

3.3 Disassembly and reassembly

3.3.1 Before disassembly

NOTE: Wear a grounded, antistatic wristband when handling PC boards. Electrostatic discharge may damage components on the board.

NOTE: Handle all PC boards by their edges.

3.3.2 Tools needed



- torx screwdrivers; T6, T8
- flat blade screwdriver
- pincers
- antistatic wristband

CAUTION When reassembling the module, make sure that all cables are reconnected properly.

3.3.3 To disassemble the module

In case you are replacing either the Front chassis unit or the manifold, start by removing the Module Front Cover from the module by releasing the snaps that hold the front cover to the front chassis. Then follow the disassemble instructions

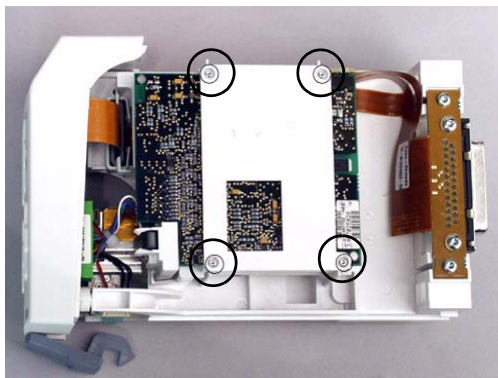


1. Remove the two screws (T8) holding the module cover to the module frame from the back of the module.



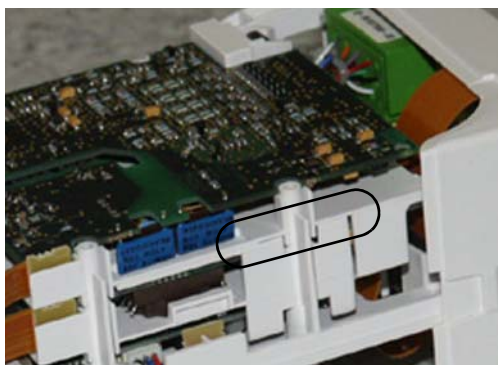
2. While pressing the release latch, pull the module cover slowly backwards and remove it from the main body.

NOTE: When reassembling, be carefull not to damage the membrane keyboard flex. Guide the flex inside the frame and the module casing.



3. To remove the ECG board

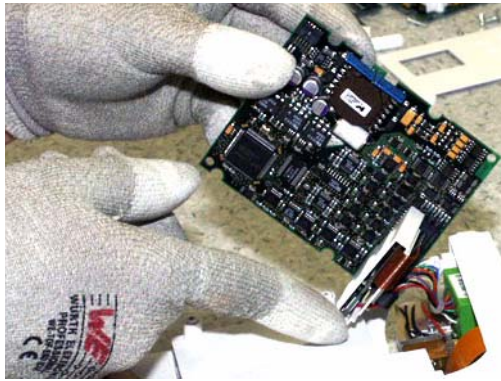
- Remove the four screws (T6) holding the insulator cover and lift the cover up.



NOTE: When reassembling, push the ECG board a little to ensure that the insulator plates are correctly reassembled. Guide the upper plate inside the lips of the lower plate.



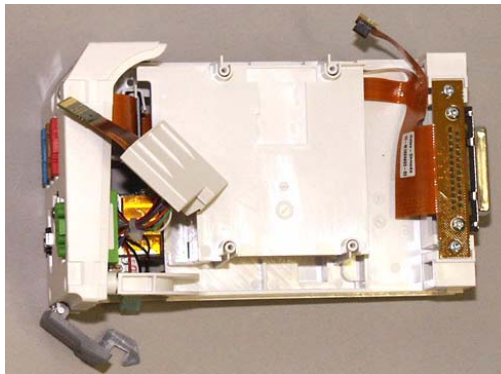
- Lift the ECG board a little and disconnect the module bus connector from the ECG board.
- Carefully lift the board together with the ECG input unit up.



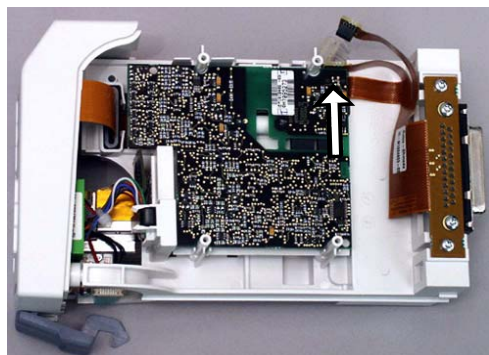
- Turn the ECG board 180 degrees around the input unit.



