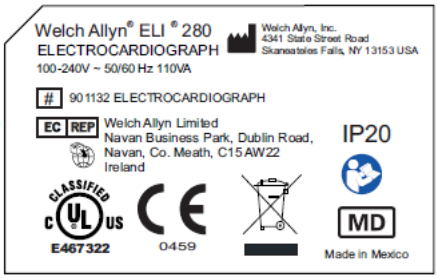


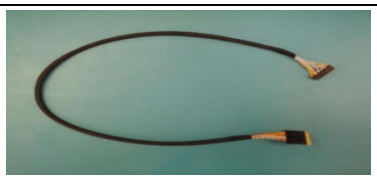
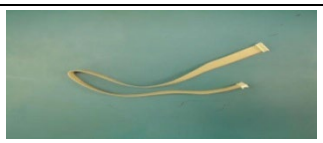
3. To install the assembly, first secure the antenna mount to the lower housing with the washer and nut using a 9.0 inch-pound hand torque wrench, and then connect the antenna cable to the communication module.

The items listed in the Item Identification Table identify the serviceable level of the device.

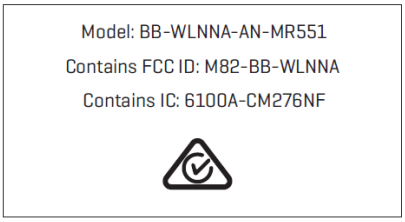
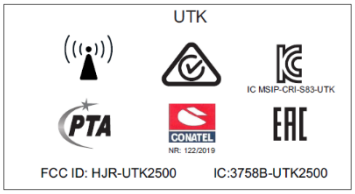
Subcomponents of assemblies listed are not available as individual service items from Baxter, the assembly level item must be used for servicing purposes.

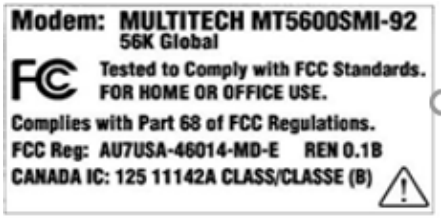
Item Identification Table

Item #	General Description	Part Number	Picture
1	LOWER HOUSING	8361-002-50	
2	FOOT	6320-003	
3	LABEL **ELI** 280 NAMEPLATE LABEL **ELI** 280 NAMEPLATE INMETRO LABEL **ELI** 280 NAMEPLATE McKESSON LABEL BURDICK 280 NAMEPLATE	421720 421732 421721 421768	 Inmetro, Burdick, and McKesson labels not shown
4	BATTERY	4800-013	

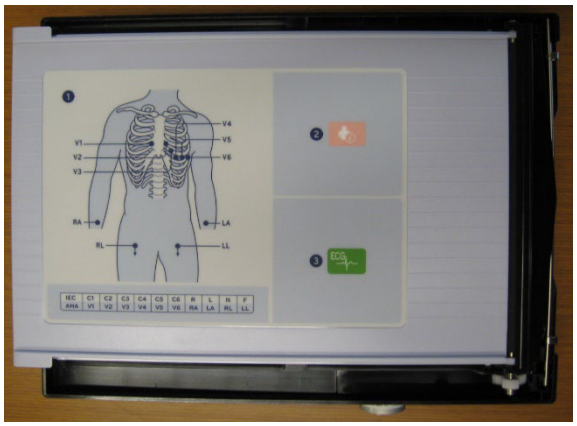
Item #	General Description	Part Number	Picture
5	PAD BATTERY	8361-007-50	
6	PAD BATTERY	8361-006-50	
5	TAPE 2 SIDED	7401-003	
6	CABLE POWER	25020-078-50	
7	BATTERY DOOR	8361-004-50	
8	CABLE ASSEMBLY **ELI** 280 LCD TO MOTHERBOARD	8361-005-50	
9	SCREW THD-FORM 3/8"	6020-062	
10	SCREW THD-FORM 1/4"	6020-060	+
11	CABLE TIE 3.9"	7495-001	
12	CABLE ASSEMBLY PICOFLEX RIBBON CABLE	25018-048-50	

Item #	General Description	Part Number	Picture
13	RECON **ELI** 280 PCB ASSY W/O COMM RECON **ELI** 280 PCB ASSY W/MODEM RECON **ELI** 280 PCB ASSY W/LAN+WLAN **ELI** 280 TESTED DIGITIAL PCB ASSY 4TH ED **ELI** 280 TESTED PCBA 4th Ed w/MODEM **ELI** 280 TESTED PCBA 4th Ed w/LAN+WLAN	SR26025-113-151 SR26025-113-152 SR26025-113-153 SERV 26025-113-400 SERV 26025-113-401 SERV 26025-113-402	
14	TOUCH SCREEN CONTROLLER	26025-114-150	
16	WRITER ASSEMBLY **ELI** 280/**ELI** 380 - NO LABEL	22500-280-50	
17	SCREW M3 X 8	6020-835-02	
19	LABEL POWER **ELI** 280	9042-077-01	
20	COVER SMA ROUND BLACK	8347-011-51	

Item #	General Description	Part Number	Picture
20	SCREW THD-FORM 1/2"	6020-061	
21a 21b	UTK v1 w/software UTK v2 w/software	26025-092-151 26025-092-404	
22	SCREW PAN HEAD PHILLIPS	6020-0WEP	
23	**ELI** 280 UPPER HOUSING & TOUCH SCREEN ASSY	8361-050-50	
24	Not Used	Not Used	
25	v2 UTK Label for Cardiographs	728940	
26	LABEL REG WLAN B&B ELECTRONICS	777190	
27	LABEL REGULATORY UTK	9050-059-07	

Item #	General Description	Part Number	Picture
28	LABEL **ELI** 2XX MULTITECH MODEM ID	9025-049-02	
29	WIFI MODULE, DUAL BAND EMBEDDED	776546	

Thermal Writer Disassembly



Special Instructions

- This assembly procedure describes the use of Vibra-Tite on some threaded parts. The Vibra-Tite must dry for a minimum of 10 minutes before assembly. The Vibra-Tite may be applied to the threaded pieces ahead of time and allowed to dry. This way the parts will be available for assembly when needed. If the parts already have Vibra-Tite, this process can be skipped.
- Before applying all adhesive backed materials, clean surface with alcohol to make sure it is clean and oil free.
- Torque specifications for all fastening devices shall be 3.5-4.0 lbs-in, unless otherwise noted.

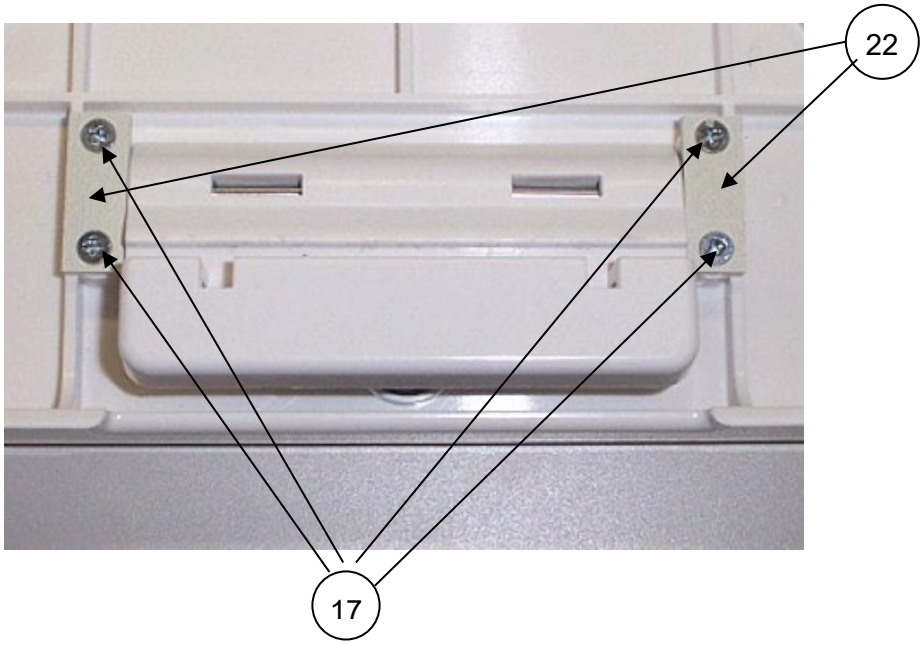
NOTE: Item numbers in this section refer to the parts in the Thermal Writer Item Identification Table.

NOTE: The writer assembly can be obtained as a complete assembly for service purposes, or a specific part or subassembly can be obtained to repair a specific writer related issue. The entire writer door with the platen roller, latch assembly is available as an assembly; and the thermal print head, print

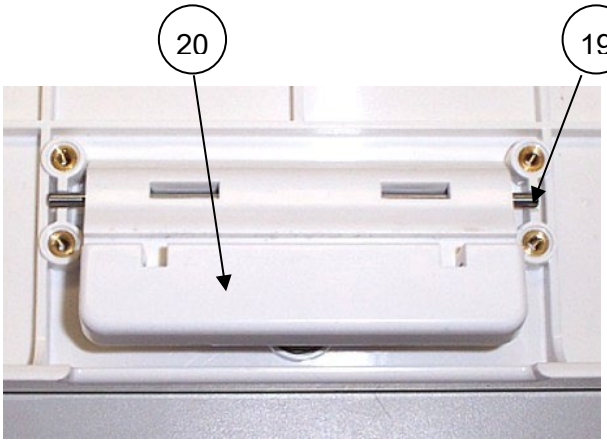
head mount, anti-static brush, and associated cables are also available as an assembly. (Refer to the Thermal Writer Item Identification Table).

