12 Disassembly and reassembly

12.1 Disassembly guidelines

Field repair of the patient monitor is limited to replacing Field Replaceable Units (FRUs). See chapter 13. Service parts for a detailed list of available FRUs. Attempting a field repair on a printed circuit board or a factory sealed component or assembly could jeopardize the safe and effective operation of the patient monitor.

NOTE: Only a qualified service technician should perform field replacement procedures.

NOTE: Perform the checkout procedure described in chapter 10. Maintenance and checkout each time after you have done any disassembly to the patient monitor.

12.1.1 ESD precautions

All external connectors of the patient monitor are designed with protection from ESD damage. However if the patient monitor requires service, exposed components and assemblies inside are susceptible to ESD damage. This includes human hands, non-ESD protected work stations or improperly grounded test equipment. The following guidelines may not guarantee 100% static-free workstation, but can greatly reduce the potential for failure of any electronic assemblies being serviced:

- Discharge any static charge you may have built up before handling semiconductors or assemblies containing semiconductors.
- A grounded, antistatic wristband or heel strap should be worn at all times while handling or repairing assemblies containing semiconductors.
- Use properly grounded test equipment.
- Use a static-free work surface while handling or working on assemblies containing semiconductors.
- Do not remove semiconductors or assemblies containing semiconductors from antistatic containers until absolutely necessary.
- Do not slide semiconductors or electrical/electronic assemblies across any surface.
- Do not touch semiconductor leads unless absolutely necessary.
- Semiconductors and electronic assemblies should be stored only in antistatic bags or boxes.
- Handle all PCB assemblies by their edges.
- Do not flex or twist a circuit board.

WARNING **Pins of connectors identified with the ESD warning symbol should not be touched. Connections should not be made to these connectors unless electrostatic discharge (ESD) precautions are used.**

12.1.2 Reassembly precautions

Pay attention to the following generic precautions when reassembling the patient monitor:

- Note the positions of any wires, cables or connectors. Mark them if necessary to ensure that they are reassembled correctly.
- Save and set aside all hardware for reassembly
- GE recommends using the new fasteners (screws, washers, etc.) provided in the FRU kits rather than reusing the old fasteners. Some fasteners are not intended to be re-used

more than three times. Use only new screws attaching into light metal parts. Take advantage of existing thread pattern cut by turning the screw counterclockwise until it drops into the existing thread pattern.

- We have added the maximum recommended torque value to be used for each screw and nut in reassembly. These values are listed in brackets after each disassembly step.
- When attaching self-tapping screws to light metal parts without existing threads (new light metal FRU parts), you should use a higher torque than is recommended for reassembled parts, but still not more than 1.6 Nm.

NOTE: It is not required to a use torque wrench or torque screwdriver when reattaching the patient monitor using the recommended standard hand tools. Just ensure visually that the screws are properly attached, but avoid over tightening by using excess force as this may damage the existing thread patterns. However, when using battery-operated tools, ensure that it is equipped with torque limiter and the torque is properly adjusted.

12.1.3 Required tools

- insulated Torx T6 and T10 screwdrivers
- insulated flat blade screwdriver (width 2.5 mm / 0.1 in)
- pliers
- antistatic ESD wristband

NOTE: Use torque wrench and torque screwdriver to comply with the given torques.

WARNING **Due to possible high voltage present, use an insulated screwdriver at all times.**

12.1.4 Before disassembly

WARNING **PATIENT MONITORING INTERRUPTION — Make sure a patient is not being monitored while servicing the equipment.**

WARNING **DISCONNECTION FROM MAINS - When disconnecting the device from the power line, remove the plug from the wall outlet first. Then you may disconnect the power cord from the device. If you do not observe this sequence, there is a risk of coming into contact with line voltage by inserting metal objects, such as the pins of leadwires, into the sockets of the power cord by mistake.**

WARNING **SAFETY GROUND - Remove power cord from the mains source by grasping the plug. Do not pull on the cable.**

WARNING **ELECTRIC SHOCK - Always unplug the grounded cables when not in use. Leaving them connected could result in an electric shock from the ground contact in the other end.**

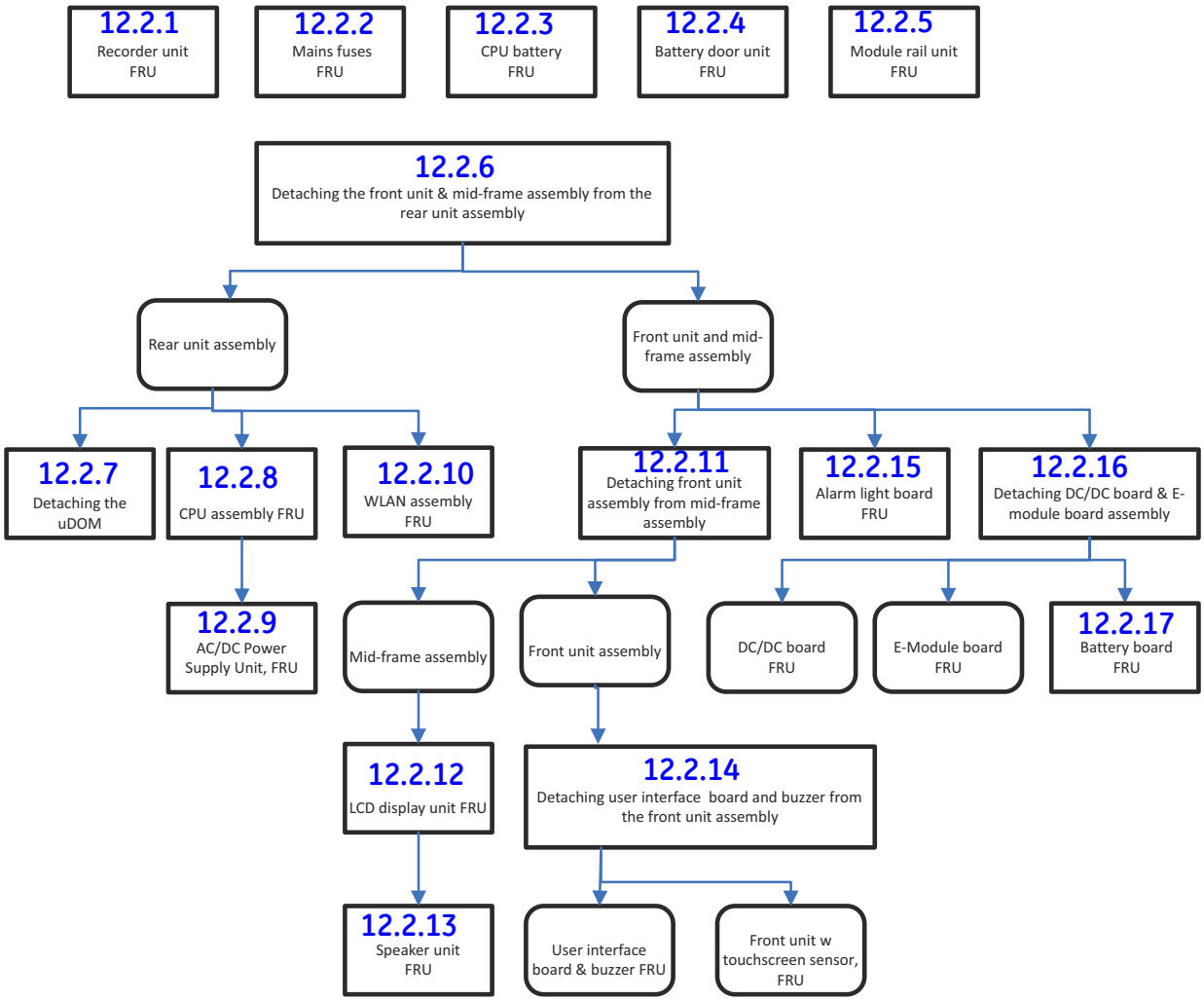
1. Turn the patient monitor off from the **On/standby** button.
2. Disconnect the patient monitor power cord first from the wall outlet and then from the monitor.
3. Remove the patient monitor batteries.
4. Disconnect all external cables connected to the patient monitor.
5. Disconnect all parameter modules.
6. Detach the patient monitor from the mount if installed.