- Disconnect the ECG input flex connector from the ECG board. Be carefull not to damage the flex.



- 4. To remove the STP board.
- Lift the ECG-STP board insulator plate up.

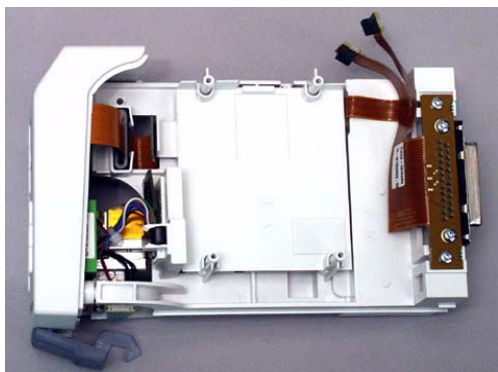


- Disconnect the module bus connector from the STP board.

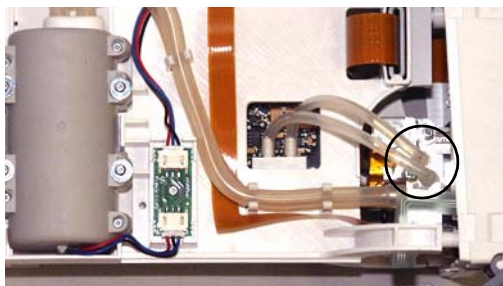


- Flip the module upside down and disconnect the STP input flex connector through the hole in the module frame. Flip the module over again
- Remove the STP board.

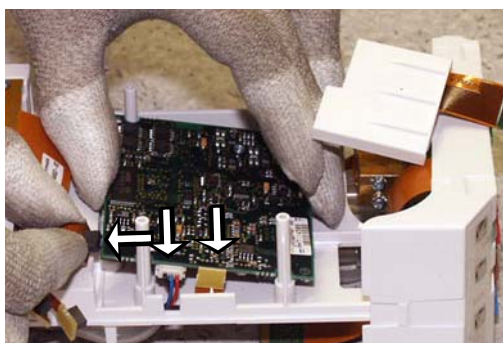
NOTE: When reassembling, be careful not to damage the STP input flex. Make sure the STP input flex connector is properly connected.



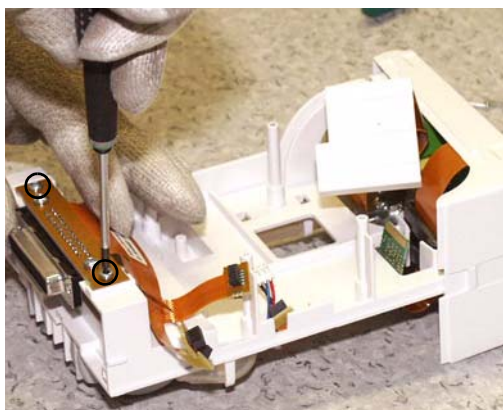
5. To remove the NIBP board:
- Lift the STP-NIBP board insulator plate up.



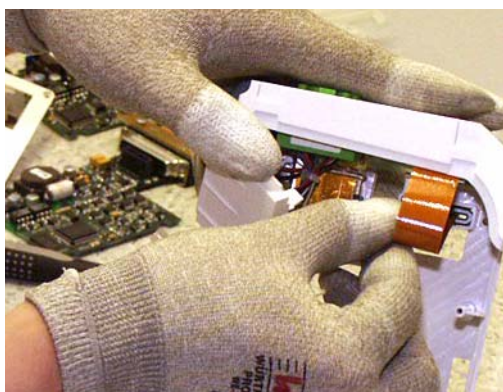
- Flip the module over and disconnect the hoses (2 pcs) coming from the manifold.
- NOTE: Note the positions of the hoses; mark them if necessary to ensure they are replaced correctly.



- Flip the module over again. Lift the NIBP board carefully and disconnect the module bus connector, pump connector and NIBP flex connector from the NIBP board.
- Remove the NIBP board.