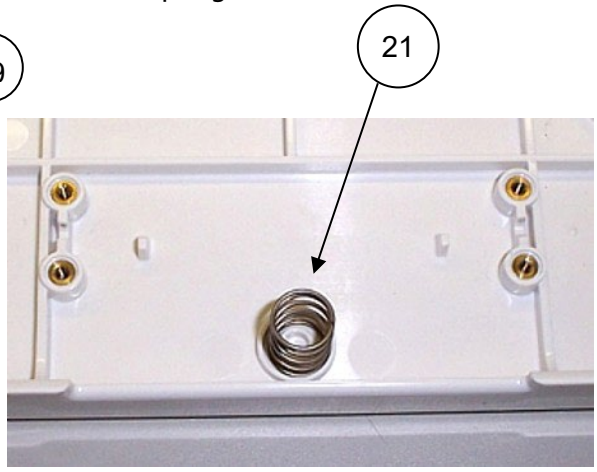
To remove the writer door assembly, both the door latch assembly and printhead assembly must be removed to allow the writer door full travel to reach the insertion/removal slots provided.

1. To remove the latch assembly, open the writer door, then turn the writer over and remove the 4 screws (17) shown. There are 2 Pivot Bar Restraining Plate (22) under the screws.

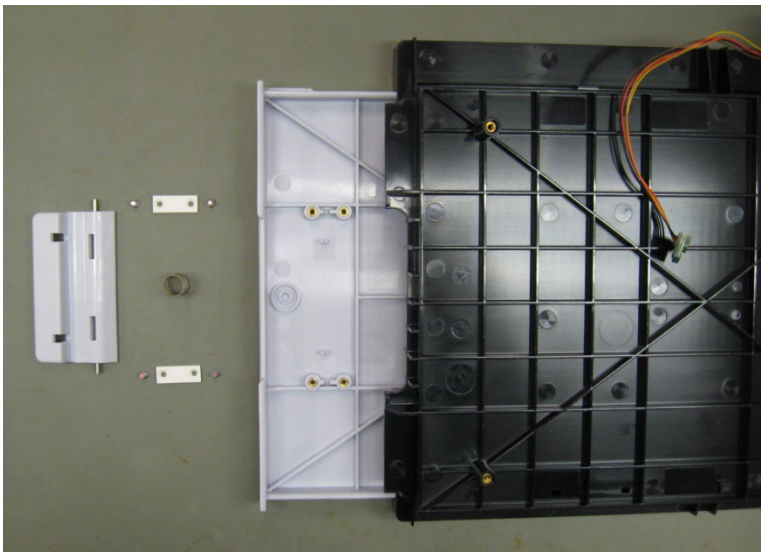


2. Remove the Latch Release (20), Pivot Bar (19), and the spring (21).

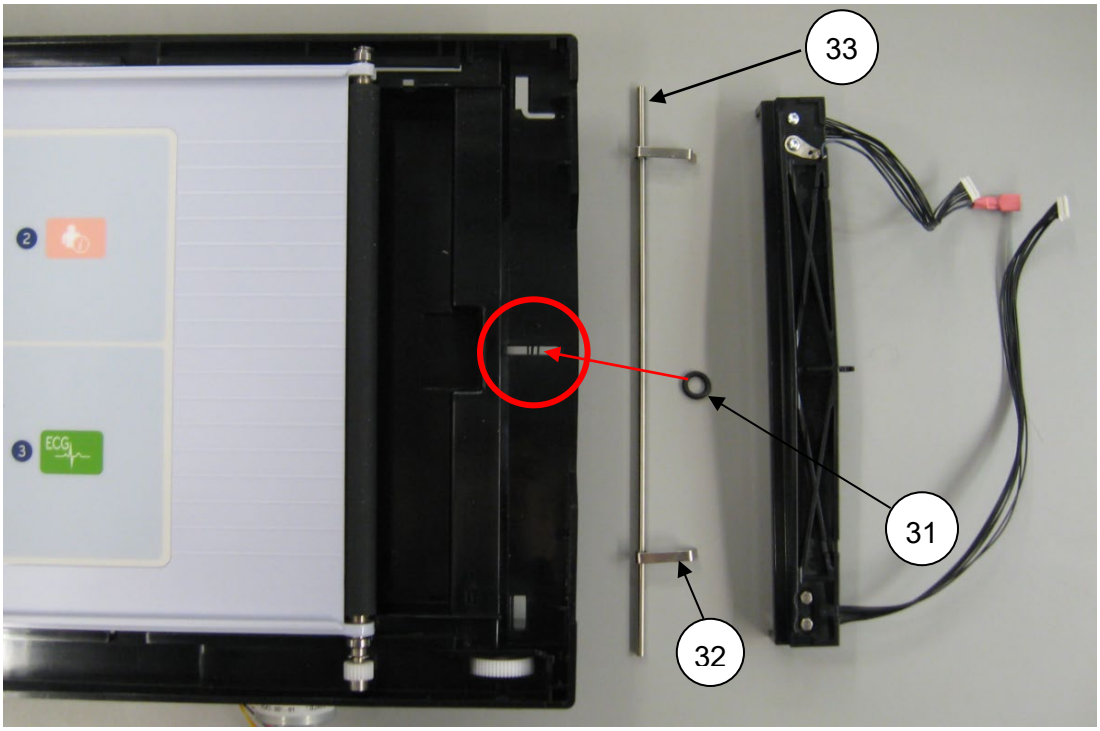




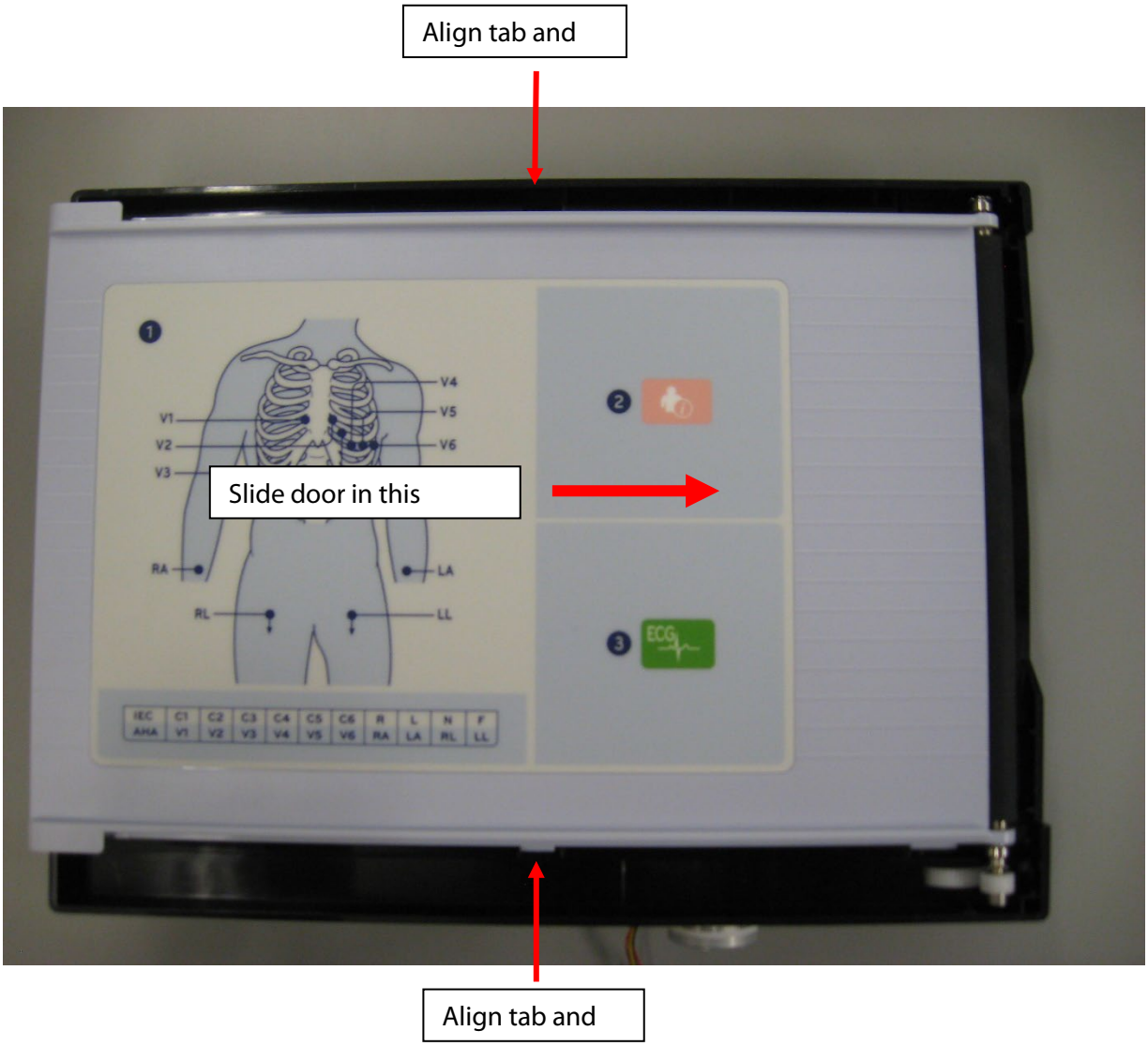
The picture below shows the writer assembly with the latch removed.