NOTE: If you disconnect the patient monitor from the AC power source and remove the battery prior to turning the monitor off, the monitor will start alarming about power loss situation. Select the ***Silence alarm*** to silence this alarm.

Disassembly workflow

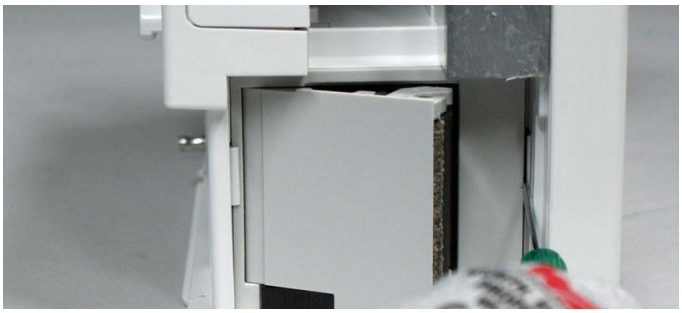
Use this workflow diagram to find the simplest way to disassemble the required parts of the patient monitor. Numbers in the diagram refer to the sections in this Disassembly chapter.

Follow the arrows from the top down to the required part and disassemble the monitor by following the steps in between.



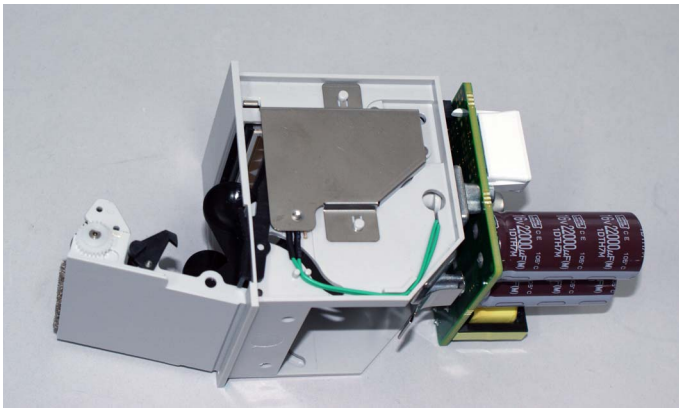
12.2 Disassembly procedures

12.2.1 Replacing the recorder unit (FRU)



1. Open the recorder door and remove the paper roll if installed.
2. Release the two snaps on each side of the recorder by pressing with a flat blade screwdriver.

3. Pull the recorder out of the monitor, first a little by pulling from the recorder door, and then all way out by pulling from the recorder body.
   NOTE: Be careful not to damage the recorder door or the grounding plate when pulling out the recorder.



- FRU, Recorder unit, B450

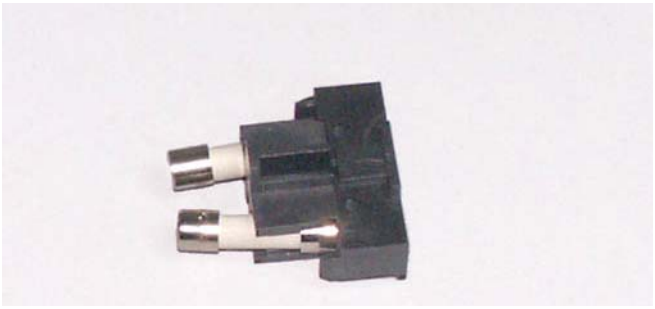
Reassemble in reverse order:

- Push the recorder unit all the way into its slot until it locks.

12.2.2 Replacing the mains fuses (FRU)

The mains fuses are located on the side of the monitor, inside the AC inlet.

1. Release the snap in the fuse holder of the AC inlet by pressing it with a flat blade screwdriver. Pull the fuse holder out of the AC inlet.



2. Replace the fuses with new ones. Use only fuses with the same rating.

Reassemble in reverse order:

- Push the fuse holder all the way in until it snaps to its place.

12.2.3 Replacing the CPU battery (FRU)

1. Remove the screw (T10) holding the service cover. Torque [1.2 Nm].

2. Release the snap that holds the service cover using a flat blade screwdriver.

3. Pull out the service cover.

4. Detach the CPU battery from the CPU carrier board with a flat blade screwdriver.

NOTE: Dispose the battery according to local, state or country laws.

- Reassemble in reverse order.

12.2.4 Replacing the battery door unit (FRU)

1. Open the battery door.
2. Release the snap that holds the battery door assembly to the patient monitor using a flat blade screwdriver.

3. Pull the battery door assembly out of the patient monitor.

- FRU, Battery door unit, B450

Reassemble in reverse order:

- Align the battery door plate to its guide rails.
- Push the battery door assembly all the way into the monitor frame until it snaps to its place.
- Close the battery door.

12.2.5 Replacing the module rail unit (FRU)

1. Remove the four screws (T10) that mount the module rail unit to the rear unit assembly.

NOTE: Notice the torque during the reassembly:

- if you replaced the CPU assembly, use 1.2 Nm.
- if you didn't replace the CPU assembly, use 0.8 Nm.

2. Pull out the module rail unit.

- FRU, Module rail unit, B450

Reassemble in reverse order.

- Ensure that the module rail unit connector is correctly aligned to the connector in the CPU board.

WARNING **Use only GE specified screws and torque when replacing the module rail unit.**

12.2.6 Detaching the front unit and mid-frame assembly from the rear unit assembly

This step only for monitors without a recorder unit:

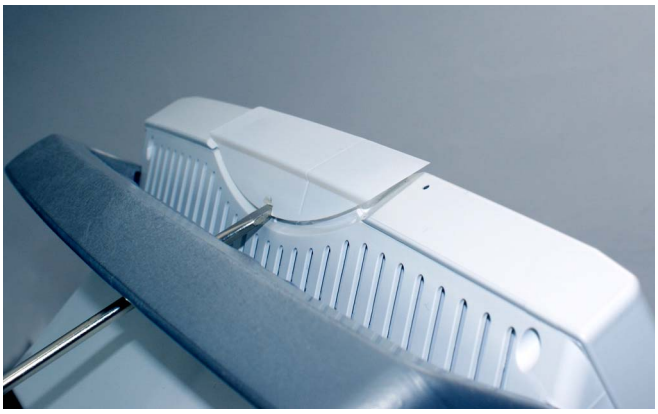
1. Use a flat blade screwdriver to release the snap that fastens the recorder cover plate to the monitor frame. Detach the recorder cover plate.

NOTE: If there is a recorder installed, you do not have to remove it.

1. Remove the screw (T10) holding the service cover. Torque [1.2 Nm].

2. Release the snap that holds the service cover using a flat blade screwdriver.

3. Pull out the service cover.



4. Carefully detach the alarm light lens.
   Release the snaps holding the alarm light lens by sliding a flat blade screw driver under the lens and carefully lift the lens up using the screw driver.

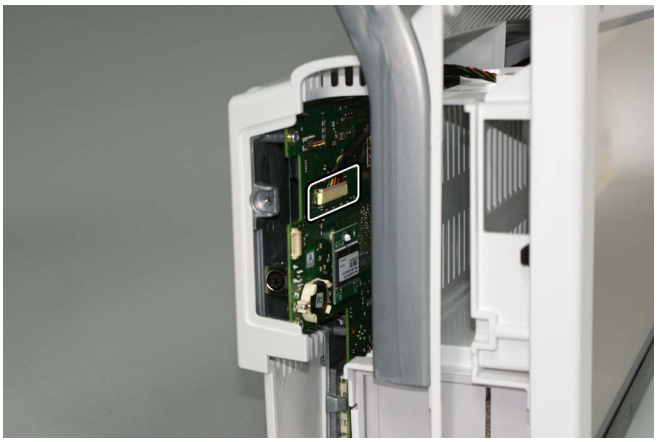
5. Remove the three screws (T10) in the bottom of the patient monitor. Torque [0.6 Nm].