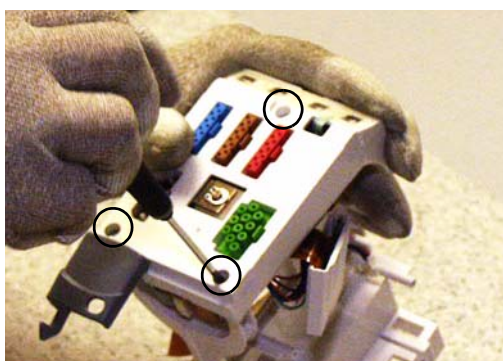
6. To remove the module bus connector:
- Remove the two screws (T8) holding the connector to the frame.



7. To remove the Front Chassis Unit:
- Carefully push/ pull the STP input flex connector through the ferrites to the other side of the frame. The ferrites should stay in place, if not, remember to reassemble them.



- To release the NIBP flex board:
 - Disconnect the hoses (2 pcs) from the manifold and lift them up from the holders to release the NIBP flex board.
- NOTE: Note the positions of the hoses; mark them if necessary to ensure they are replaced correctly.
- Pull the NIBP flex board through the frame.



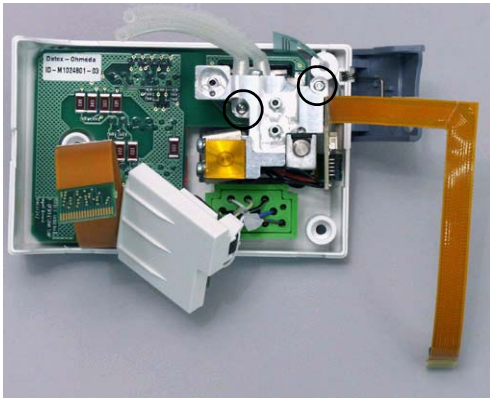
- Remove the three screws (T8) holding the front chassis to the module frame.



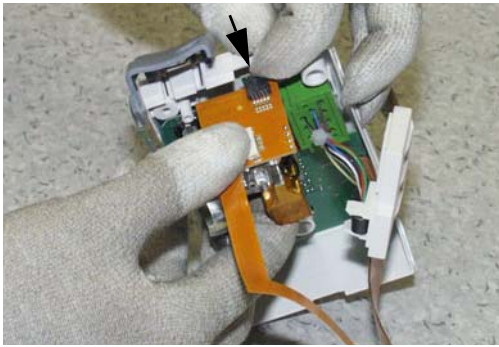
- Detach the front chassis unit from the module frame. Be careful not to damage the NIBP flex board.



8. To remove the manifold:
- Open the connector lock from the NIBP flex board and disconnect the membrane keyboard flex.

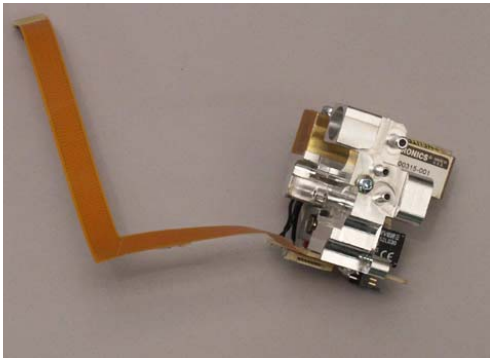


- Remove the two (T6) screws holding the manifold to the Front chassis.



- Disconnect the NIBP flex board connector from the STP input board. Lift the manifold carefully aside. Be careful not to damage the NIBP flex board.

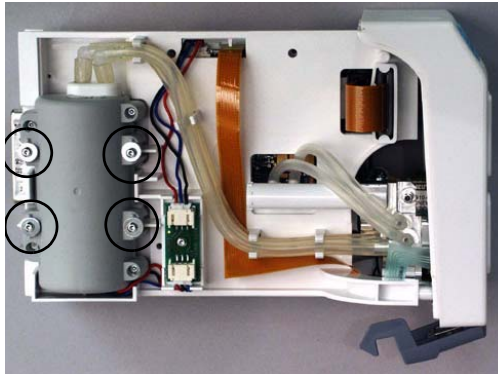
NOTE: When reassembling, make sure that the NIBP flex board is properly connected (all pins connected) to the STP input board.