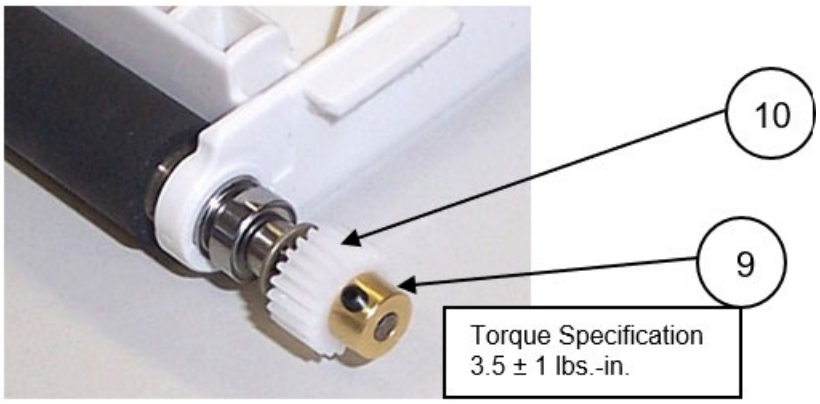
3. On the other end of the writer assembly, the printhead assembly must be removed from its installed position. This is done by removing the O-Ring that holds the assembly in place (underside of area circled) and unlatching the Spring Bar retaining clips as shown below.



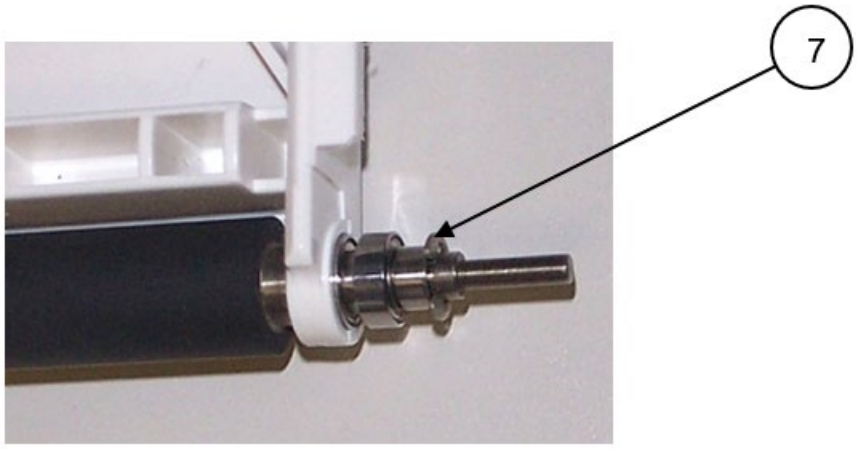
4. Once the printhead assembly is removed from its installed position, the Writer Door assembly can be removed by sliding it past the “closed” position until the removal/install slots are aligned. The door assembly is then lifted in an upward direction.



5. To remove the platen from the cover, loosen Set Screw (Item 9) from the Pinion (Item 10).

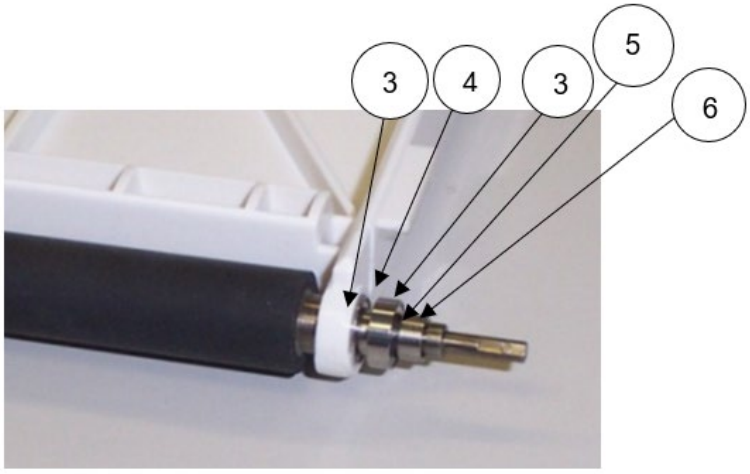


6. Remove the E-Ring (Item 7) as shown.

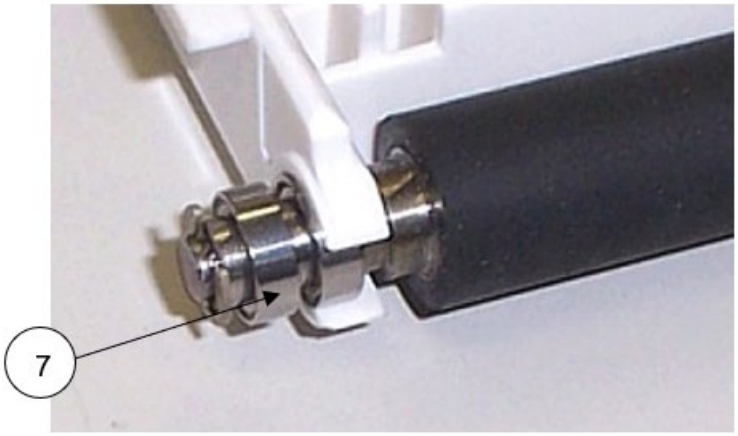


7. Remove the following items from the Platen.

- Ball Bearing (Item 3)
- Small Spacer (Item 4)
- Ball Bearing (Item 3)
- Wave Washer (Item 5)
- Large Spacer (Item 6)

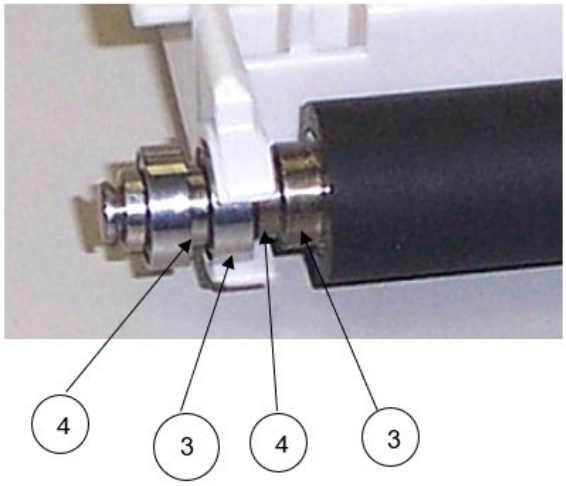


8. Remove the E-Ring (Item 7) as shown.



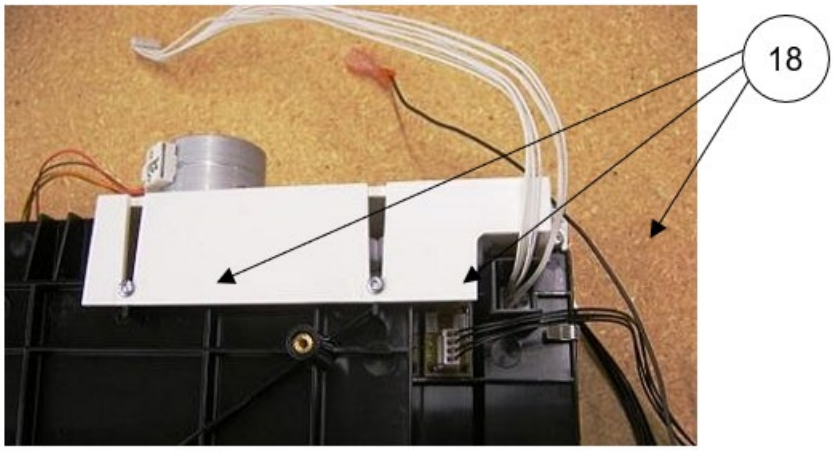
9. Remove the following from the shorter side of the Platen.