6. Remove the two screws (T10) in the top of the patient monitor. Torque [1.2 Nm].

7. Remove the screw (T10) next to the handle. Torque [1.2 Nm].

8. Pull out the front unit and mid-frame assembly from the rear unit assembly a little so that you have access to the AC/DC and display cables.

9. Detach the AC/DC cable from the DC/DC board connector.



10. Detach the display cable from the CPU carrier board.

11. Pull out the front unit and mid-frame assembly all way out from the rear unit assembly.

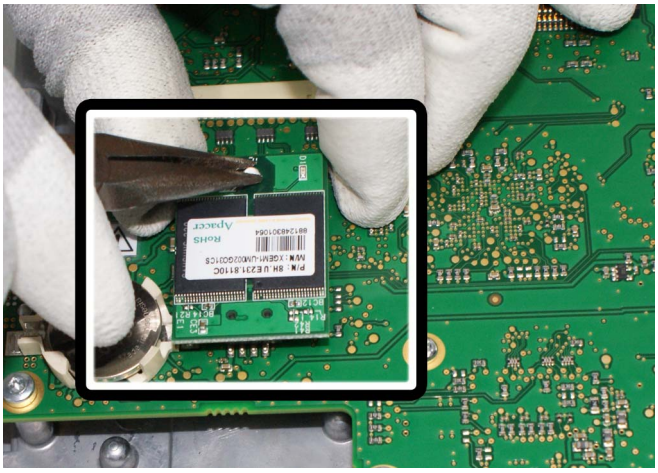
Reassemble in reverse order:

- When reassembling, ensure that the connector in the E-module board is properly aligned with the connector in the CPU carrier board.
- Remember to reconnect the AC/DC cable and the display cable.

12.2.7 Detaching the uDOM

Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly



Keep the rear unit assembly on the table, the device label side facing down.

1. Carefully detach the uDOM from the CPU assembly. The uDOM is connected to the CPU assembly with a connector from one and with a nylon support post from the other end. You may need pliers to squeeze the nylon support post a little to detach the uDOM.

uDOM replacement:

- Reassemble in reverse order.

Contact GE Service if you doubt that the uDOM is defective. Some of the reconfiguration steps required after uDOM replacement can be performed only by GE service.

NOTE: The uDOM service part includes software, but no licenses. The monitor serial number and all clinical and platform settings are set into factory defaults.

After replacing the uDOM, and reassembling the patient monitor, perform the following tasks:

1. Connect the power cord to the patient monitor and to the wall outlet.
2. Turn on the patient monitor from the On/Standby button. The new software in the uDOM will install automatically during the first restart. This may take several minutes and the patient monitor may reboot automatically. Wait until the software installation is completed, and normal monitoring screen appears. Do not interrupt software installation.
3. Login to Webmin and perform the following configurations:
   a) Restore the backup copy of the saved platform and clinical settings back to the monitor (see 7.17)
   b) Enter the original Host Serial Number printed to the device plate (see 7.13).
   c) Reload licenses from a license file, or enter them manually (see 7.18).
4. Perform a complete checkout procedure (see 10).

12.2.8 Detaching the CPU assembly (FRU)

The CPU assembly consists of CPU carrier board, CPU module and uDOM.

Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly

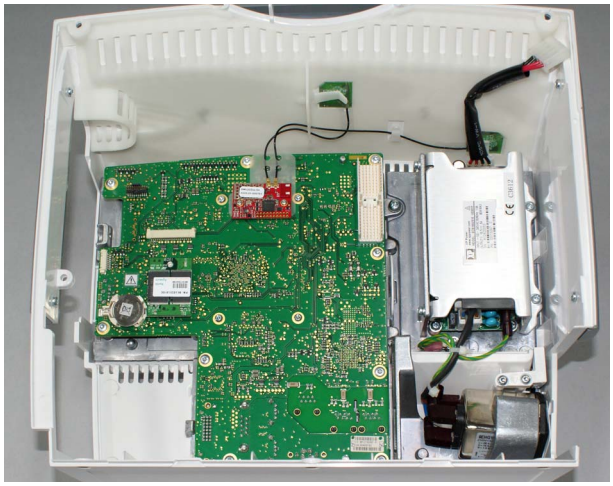
Keep the rear unit assembly upright on the table. Support the CPU board and AC/DC power supply unit with your hand, so that they do not drop when you perform the following steps.

1. Remove the four screws (T10) that mount the module rail unit to the rear unit assembly.

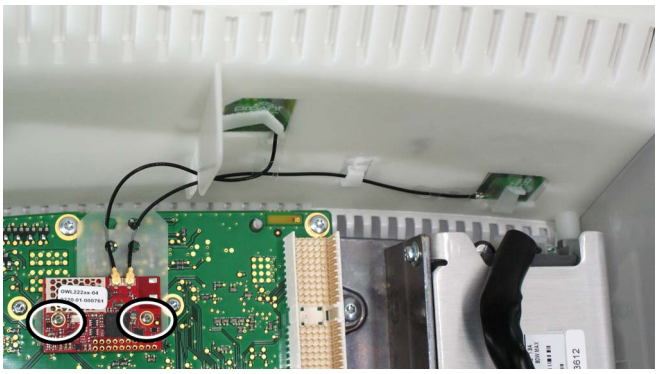
NOTE: Notice the torque during the reassembly:

- if you replaced the CPU assembly, use 1.2 Nm.
- if you didn't replace the CPU assembly, use 0.8 Nm.

2. Pull out the module rail unit.

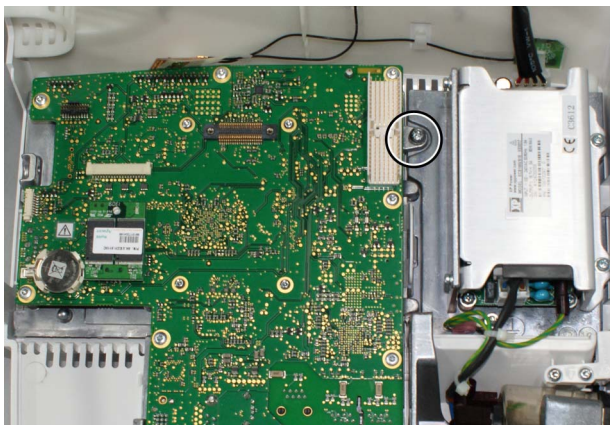


Keep the rear unit assembly on the table, the device label side facing down.



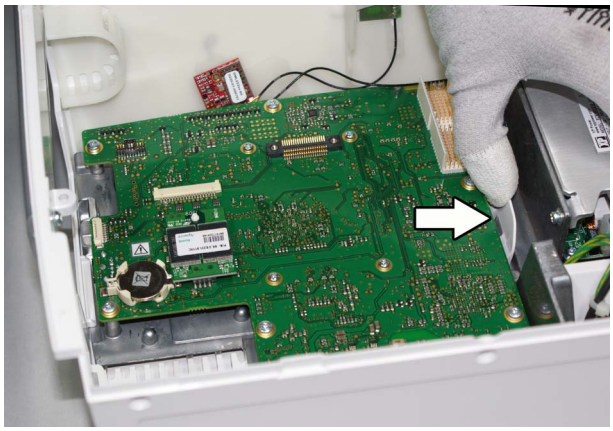
3. Detach the WLAN card from the CPU carrier board, if installed.
   a. Remove the two screws (T6) that hold the WLAN radio card to the CPU carrier board. Torque [0.3 Nm].
   b. Detach the WLAN radio card carefully from its connector in the CPU carrier board.