To reassemble the module, reverse the order of the disassembly steps. Pay special attention to the NOTES during the reassembling.

Always perform the ["Service check"](#) after reassembling the module.

To remove the pump unit



1. Follow the disassemble instruction steps 1 and 2.
2. Remove the four screws (T6) with washers holding the NIBP pump to the frame.



3. Remove the screw (T6) holding the pump connector board to the insulator plate and lift the board up. Disconnect the pump connector.

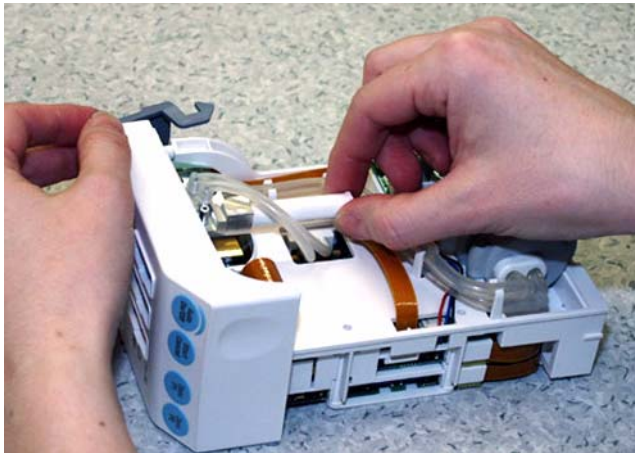


4. Disconnect the hoses and remove the the pump unit.
NOTE: Note the positions of the hoses; mark them if necessary to ensure they are replaced correctly.

Reassemble the module in reverse order.

Always perform the ["Service check"](#) after reassembling the module.

3.3.4 To replace the NIBP filter:



1. Follow the disassemble instruction steps 1 and 2.
2. Remove the NIBP filter cover and replace the filter.

Reassemble the module in reverse order.

Always perform the [“Service check”](#) after reassembling the module.

3.4 Adjustments and calibrations

NOTE: Use only properly maintained, calibrated and traceable measurement equipment for the specified calibrations and adjustments to ensure accuracy.

3.4.1 NIBP calibrations

The electronics of the NIBP pressure measurement is calibrated at the factory. The processor automatically maintains the zeroing pressure. If the zero point of the pressure transducer drifts more than specified, an error message is given and the NIBP board should be recalibrated or replaced.

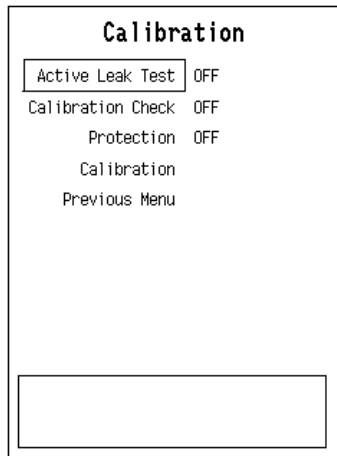
Recalibrate the NIBP measurement once a year. The checking and recalibration can be done in the NIBP service menu.

The calibration of the primary pressure channel can also be checked from the NIBP setup menu (**NIBP - NIBP Setup - Calibration Check**). In this case, the auto zeroing is performed at start - remove the hose before entering to ensure atmospheric pressure to the pressure transducers - the primary pressure is displayed. The zero-offset value should then be zero.

Check the intake air filter as part of the calibration check. Change the filter if it is visibly dirty.

Calibration check

1. Enter **Calibration** menu:
Monitor Setup - Install/Service (password 16-4-34) - **Service** (26-23-8) - **Parameters - NIBP - Calibrations**



2. Select **Calibration Check** and push the ComWheel.
3. Connect an external precision manometer to the module.
4. Pump the following pressures to manometer and check the difference between the manometer and monitor pressure display (The zeroing offset is automatically subtracted from the pressure readings).

Table 3 NIBP calibration check pressures

Pressure	Max. error	Example
0 mmHg	±5 mmHg (=zero offset)	-1
100 mmHg	100 ±2 mmHg	100 ±2
200 mmHg	200 ±3 mmHg	200 ±3

If the error of pressure channel B1 is larger than specified above, the module should be recalibrated. The error of B2 is allowed to be even twice as large because it has no effect on blood pressure measurement accuracy. However, we recommend recalibrating the module when the error of B2 is larger than specified above to ensure best possible operation.