- Ball Bearing (Item 3)
- Small Spacer (Item 4)
- Ball Bearing (Item 3)
- Small Spacer (Item 4)

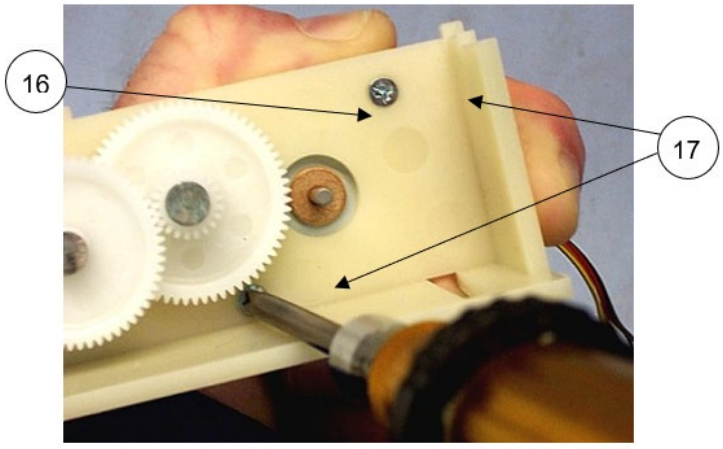


Gearbox and Motor

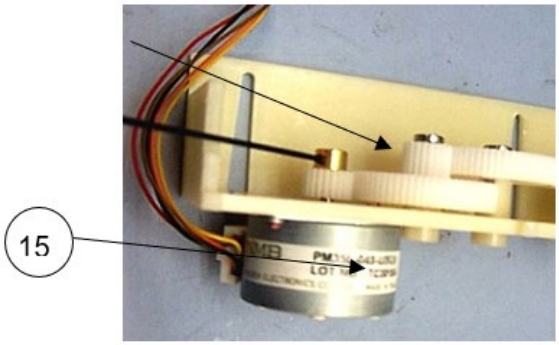
1. Turn the paper tray over and remove the 3 screws (18) to release the gearbox assembly.



2. Remove the stepper motor from the Gear Box (Item 16) by removing 2 screws (17).

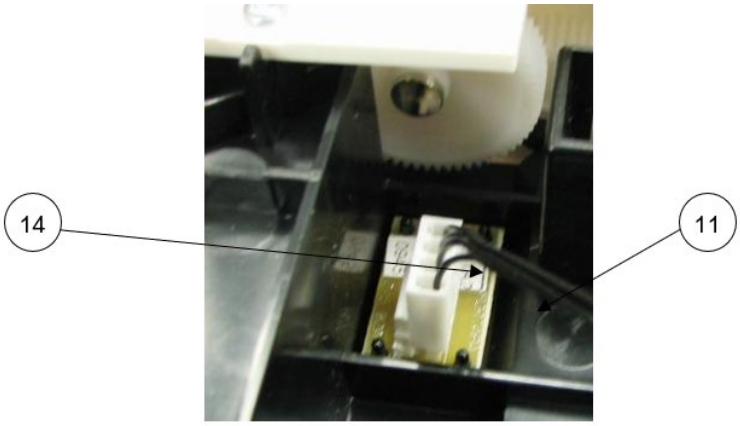


3. Remove the set screw (9), to remove the Stepper Motor (15).

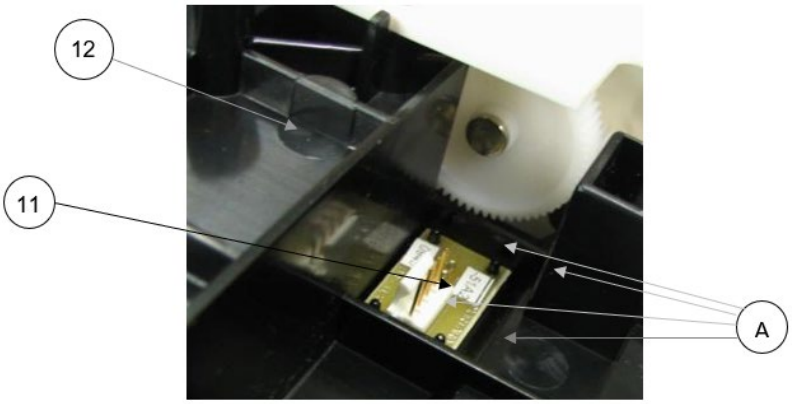


Cue Sensor Replacement

1. Remove the Cue Sensor Cable (Item 14) from the Cue Sensor PCB (11) located on the paper tray.

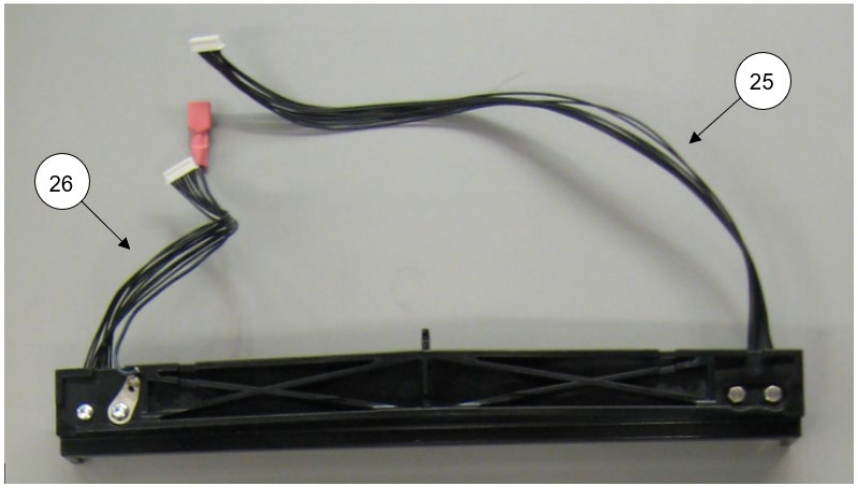


2. Two of the 4 plastic posts (A) that hold the Cue Sensor onto the Paper Tray (12) have a cyanoacrylate adhesive applied to hold it in place. Use a side cutter to flush cut the two posts with the adhesive to remove the Cue Sensor PCB (11) from the Paper Tray (use the two remaining posts to fasten the replacement item).

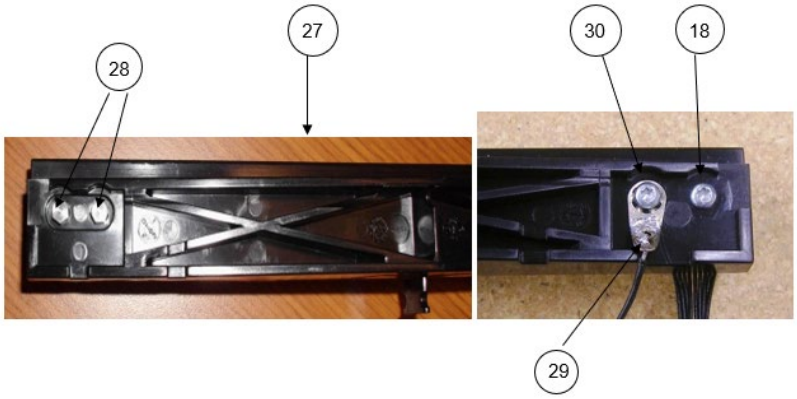


Printhead Replacement

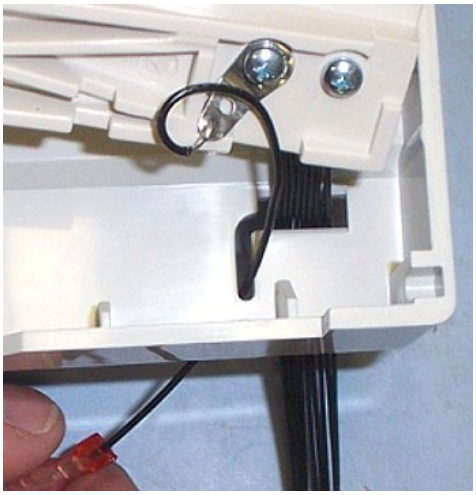
1. Remove the Print Head Cables (25 & 26).



2. To remove the Print Head from the Print Head Mount (Item 27 above) remove the two Shoulder Screws (Item 28) and Coated Screw (Item 18). Remove Ground Wire (Item 29) with Bare Screw (Item 30) as shown.

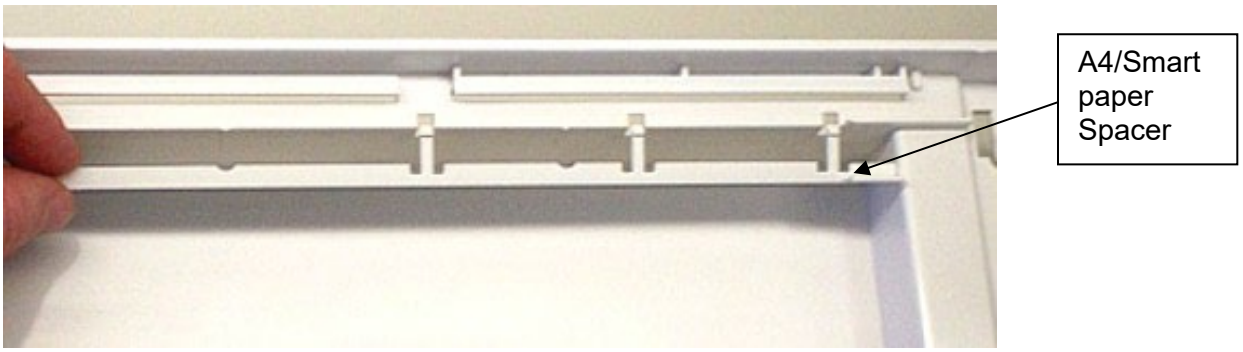


3. When reinstalling the printhead assembly, create a loop with the ground wire to allow it to move freely within the provided slot.