NOTE: Be careful not to damage the fragile WLAN antenna boards or antenna cables.

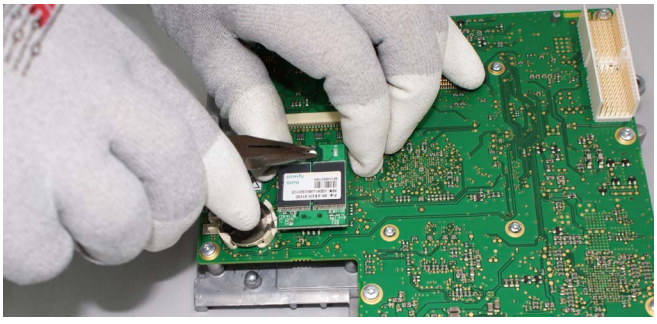


4. Detach the grounding screw (T10) holding the CPU assembly and AC/DC unit together. Torque [1.6 Nm].

NOTE: During the reassembly, make sure to fasten the grounding screw properly. This is important to ensure that the CPU assembly is properly connected to the protective earth.

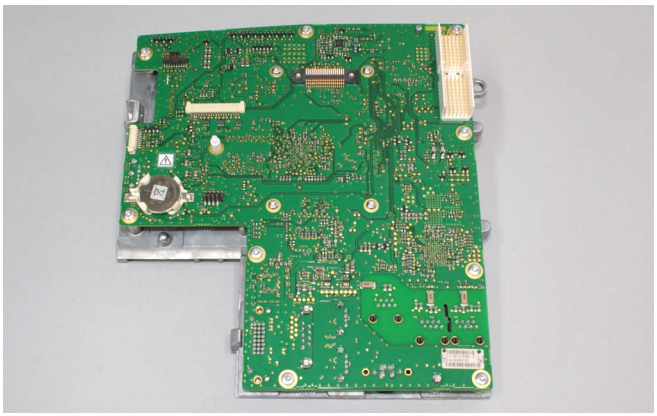


5. Release the latch holding the CPU assembly and pull the assembly out from the rear unit.



6. Carefully detach the uDOM from the CPU assembly. The uDOM is connected to the CPU assembly with a connector from one and with a nylon support post from the other end. You may need pliers to squeeze the nylon support post a little to detach the uDOM.

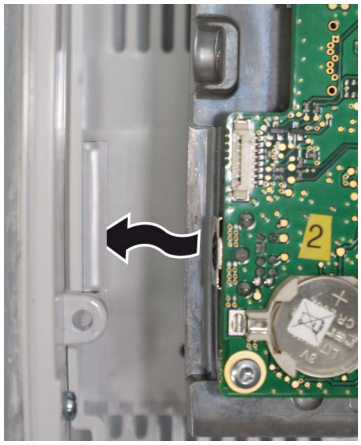
   NOTE: If replacing the CPU assembly, detach the original uDOM from the CPU carrier board and then attach it to the new CPU assembly. The software, licenses and clinical and service configurations are stored in the original uDOM.

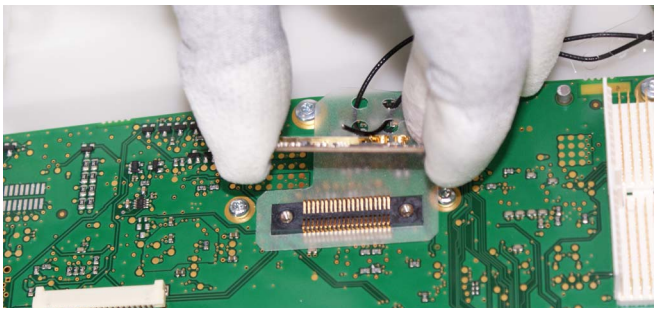


- FRU, CPU assembly, B450

Reassemble in reverse order. Note the following:

- **Step 6:** Remember to first reattach the original uDOM to the CPU assembly.
- **Step 5:** When reassembling the CPU assembly, make sure to first place the heat sink under the plastic lip of the rear unit assembly. Then press the other edge of the heat sink under the latch.





Step 3:

- Remember to reattach the WLAN radio card back to the CPU assembly. Place the WLAN antenna guide around the CPU board connector before reattaching the connector.

Step 1:

- Check the correct position of the CPU assembly and the AC/DC power supply unit before you fasten the four screws (T10) that hold the CPU assembly and the module rail unit to the rear unit assembly.
- Support the CPU assembly and the AC/DC power supply with your hands, while you attach and tighten the screws.

  NOTE: Notice the torque during the reassembly:

  - if you replaced the CPU assembly, use 1.2 Nm.
  - if you didn't replace the CPU assembly, use 0.8 Nm.

WARNING **Use only GE specified screws and torque when replacing the module rail unit.**

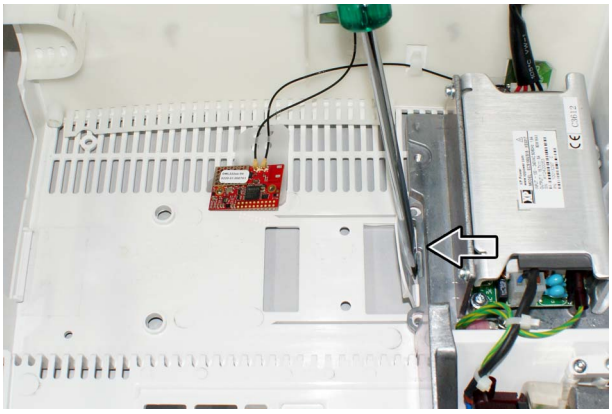
NOTE: After replacing the CPU Assembly, during the first start-up, the patient monitor will automatically check the EMBC software version in the replaced CPU Assembly and update the software if necessary. Wait for 5 minutes to see if the software update is initiated and do not interrupt the process.

12.2.9 Replacing the AC/DC power supply unit (FRU)

Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly

b. 12.2.8. Detaching the CPU assembly (FRU)



Keep the rear unit assembly on the table, the device label side facing down.

1. Press the latch and pull out the AC/DC power supply unit from the rear unit.

NOTE: Be careful not to damage the fragile WLAN antenna boards or antenna cables.

Reassemble in reverse order.

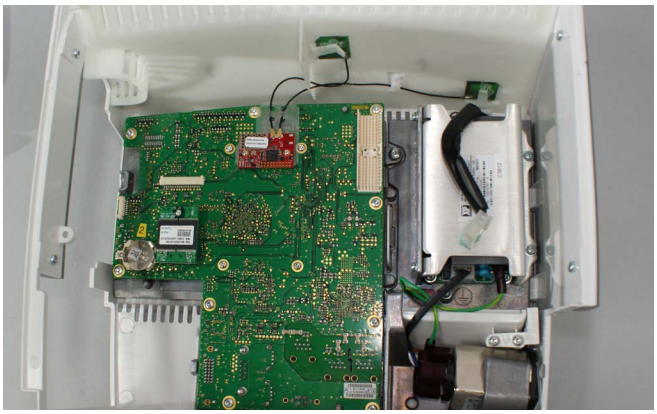
- Ensure that the AC/DC power supply unit is properly aligned to the rear unit assembly.
- Make sure that the primary conductors are not squeezed.