Calibration

1. Enter **Calibration** menu.
2. Remove the hoses from the front panel connector to enable proper zeroing.
3. Select **Calibration**. If it is not available, perform the steps a, b, and c.

NOTE: Do not pull out the hemodynamic module from the monitor frame. The module must be in the frame during the whole procedure.

- a. Press the hemodynamic module buttons **Auto ON/OFF** and **Start Cancel** simultaneously for 3 seconds to enable the calibration. This enables menu selection **Protection**. The message 'Calibration switch ON!' is displayed.
- b. Select **Protection OFF** in the **Calibration** menu and push the ComWheel.
- c. Press the buttons again for 3 seconds. Menu selection **Calibration** is now enabled, and **Protection** is disabled. When the calibration is enabled, a message 'Calibration not protected' is displayed.
 - Start calibration by pushing the ComWheel. Messages 'Zeroing' and 'Zeroed' will be displayed in the NIBP message field. After this, a pressure bar and text 'Calibrating' will be displayed.
 - Connect an external mercury manometer with a pump to the module through the both tubes of the hose - both transducers B1 and B2 must be calibrated simultaneously. Pump up to a pressure of about 200 mmHg according to the manometer. Calibration is possible in the range of 150 to 250 mmHg.
 - Verify that both pressure values in the prompt field match the manometer reading. If not, adjust by turning the ComWheel. When the values of the pressure bar and the manometer are equal, push the ComWheel to confirm the calibration. The message 'Calibrated' will be displayed on the NIBP digit field after a few seconds, which means that the calibration succeeded, and the new calibration data is saved in EEPROM.

NOTE: When calibrating NIBP, always change the displayed pressure value slightly with the ComWheel, even in cases where the value would be correct. For example, change the value one step higher and then back one step lower. 'Calibrated' text should appear in the display. This ensures that the calibration procedure is correctly registered and stored by the module.

- To set the protection on:
Press NIBP module buttons **Auto ON/OFF** and **Start Cancel** simultaneously for 3 seconds. Select **Protection ON** and push the ComWheel. Then press the buttons again for three seconds.
- Remove the module from the frame and plug it back again. Then perform "[Calibration check](#)" (see the preceding page) to verify the new calibration.

3.4.2 Temperature calibration

NOTE: For the temperature calibration, separate, accurate test plugs (25 °C and 45 °C) are needed. A test set of two plugs is available from GE Healthcare, order code 884515.A Dual temperature adapter cable, order code 402015-004 is also required for the temperature calibration.

Calibrate the temperature, when the measured test values differ for more than ± 0.1 °C, and always after STP board replacement.

1. Enter ESTPR: STP service menu.
(Monitor Setup - Install/Service (password 16-4-34) - **Service** (password 26-23-8) - **Parameters**).
2. Enter **Calibrations** menu.
3. Choose **Protection OFF** in protect mode.
4. Select **Calibrate T1/Calibrate T2**.
5. Insert calibration plug (25 °C) into T1/T2 connector.
6. Push the ComWheel.
7. Insert calibration plug (45 °C) into T1/T2 connector.
8. Push the ComWheel.
9. Choose **Protection ON** in protect mode.

3.4.3 Invasive pressure calibration

NOTE: Before starting invasive pressure calibration, disconnect all patient cables and discharge the patient.

Calibrate the invasive pressure when the pressure transducer (probe) is replaced with a different type of transducer, and when the STP board is replaced.

1. Enter ESTPR: the STP service menu.
(Monitor Setup - Install/Service (password 16-4-34) - **Service** (password 26-23-8) - **Parameters**).
2. Enter **Calibrations** menu.
3. Connect a pressure transducer with a pressure manometer to the P1/P2 connector. Choose **Calibrate P1** or **Calibrate P2**. Leave the transducer to room air pressure.
4. Push the ComWheel to start zeroing.
5. Supply a pressure of 100 mmHg to 300 mmHg to the transducer. The recommended pressure is 200 mmHg.
6. Set the pressure on the display to match the pressure reading on the manometer and push the ComWheel. A tolerance of ± 1 mmHg is allowed.
7. The message 'Calibrated' will be displayed on the display.