ELI 280 Writer A4/Smart paper Spacer

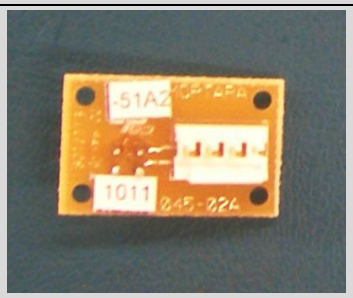
If A4/Smart paper Spacer is part of configuration, install A4/Smart paper Spacer into Paper Tray as shown. Snap into place.

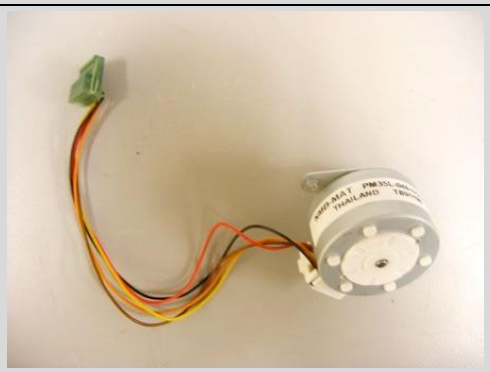
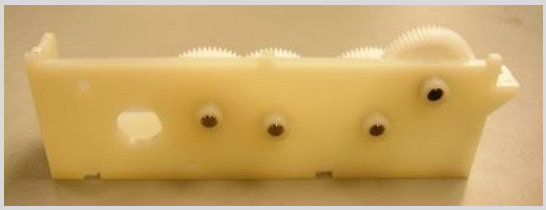
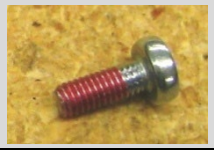


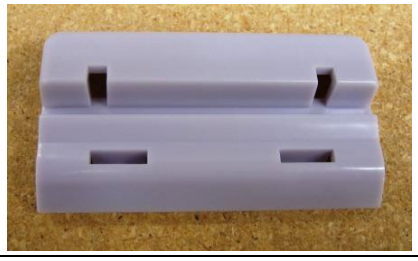
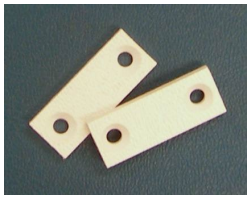
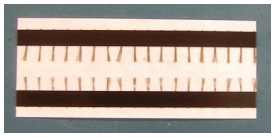
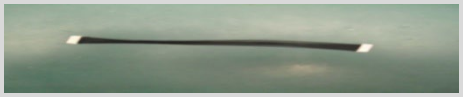
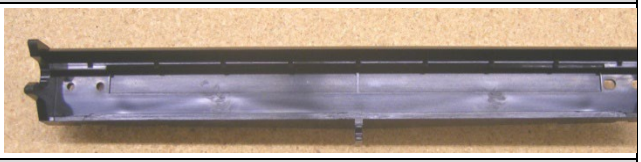
The items highlighted in grey that are listed in the Thermal Writer Item Identification Table identify the serviceable level of the device. Subcomponents of assemblies listed are not available as individual service items from Baxter, the assembly level item must be used for servicing purposes.

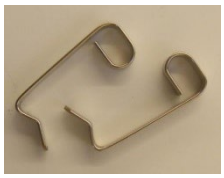
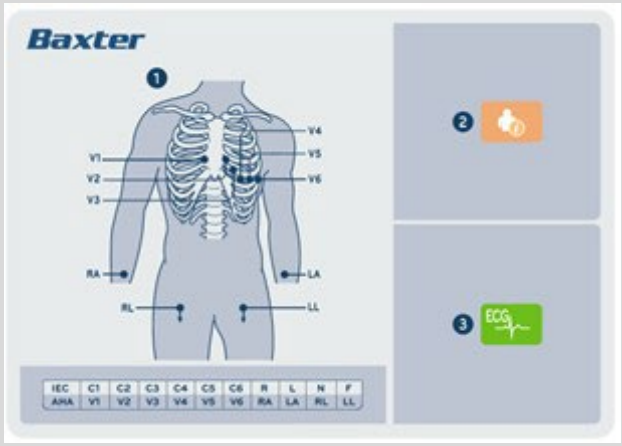
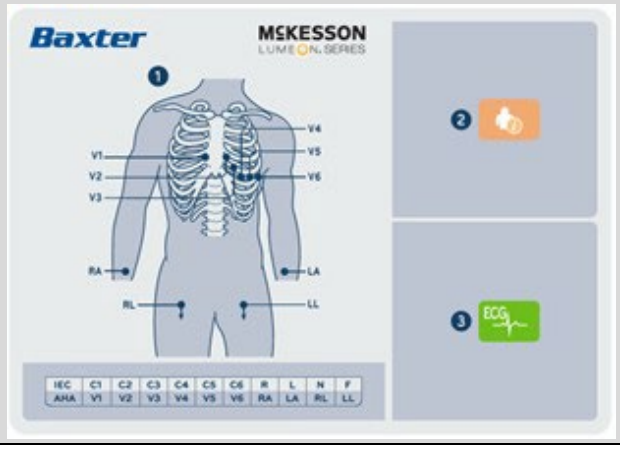
Thermal Writer Item Identification Table

Item #	General Description	Part Number	Picture
1	Platen	6570-842-02	
2	Paper Tray Cover	8342-003-51	
3	Ball Bearing	6520-003	
4	Small Spacer	6125-017	
5	Wave Washer	6100-004	
6	Large Spacer	6125-004	

Item #	General Description	Part Number	Picture
7	E-Ring	6140-003	
8	Vibra-Tite	7403-001	
9	Setscrew M2.5 x 4mm	6030-025	
10	Pinion (Spur w/ Hub)	8342-009-01	
11	Cue Sensor PCB	26025-045-151	
12	Paper Tray	8342-005-51	

Item #	General Description	Part Number	Picture
13	Cyanoacrylate Adhesive	9326-002	
14	Cable Assembly for Cue Sensor	25020-066-50	
15	Stepper Motor	6545-008-01	
16	Gear Box Assembly	8342-004-53	
17	Screw Flathead Torx	6020-735-02	
18	Panhead Torx Screw Coated	6020-835-02	
19	Release Pivot Bar	8342-018-01	

Item #	General Description	Part Number	Picture
20	Release Latch	8342-008-02	
21	Spring, Compression	8342-019-01	
22	Pivot Bar Plate	8342-020-01	
23	Printhead	5450-004	
24	Anti-Static Brush	7480-090	
25	Cable Assembly Black, print head to PCB	25018-041-50	
26	Cable Assembly Black, print head to PCB	25018-034-50	
27	Printhead Mount	8342-006-03	
28	Shoulder Screw	6001-002-01	
29	Ground Wire	25020-058-50	

Item #	General Description	Part Number	Picture
30	Panhead Screw Bare Metal Torx	6020-835	
31	O-Ring	6141-003	
32	Retention Clip	8342-025-50	
33	Spring Bar	8342-017-01	
34	User Instruction Label – **ELI** product User Instruction Label – BUR product LABEL, MLBUR280 USER INSTRUCTION	777226 9042-078-02 777227	 (777226 label shown above, 777227 below) 

Item #	General Description	Part Number	Picture
35	8" WRITER LID ASSEMBLY – **ELI** 280/380 NO LABEL	SERV-ASSY-181-02	
36	**ELI** 280/350/380 PRINTHEAD ASSY BLACK	41000-028-54	

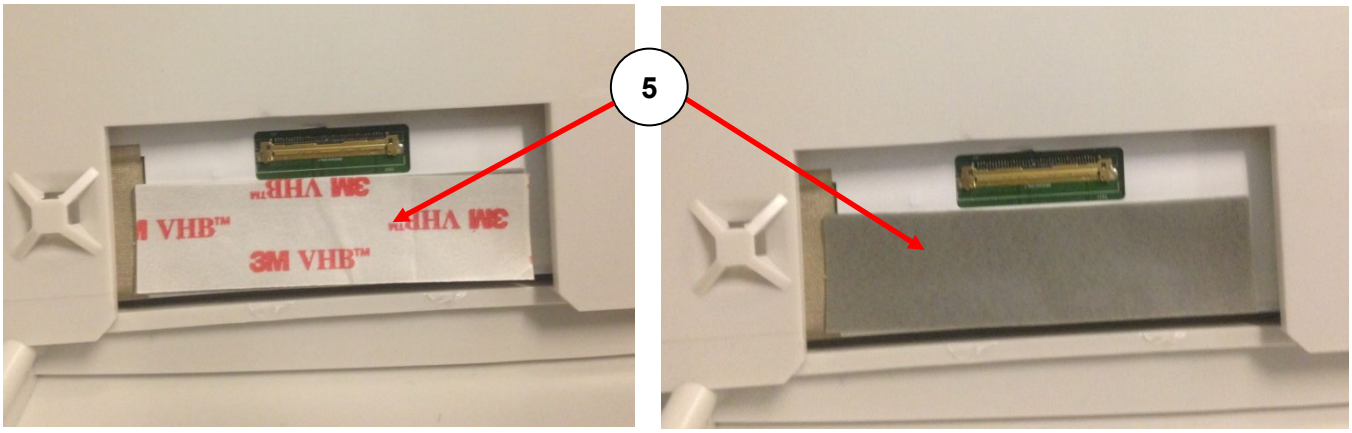
Order of Reassembly

The following sequence defines the preferred method for unit reassembly.