- FRU, AC/DC power supply unit, B450

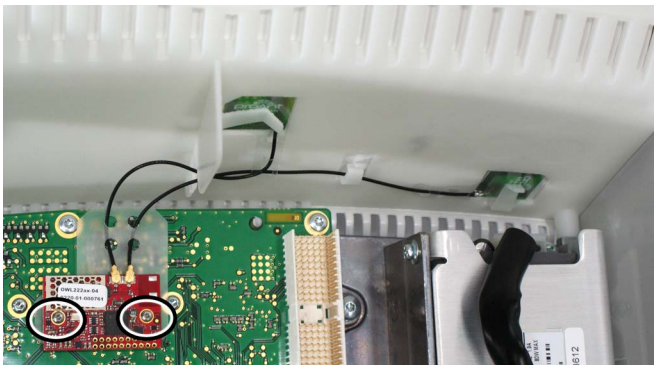
12.2.10 Replacing the WLAN assembly (FRU)

Disassemble first:

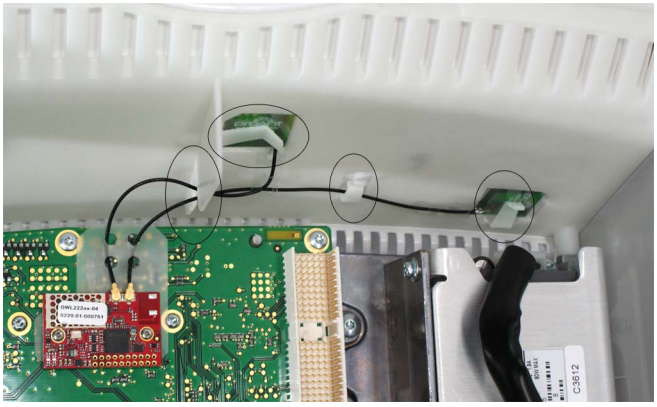
a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly



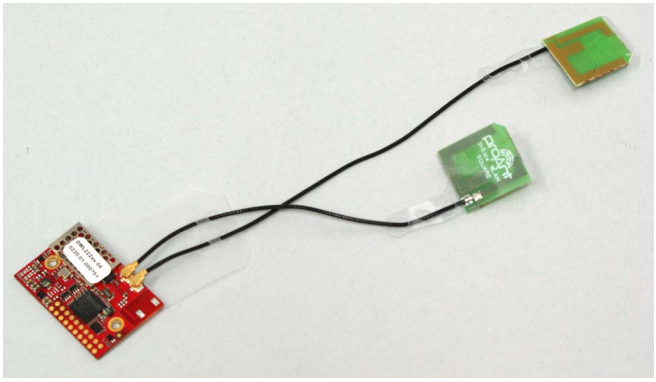
1. Keep the rear unit assembly on the table, the device label side facing down. Be careful not to damage the fragile WLAN antenna boards and antenna cables.



2. Remove the two screws (T6) that hold the WLAN radio card to the CPU assembly. Torque [0.3 Nm]. Detach the WLAN radio card carefully from its connector in the CPU carrier board.



3. Detach the two WLAN antenna boards and antenna cables carefully from their holders on the inner roof of the rear unit.



- FRU, WLAN assembly, B450

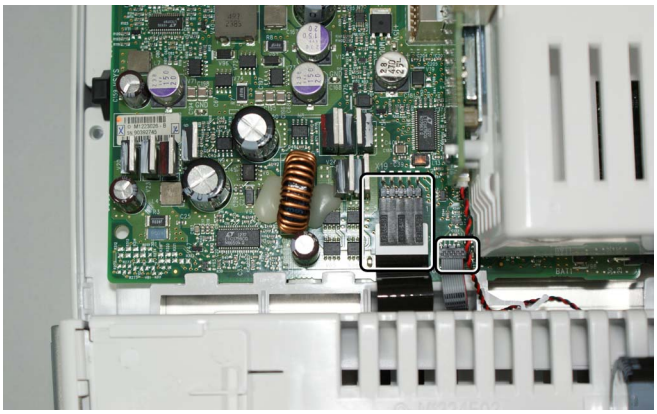
Reassemble in reverse order:

- Be careful not to bend the antenna boards or damage the antenna cards.
- Ensure that the antenna boards and antenna cables are properly mounted to their holders on the inner roof of the rear unit.

12.2.11 Detaching the front unit assembly from the mid-frame assembly

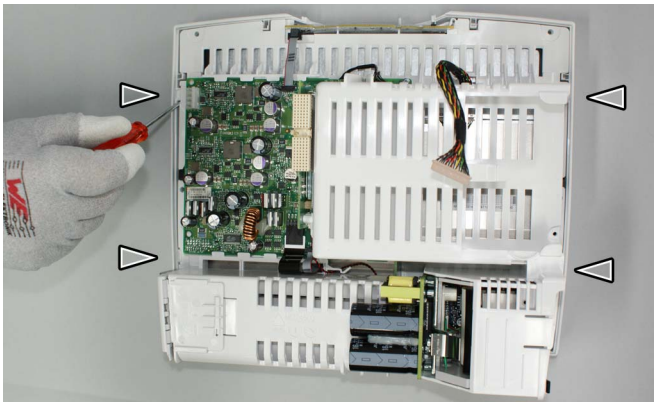
Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly



Keep the front unit and mid-frame assembly on the table the display facing down. Protect the touchscreen sensor from any scratches and dust.

1. Detach user interface and touchscreen cables from the DC/DC board.



2. Release the four snaps - two on each side - that mount the front unit assembly to the mid-frame assembly.

3. Carefully support the LCD display while you lift the mid-frame assembly from the front unit assembly. The LCD display should remain attached to the display holder of the mid-frame unit with the two rubber fasteners of the display gasket. Guide the disconnected cables through the openings in the unit.

- Front unit assembly

- Mid-frame assembly

Reassemble in reverse order:

- Ensure that the display gasket is correctly aligned and that the four snaps lock properly when attaching the front unit assembly back to the mid-frame assembly.
- Guide the touchscreen and user interface cables through the openings in the mid-frame assembly. Connect the cables to the connectors in the DC/DC board.

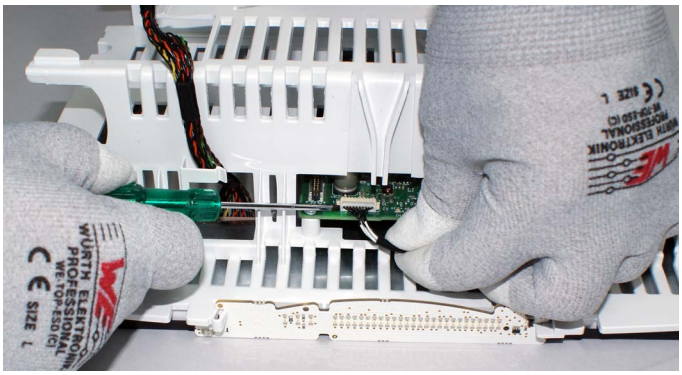
NOTE: You may find it easier to first connect the user interface cable to the DC/DC board and guide it towards the user interface board through the opening in the mid-frame assembly.

12.2.12 Replacing LCD display unit (FRU)

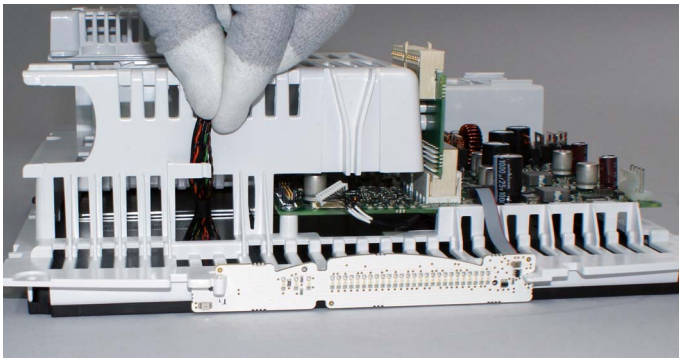
Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly

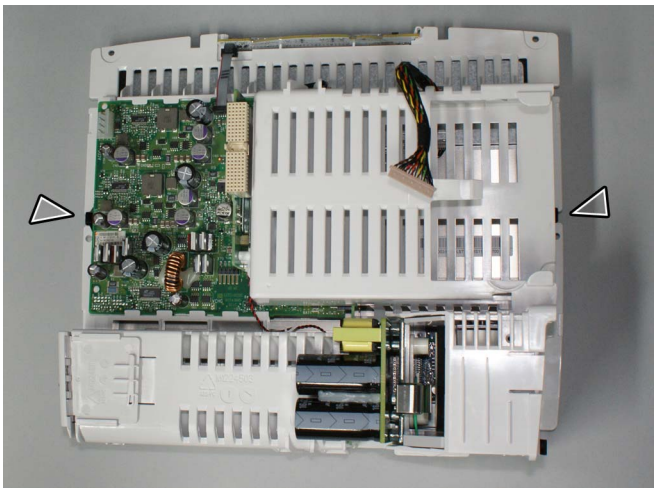
b. 12.2.11. Detaching the front unit assembly from the mid-frame assembly



1. Detach the LCD backlight cable from the DC/DC board using a screw driver.



2. Guide the display cable through the openings in the mid-frame unit. free.



3. Detach the two rubber fasteners that hold the LCD display attached to the plastic display holder of the mid-frame unit.

4. Lift the LCD display with its gasket from the display holder in the mid-frame unit.

- FRU, LCD Display unit, B450

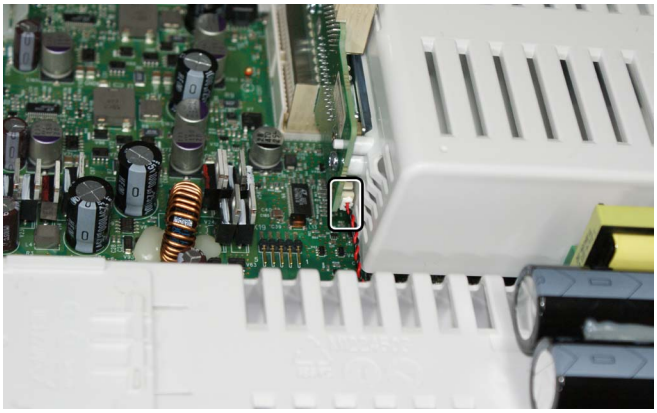
Reassemble in reverse order.

1. Guide the display and LCD backlight cables back through the openings in the mid-frame assembly.
2. Check that the display gasket is properly aligned around the LCD display. Then carefully align the LCD display with the gasket to the display holder in the mid-frame assembly and lock the two rubber fasteners to the mid-frame.
3. Connect the LCD backlight cable to the DC/DC board.

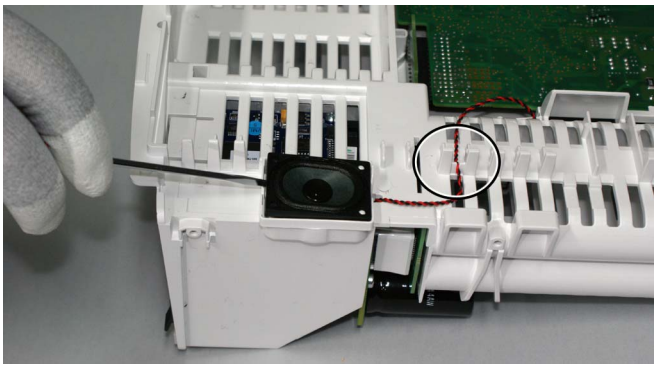
12.2.13 Replacing the Speaker unit (FRU)

Disassemble first:

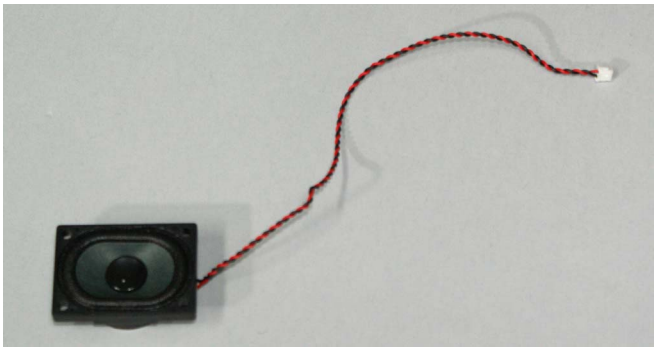
a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly
b. 12.2.11. Detaching the front unit assembly from the mid-frame assembly
c. 12.2.12. Replacing LCD display unit (FRU)



1. Detach the speaker cable from the E-module board and guide it through the openings in the mid-frame unit.



2. Lift the speaker up using a screw driver and detach the speaker.



- FRU, Speaker Unit, B450

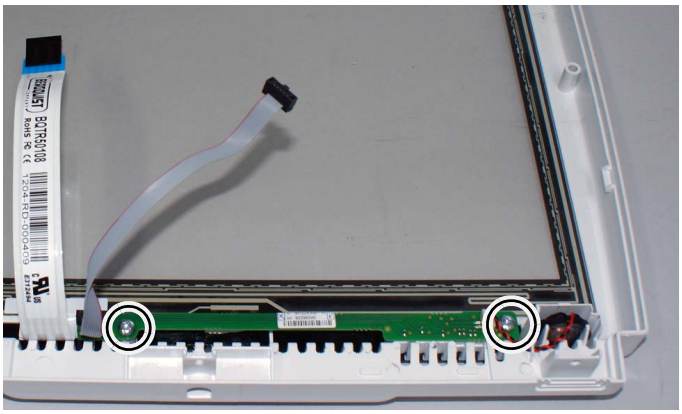
Reassemble in reverse order.

- While reattaching make sure to guide the speaker cable correctly through the cable clamp and the guiding notch.

12.2.14 Detaching the user interface board and buzzer from the front unit assembly

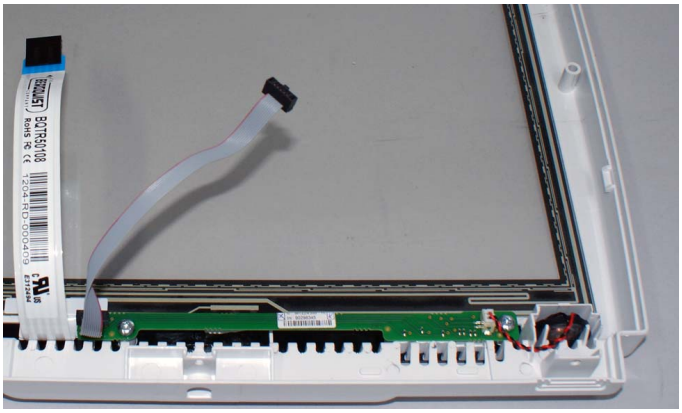
Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly
b. 12.2.11. Detaching the front unit assembly from the mid-frame assembly

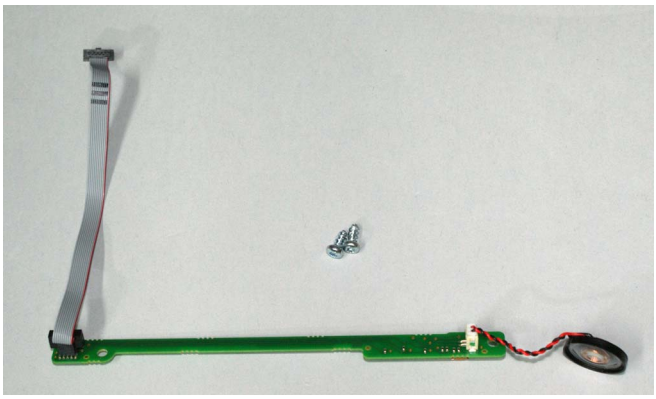


Keep the front unit assembly on the table, the touchscreen sensor facing down. Protect the touchscreen sensor from any scratches and dust.

1. Remove two screws (T10) that mount the user interface board to the front unit. Torque [0.6 Nm].



2. Detach the buzzer cable from the user interface board.
3. Lift the buzzer up.
   The front unit with the touchscreen sensor is a FRU. The user interface board with the buzzer is another FRU.



- FRU, User Interface Board& Buzzer, B450

- FRU, Front unit with touchscreen sensor, B450

Reassemble in reverse order.