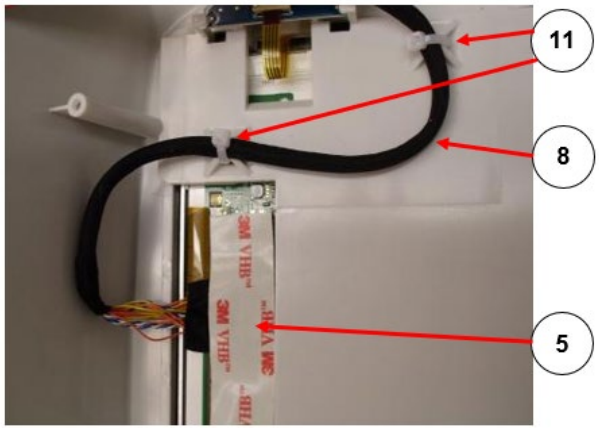
Touch Screen Cable Installation

ATTENTION: PCB assembly contains ESD sensitive devices. Use appropriate precaution when handling unit.

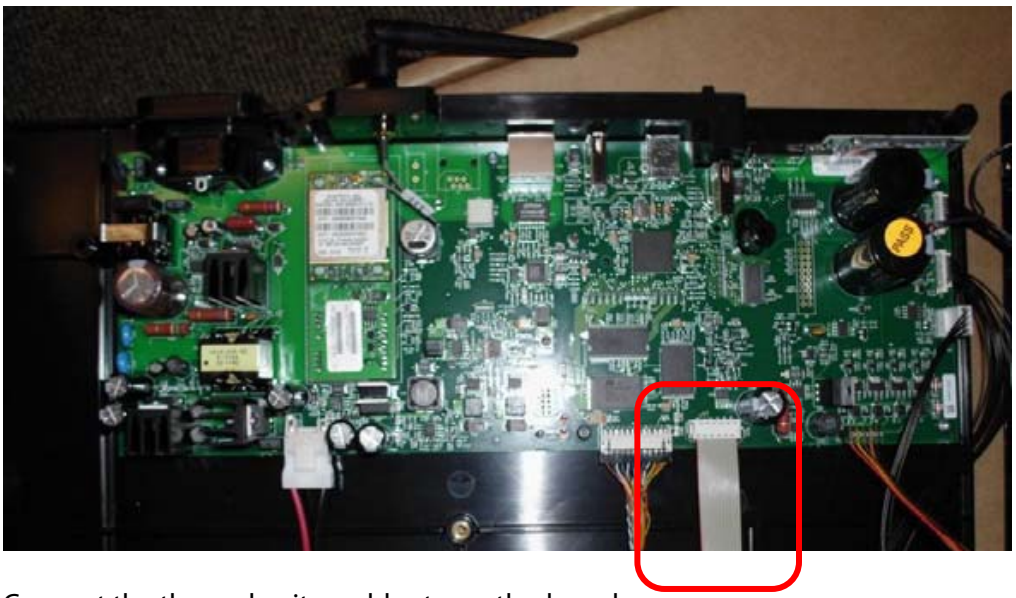
1. Install Cable Assembly (Item 8) onto Upper Housing Assembly (Item 23) at location CN1.
2. Apply a piece of 2-sided tape (Item 5) below connector. Apply uniform pressure across entire length of tape. Remove backing of 2-sided tape (Item 5).



3. Install Cable Assembly (Item 8) into LCD connector at location CN1. Apply uniform pressure across Cable Assembly. Align Cable Assembly so the wires are positioned straight back from the connector as shown.
4. Apply another piece of 2-sided tape (Item 5) to secure the cable to the mating connector. Apply uniform pressure across entire length of tape. Secure Cable Assembly (Item 8) to Upper Housing (Item 18) using a cable tie (Item 11) in two locations as shown above.



5. Plug the other end of Cable Assembly (Item 12) into P8 of the **ELI** 280 PCB Assembly (Item 13).



6. Connect the thermal writer cables to motherboard

7. Connect the display cables to motherboard

8. Connect the main battery connector to the motherboard (if previously disconnected).
9. Place the writer assembly onto its mounting posts, while ensuring not to pinch the motor cable wires between plastic mounts.
10. Open the writer door and carefully place the cover assembly in place without moving the thermal writer from its mounting posts (light downward pressure on the writer assembly will ensure it does not move during this operation).

11. Once the cover assembly is in place, carefully close the writer door and make sure the writer assembly is properly aligned within the cover opening.
12. Slide the unit to the edge of the work surface and hold the top cover tightly to the lower housing while turning the unit over, so that it rests upside down on the work surface.

13. Insert the four (4) writer screws and tighten them to 5.0 inch-pounds, then insert the eight (8) housing screws and tighten them to 5.0 inch-pounds to secure the upper housing to the lower housing.
14. Install the main battery (if previously removed) and tighten the battery door screw to 3.5 inch-pounds.

Conformance Testing

Conformance testing is to be performed by Authorized Baxter Service Representatives to verify the device is functioning correctly after repair operations have been performed. Testing results should be documented on the test data record at the end of this section of the manual.

Print the device configuration (attach to the Test Data Record (TDR).

Power Testing

- Ensure battery is fully charged before performing these tests, voltage and current limits are based on a fully charged battery.
- Ensure there is no power connected to the UUT AC inlet.
- Turn the unit over and remove the battery plate (see Unit Disassembly section "Battery Removal"). To gain better access to the terminals, pull the battery out of the compartment. Disconnect the red battery cable from the red terminal.

NOTE: Based upon customer usage and age of battery, replace as needed.

Note battery age (if possible)
This information can be found on the white "date code" sticker located on the battery (use the earliest date that is not crossed out). Record Date on TDR.

Battery (open circuit)
Measure battery voltage using a voltage meter; verify the meter reads greater than 12.5vdc. Record Result on TDR.

Battery (load)
Measure the battery voltage using a volt meter and a power resistor load (10ohm, 20watt) in parallel with the battery. After approximately 5 seconds, verify the meter reads greater than 11.7vdc. Record Result on TDR.

Off current
Connect a current meter in line with battery. With the UUT power off, verify the current meter reads less than 250 uA. Record Result on TDR.

On current
Turn on the unit and verify the current meter reads less than 1.1 A. Record Result on TDR.

AC charging current
Apply AC power to the unit and verify that the current draw from the battery reverses polarity and the value starts decreasing as time increases. Record Result on TDR.

Battery charger output voltage
Disconnect the current meter and measure the battery charger output voltage between the red

disconnected battery cable and the negative terminal on the battery. It should read between 13.0vdc and 14.7vdc. Record Result on TDR.

Reconnect the red battery cable to the red terminal and reinstall the battery and cover plate.

NOTE: The touch screen will need to be recalibrated date and time will need to be reset every time the battery is disconnected.

Functional Testing

The MAIN SCREEN is displayed when the unit is first turned on.

The LCD will timeout and go dark if there is no ECG or user input. Touch the screen or press the power button to re-activate.

SERVICE SCREEN

1. To access the SERVICE SCREEN begin at the MAIN SCREEN.
2. Press the **GEARS** icon (lower right).
3. Press **ADVANCED**, then enter the admin password.
4. Press **SERVICE**.

CONFIGURATION SCREEN

1. To access the CONFIGURATION SCREEN begin at the MAIN SCREEN.
2. Press the GEARS icon (lower right).
3. Press **ADVANCED**, then enter the admin password.

Battery Status in About Screen

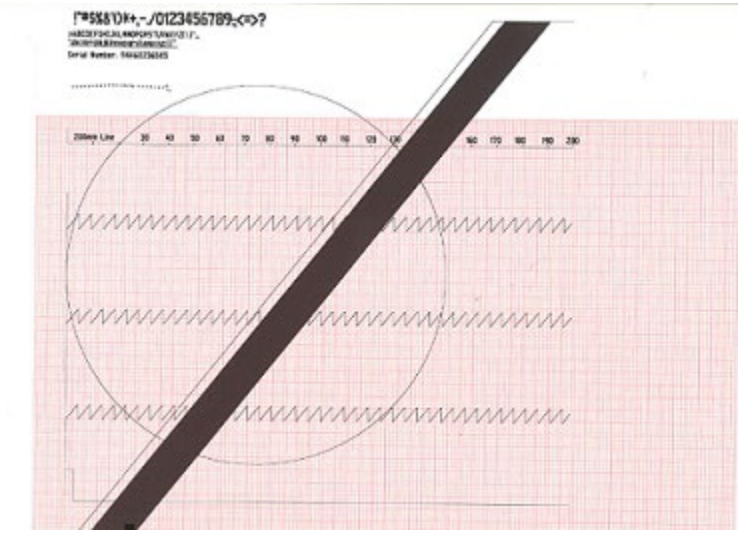
1. From the MAIN SCREEN press the **GEARS** icon.
2. If unit is connected to AC power, disconnect the unit.
3. Enter the About screen from the configuration menu. Observe the Battery Voltage field over at least 10 minutes. Confirm that the battery voltage information updates periodically.
4. Record Results on the TDR
5. Run the unit on battery power for at least 10 minutes and then return to the About screen from the configuration. View the Battery Voltage information and confirm that the value has updated.
6. Connect the unit to AC power and observe the field over the next several minutes. Confirm that the field updates the information as the battery is charging.
7. Record Results on the TDR