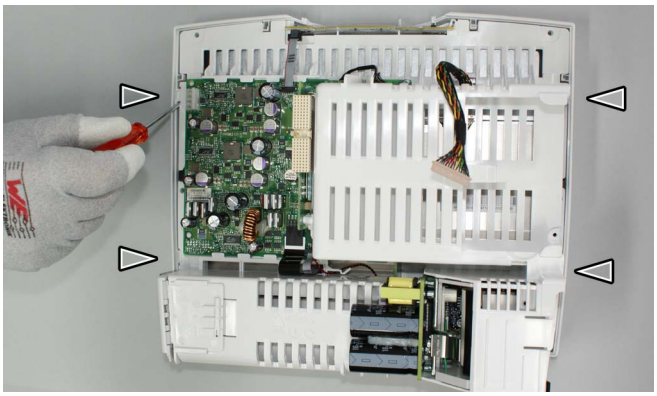
Note: Make sure to guide the buzzer cable through the guiding notch.

12.2.15 Replacing the alarm light board (FRU)

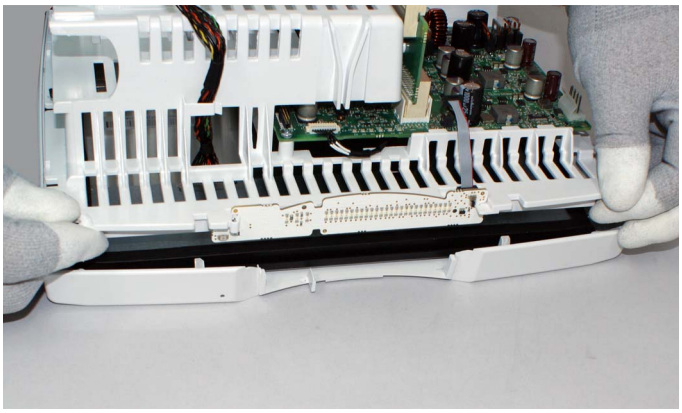
Disassemble first:

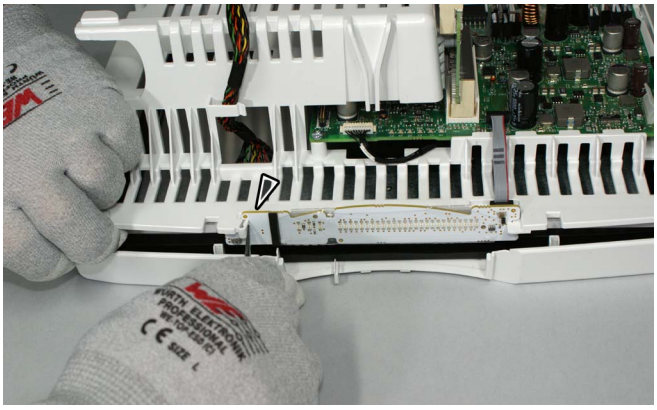
a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly

1. Detach the alarm light board cable from the DC/DC board.

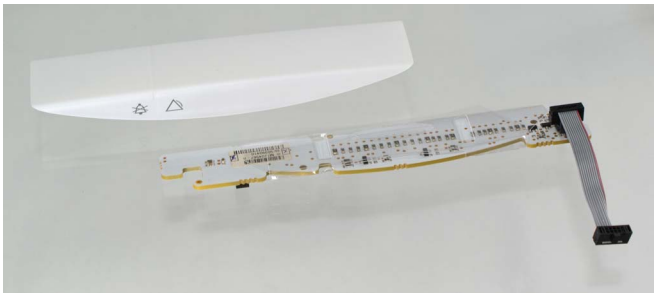


2. Release the four snaps - two on each side - that mount the front unit assembly to the mid-frame assembly to be able to detach the alarm light board and detach the alarm light board.





3. Release the snap that holds the alarm light board.



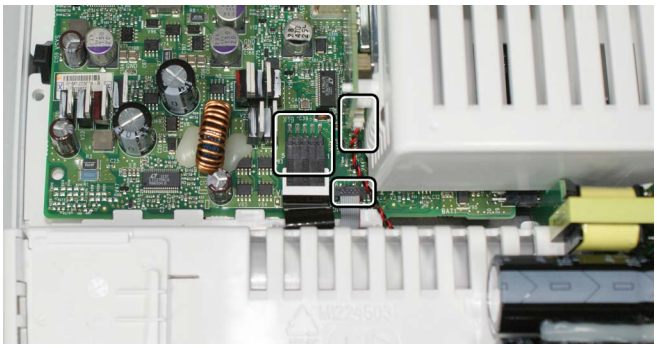
- FRU, Alarm light unit, B450.

Reassemble in reverse order.

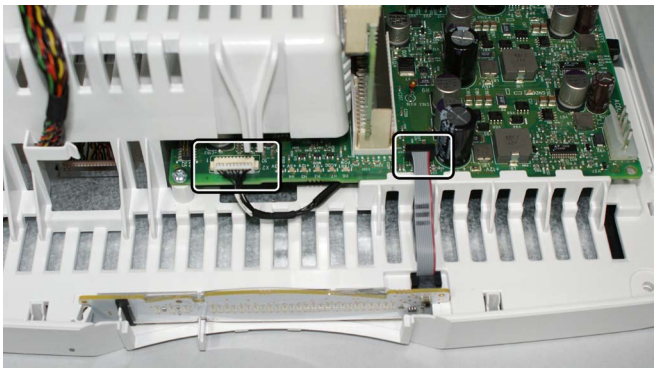
12.2.16 Detaching DC/DC board and E-Module board assembly

Disassemble first:

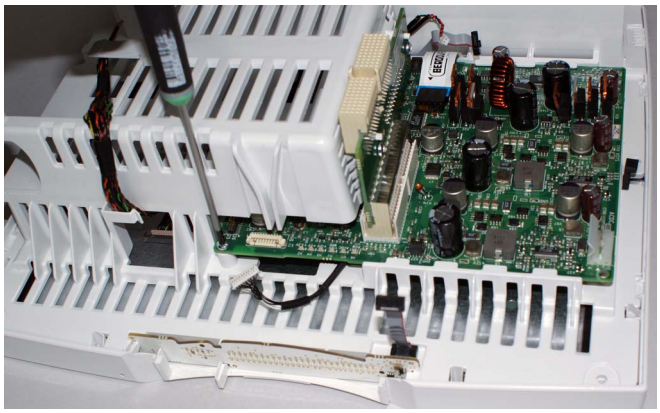
a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly



1. Detach the following cables:
   - the touchscreen cable and the user interface cable from the DC/DC board
   - the speaker cable from the E-module board

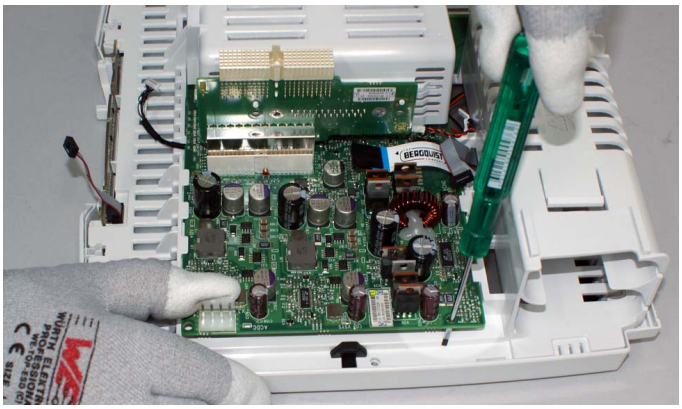


2. Detach the following cables from the DC/DC board:
   - Alarm light board cable
   - LCD backlight cable



3. Remove the screw (T10) that mounts the DC/DC board to the mid-frame assembly. Torque [0.6 Nm].

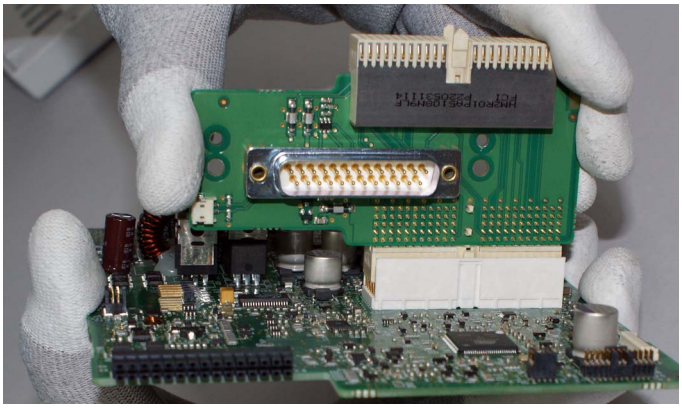
4. Remove the two screws (T10) that mount the E-module board to the mid-frame assembly. Torque [0.6 Nm].



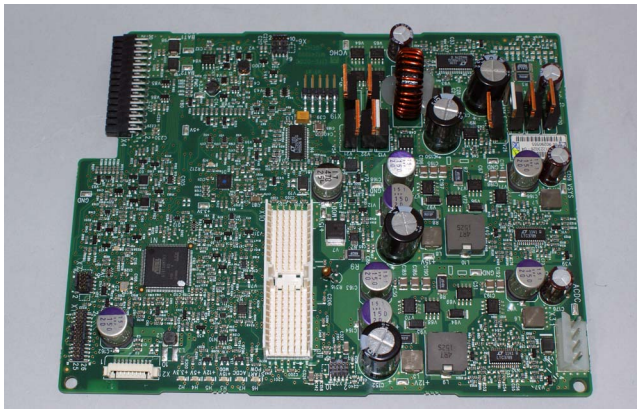
5. Use the flat blade screw driver to release the DC/DC board and the E-module board assembly from the mid-frame assembly.

6. Slide the DC/DC board and E-Module board assembly out from the mid-frame assembly.

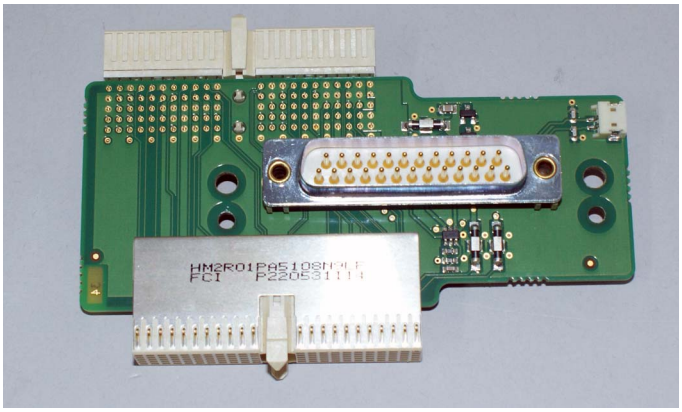
NOTE: When reassembling, make sure that the connector between the battery board and the DC/DC board is properly connected.



7. Detach the E-module board from the DC/DC board.



- FRU, DC/DC Board, B450.



- FRU, E-Module Board, B450

Reassemble in reverse order.

NOTE: After replacing the DC/DC Board, during the first start-up, the patient monitor will automatically check the PUIC software version in the replaced DC/DC board and update the software if necessary. Wait for 5 minutes to see, if the software update is initiated and do not interrupt the process.

12.2.17 Replacing the battery board (FRU)

Disassemble first:

a. 12.2.6. Detaching the front unit and mid-frame assembly from the rear unit assembly
b. 12.2.16. Detaching DC/DC board and E-Module board assembly

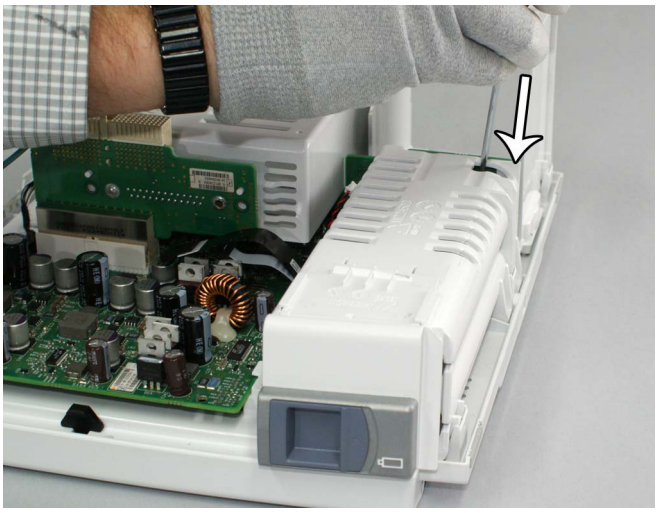
Steps 1. to 3. only for monitors with a recorder:

1. Press the two snaps on each side of the recorder with a flat blade screwdriver.

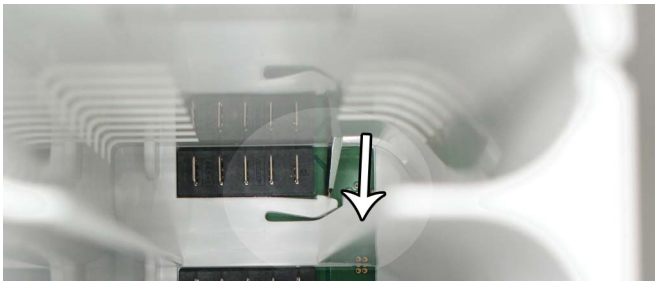
NOTE: If the monitor is not equipped with a recorder, there is a cover plate, which you do not have to remove.

2. Press the grounding plate to release the recorder unit from the mid-frame assembly.

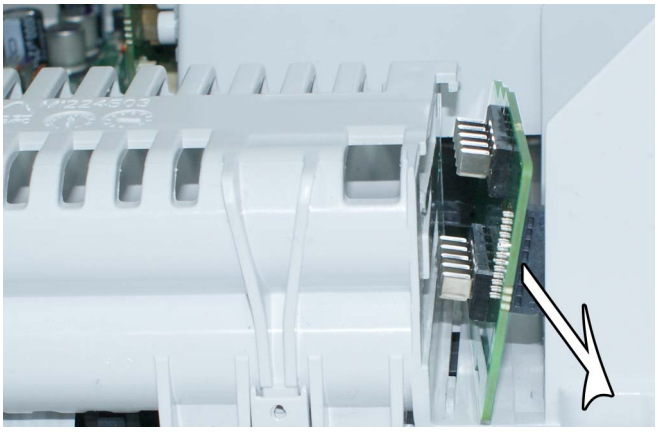
3. Pull the recorder out of the mid-frame assembly.



4. Use a flat blade screwdriver to press the snap that holds the battery board to the mid-frame assembly.



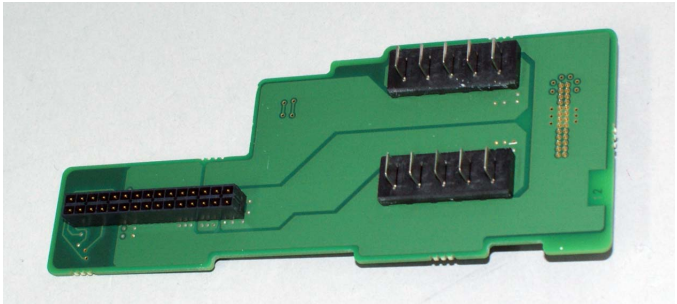
The tip of the screwdriver seen through the open battery slot.



5. Pull the battery board out from the mid-frame unit assembly.

Reassemble in reverse order:

- Ensure that the battery board is correctly aligned to its guide rails and DC/DC board - battery board connector is properly connected.



- FRU, Battery board, B450