AC LED/Display

1. Connect the AC power cord to the unit and verify that the green AC LED (located directly below the power button) illuminates continuous.
2. Press the **ON** button and verify the text on display is clear and legible and there are no flickering or missing lines/pixels.
3. Record Results on the TDR

Auto/Writer Test

1. From the Service Screen, select the **Auto Test** icon. Verify the auto test completes one cycle without an error.
2. Open and close the writer door to verify smooth operation. Verify that the door unlatches without sticking and that it latches completely.
3. From the Service Screen, select **Writer Test**. Verify that a test page is printed and the writer stops on the cue mark. The perforation of the paper should line up with the tear edge on the writer. Assure there are no gaps in the printing and the print darkness is uniform across the entire page (example shown below).
4. Verify the writer gears do not skip and paper is tracking properly (you may need to print multiple pages to observe this).
5. The Plot filter will affect the printing of the test page. In ADVANCED press **ECG** and note the value in the Filter field. Set the Filter to 40hz.
6. Press **DONE** and go to SERVICE and press **Writer Test**.
7. Change the Filter to 150hz and test, change the Filter to 300hz and test then set the Filter to the original value.
8. Record Results on the TDR



(150hz)

ECG Test

1. Connect an ECG simulator to the **AM**12 or **WAM** patient interface. Set the simulator to a known heart rate and amplitude.
2. From the Main Screen, select the **ECG** icon to capture an ECG. Enter "TESTECG" in the last name field. Verify there is an audible beep with each key press.
3. Verify that 12 ECG traces print correctly and assess the overall printout quality. Ensure uniform darkness across entire printout.
4. Record Results on the TDR

Lead Failure Test

1. Connect an **AM**12 or **WAM** patient cable to the patient input of the unit, with the other end connected to a lead failure box (TF-0620 or equivalent) or a patient simulator.
2. Using the lead fail box, momentarily press each push button to open the patient leads one at a time or disconnect one lead at a time from the simulator and verify the display indicates an open lead condition for the corresponding lead.
3. Record Results on the TDR

Lead Message

- Right Arm - RA OFF
- Left Arm - LA OFF
- Left Leg - LL OFF
- V1 - V1 OFF
- V2 - V2 OFF
- V3 - V3 OFF
- V4 - V4 OFF
- V5 - V5 OFF
- V6 - V6 OFF
- All Leads off - LEADS OFF

ECG Noise Test

1. Connect a Shorting Block (TF-0629 or equivalent and lead wire adapters to an **AM**12 or **WAM** patient interface.
2. Connect the patient interface to the unit and set the ECG gain to 20mm/mV.
3. Print a rhythm strip (approx. 1 page).
4. Verify that no channels have more than 0.5mm of noise as measured by using Baxter thermal paper. (Smallest grid line = 1mm).

5. Record Results on the TDR.

Communication Option Testing (as applicable)

The receiving station for modem, LAN and WLAN transmissions should be running Baxter **ELI** Link software. Refer to the **ELI** Link user manual for proper configuration.

Verify successful transmission of all applicable communication options by acquiring ECG records that include the transmission method in the "Patient Name" field (such as Last Name = USBD) then subsequently transmitting the ECG record stored to a compatible receiving device. Consult the product user manual if needed to properly configure the communication settings for each option present on the unit under test.

Successful transmission of the test records can be verified by viewing the ECG records in the unit directory after transmission and confirming they are marked as "transmitted" (as defined in the product user manual). Record Results on the TDR

- USB host (USB memory device needed)
- USBD
- Modem
- LAN
- WLAN

Device Cleaning

Clean unit per the instructions provided in the Preventive Maintenance section of the service manual.

Safety Testing

If the cardiograph housing was opened for repair or inspection work, the following safety tests should be performed in accordance with the IEC 60601-1 or IEC 62353 methods and limits.

The **ELI** 280 is considered a Class 1 Type CF device, intended to only be utilized with the Baxter **AM**12 or **WAM** patient input modules. Defibrillation isolation from the patient is provided by the patient input modules, which are tested separately as part of the manufacturing process (they are considered non-serviceable devices), therefore Hi-pot testing is not required for the **ELI** 280 cardiograph.

- Earth Leakage
- Enclosure Leakage
    - Non-conductive (fully insulated) chassis testing should be performed utilizing 200 cm2 conductive foil or equivalent, earth ground on AC input is utilized for functional earth (not safety grounding).
- Patient Leakage
    - Applied part – patient input (utilize Baxter **AM**12 patient cable)
- Patient Auxiliary Current
    - Applied part – patient input (utilize Baxter **AM**12 patient cable)

ELI 280 Test Data Record

Unit Serial #: _____

Print device configuration (attach to this report)

Power Testing

□ Note Battery Age (If not possible enter N/A) _____/_____ (week/year)
□ Battery (Open Circuit) Voltage _____ V (>12.5 V)
□ Battery (with Load) Voltage _____ V (>11.7 V)
□ Off Current _____ uA (<250 uA)
□ On Current _____ mA (<1.1 A)
□ AC Charging Current PASS / FAIL
□ Battery Charger Output Voltage _____ V (13.0-14.7 V)

* Based upon customer usage and age of main battery, replace as needed.

Functional testing

- □ Battery Status DC PASS / FAIL (Circle One)
- □ Battery Status AC PASS / FAIL (Circle One)
- □ AC LED/Display PASS / FAIL (Circle One)
- □ Auto/Writer Test PASS / FAIL (Circle One)
- □ ECG Test PASS / FAIL (Circle One)
- □ Lead Fail Test PASS / FAIL (Circle One)
- □ ECG Noise Test PASS / FAIL (Circle One)

Communication Option(s)

- □ USB host PASS / FAIL / N/A (Circle One)
- □ USBD PASS / FAIL / N/A (Circle One)
- □ Modem PASS / FAIL / N/A (Circle One)
- □ LAN PASS / FAIL / N/A (Circle One)
- □ WLAN PASS / FAIL / N/A (Circle One)

□ Device Cleaning

□ Safety Testing PASS / FAIL (circle)

- □ Earth Leakage
- □ Enclosure Leakage
- □ Patient Leakage
- □ Patient Auxiliary Current

Print another device configuration and compare it to the first copy (attach to the Test Data Record).

Performed by: _____ Date: _____/_____/_____

Special Functions

Time Sync

The **ELI** 280 can Time Sync against **ELI** Link 3.10 or above and **E-Scribe** 8.15 and above.

1. Touch the (System Configuration button) from the Real Time Display.
2. Touch Date/Time.
3. Touch Sync Date/Time.
4. Touch **Done** when the display shows Time Synchronized.

Testing the WLAN/LAN Settings

1. To verify connection to the WLAN or LAN touch the (System Configuration button) from the Real Time Display.
2. Touch **Network**. This will test the WLAN for signal strength and the IP number if WLAN is set to DHCP.
   - **Test WLAN** will test for a wireless connection to **ELI** Link or **E-Scribe** and download the custom ID. Touch **Done** to get back to the setting menu or to go to the Real Time Display.
   - **Test LAN** will test for a network connection to **ELI** Link or **E-Scribe** and download the custom ID. Touch **Done** to get back to the setting menu or to go to the Real Time Display.

Service Menu

The following functions/tests are all in the Service Menu.

1. To access the Service Menu, touch the System Configuration button on the real time screen.
2. Touch **Advanced**.
3. Enter the password.
4. Touch **Service**.

Cue Sensor Calibration

Cue sensor calibration is required when the cue sensor, writer assembly, or motherboard have been changed as a result of device servicing or the display shows a paper cue fault.

To calibrate the cue sensor, perform the following steps:

1. Make sure that the paper is not stopped at the perforation line by opening the paper tray, pulling out ½ sheet and closing the paper tray.
2. Touch the **Calibrate Cue** button.

Auto Test

This button is used to test the flash memory.

1. Touch **Auto Test**.
2. If the Flash Test failed contact Baxter Technical Support.

Change the Device Owner's Name

To change the device Owner's Name, perform the following steps:

1. Touch **Owner Name** and enter the password.
2. Touch the owner name box to bring up the touch keyboard.
3. Enter the name and touch **Done** when finished.

Copy Log Files to a USB Flash Drive

The Log Files may be required by Baxter Technical Support to assist with diagnosing product issues. To copy log files to a USB flash drive perform the following steps:

1. Insert a USB flash drive in the USB port on the back of the device.
2. Touch **Dump Log Files**.
3. This will put log files for Baxter Technical Support as well as battery log files on the USB flash drive.
4. The battery log is in LogBatteryMMYYYY.txt and is viewable by the customer.

Copy All ECG Records to a USB Flash Drive

This will not delete the records from the machine. This will not change the status of any status flags. This function should not be used if the unit is encrypted.

To copy all ECG Records to a USB flash drive perform the following steps:

1. Insert a USB flash drive in the USB port on the back of the device.
2. Touch **Dump Records**.

Erase All ECG Records

WARNING: The following sequence will permanently erase all ECG records from the device.

To erase all ECG records perform the following steps:

1. Touch **Erase Records**.
2. Touch **Yes**.

Writer Test

To test the writer/printhead operation, touch **Writer Test**.
The print on the paper will vary based on the filter set in System.

Test Configuration

(Manufacturing Use ONLY)

WARNING: The following will reset the device to factory test configuration settings, which may render the device inoperable in a customer setting. Print a configuration page before performing resetting to the factory test configuration.

To set the configuration to the factory test settings, touch the **Test Config** button.

Clear Flags

WARNING: Pressing this button will remove the Print, Transmit and Delete flags (P T X) for all ECG records stored in the cardiograph.

To clear all ECG status flags, touch **Clear Flags**.

Fill Directory

WARNING: This function will copy and create ECG records with new names from existing ECG records in the cardiograph until the directory is full (requires at least one stored ECG to function).

The new ECG records will not retain any status flag information from the parent record(s).

To completely fill the cardiograph directory for testing purposes, touch **Fill Directory**.

Firmware

- Used to upgrade the software on the unit.

Config File

- Used at the factory only

Options File

- Used to upgrade certain purchasable options

First Time Boot

WARNING: The following will reset the device to factory default settings. Print a configuration page before performing this test.

- Used at the factory only

IIR on

- Only needed if the unit is set for the Chinese language

Communication Options

The following Communications Options are available on the **ELI** 280.

- Transmission to USB Memory Device (USB Host Port)
- USBD Mount to **Windows** PC (USB Device option)
- LAN
- WLAN
- Modem

Communication Option Installation/Upgrades

Transmission to USB Memory Device (USB Host Port)

Communication to a USB memory device is always enabled on the **ELI** 280.

USBD Mount to Windows PC (USB Device option)

The ability to allow the **ELI** 280 to be recognized by a computer as a USB memory device is enabled via a .SNO software file provided by Baxter with the purchase of the option upgrade. The software file will set the USBD configuration to "yes" to enable the option. No additional hardware is required.

This procedure will not work if the unit is encrypted.

LAN Option

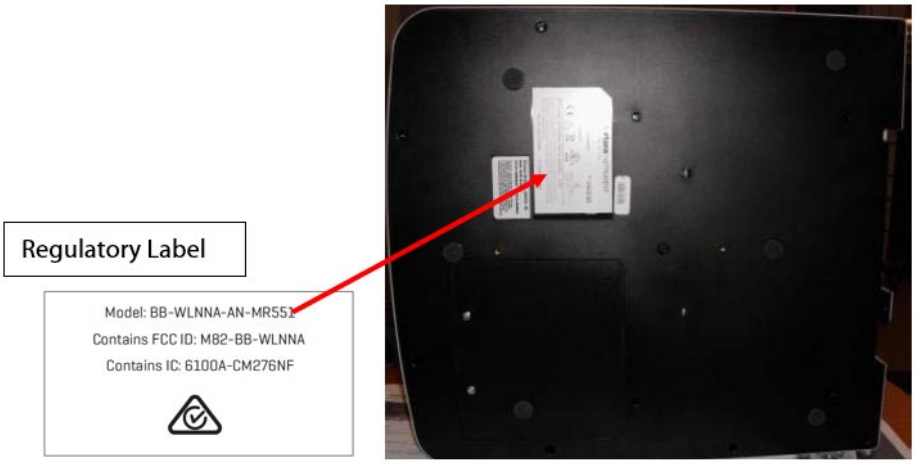
The LAN option hardware is always resident on the **ELI** 280 main PCA. The LAN option is enabled via a .SNO software file provided by Baxter with the purchase of the option upgrade. The software file will set the LAN configuration to "yes" to enable the option.

WLAN Option

The WLAN option requires the installation of a WLAN communication module, and the enabling of the option via a .SNO software file provided by Baxter with the purchase of the option upgrade. The software file will set the COM configuration to "yes" to enable the option.

Installation of the WLAN module requires it to be soldered to the main PCA in the location shown below. Once the module is installed, the antenna cable is mounted, the antenna is attached, and an external regulatory label is applied to the bottom housing (as shown below) to identify the WLAN module installed. This upgrade can only be performed by Baxter Factory Repair.

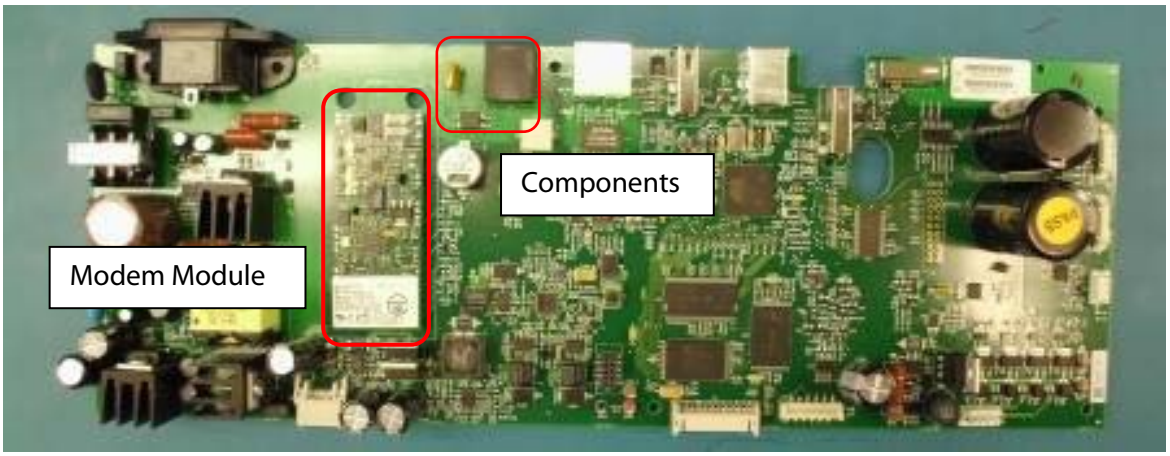
General Description	Part Number
CABLE COAX UFL TO RP-SMA BLKHD 100mm	776992
ANTENNA DUAL BAND 2400/5000 MHz RP-SMA	3600-016
B&B-N WLAN MODULE PCB ASSY	26025-077-200
LABEL REG WLAN B&B ELECTRONICS	777190



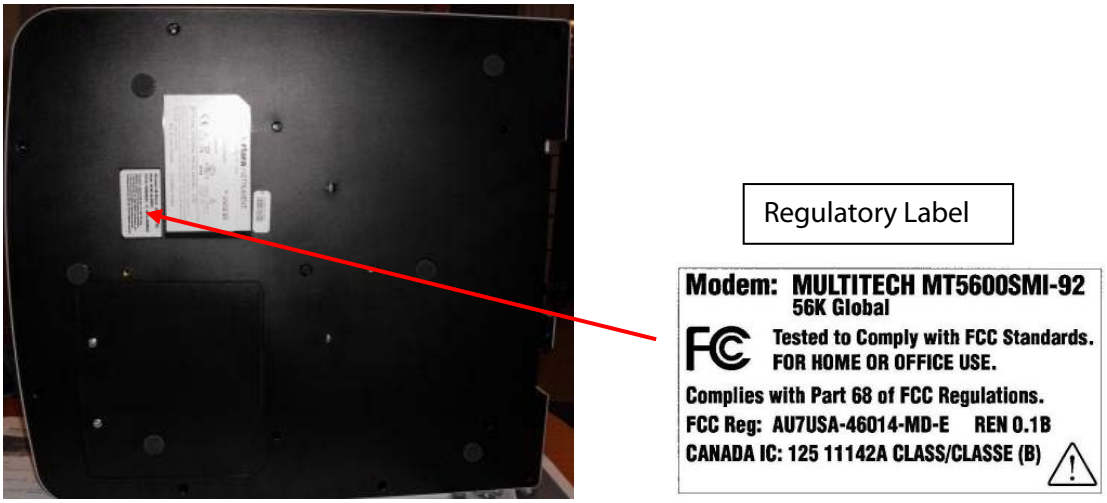
Modem Option

The Modem option requires the installation of a Modem communication module, and the enabling of the option via a .SNO software file provided by Baxter with the purchase of the option upgrade. The software file will set the COM configuration to "yes" to enable the option.

Installation of the Modem module requires it to be soldered to the main PCA in the location shown below. Once the module is installed, additional components will need to be soldered to the PCA (refer to the list below), and an external regulatory label is applied to the bottom housing (as shown below) to identify the Modem module installed. This upgrade can only be performed by Baxter Factory Repair.



General Description	Part Number
Common Mode Choke 2A 4 PIN SM	600-0515
CONN, MOD PHONE 4 PIN RA LO PRO	3225-003
FUSE POLYSWITCH TR 600V 15 mA	4027-001
LABEL **ELI** 2XX MULTITECH MODEM ID	9025-049-02
MODEM MULTITECH MT5600 V.92 5V SERIAL	9910-017



Appendix

For the following information, refer to the **ELI** 280 electrocardiograph IFU at baxter.com/getstarted.

- Product Overview
- Warranty Information
- Warnings and Cautions
- Equipment Symbols and Markings
- Electromagnetic Compatibility (EMC)
- System Settings
- Device Cleaning
- Troubleshooting