3.3 Disassembly and reassembly

3.3.1 Before disassembly

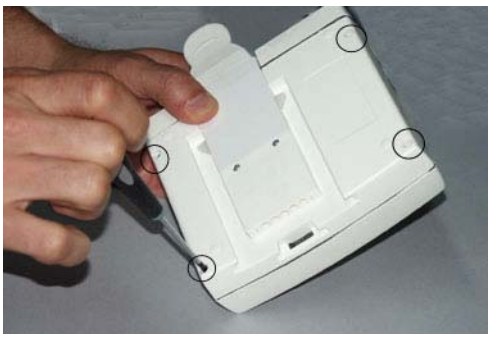
WARNING **Wear a grounded, antistatic wristband when handling PC boards. Electrostatic discharge may damage components on the board. Handle all PC boards by their edges.**

3.3.2 Tools needed

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

CAUTION When reassembling the module, make sure to reconnect all cables properly.

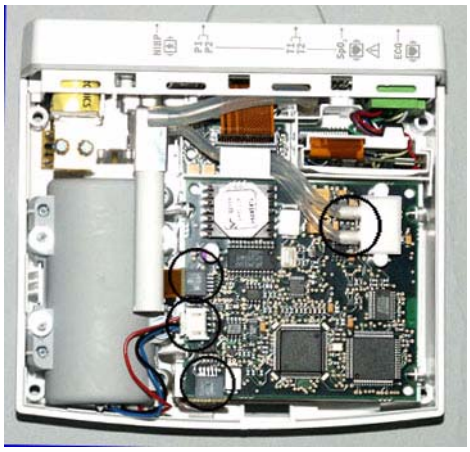
3.3.3 To disassemble the module



1. Remove the four screws (T8) holding the module cover to the frame from the bottom of the module.

2. Hold the cover from the back corners, lift it about 45° to unlock the snaps from the front unit and pull the cover out backwards.

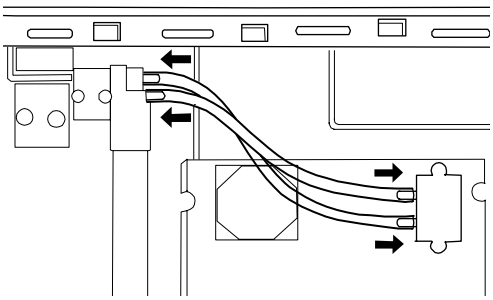
NOTE: Be careful not to damage the seal. When reassembling the seal may stick to the cover.



3. To remove the NIBP board:

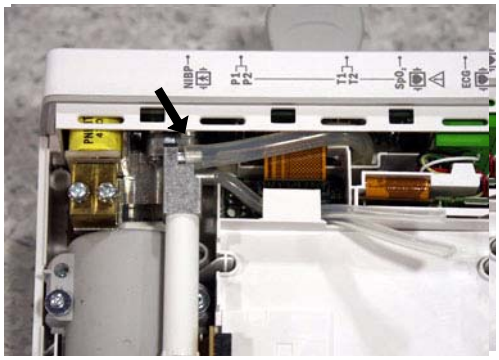
NOTE: You may remove the NIBP filter cover and the filter before disconnecting the flex cable.

- Disconnect the module bus connector, pump connector and NIBP flex connector.
- Disconnect the hoses (2 pcs) coming from the manifold.

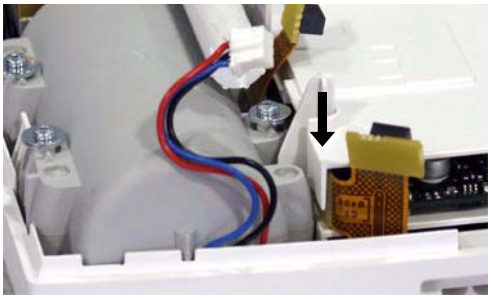


NOTE: Note the positions of the hoses; mark them if necessary to ensure they are replaced correctly.

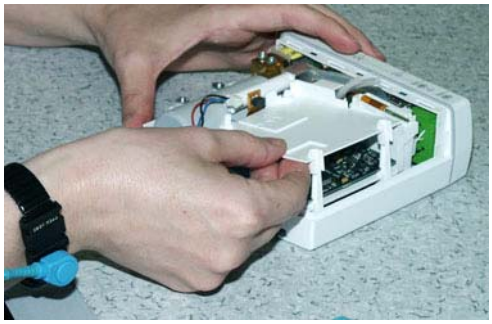
- Remove the NIBP board.



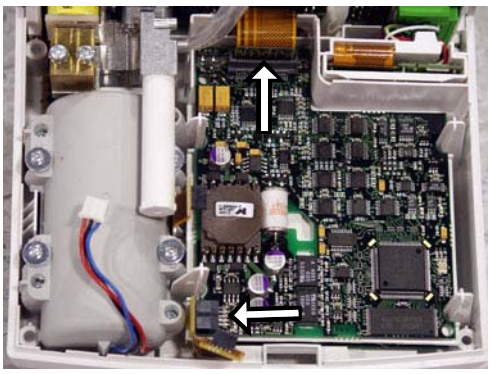
4. Disconnect the air intake hose from the NIBP manifold.



NOTE: The lips of the insulator plates secure the module bus connectors. While reassembling the insulator plates, ensure that the connector secure lips support the connectors correctly.



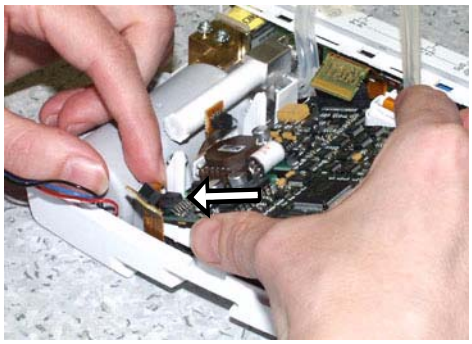
5. Lift the NIBP-STP insulator plate carefully up.



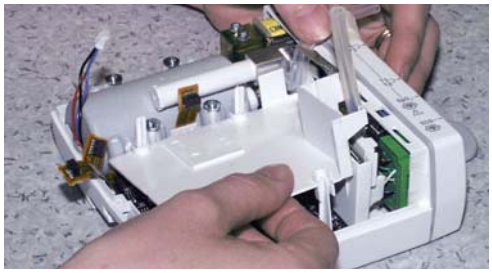
6. To remove the STP board

- Disconnect the STP input flex connector and the module bus connector.

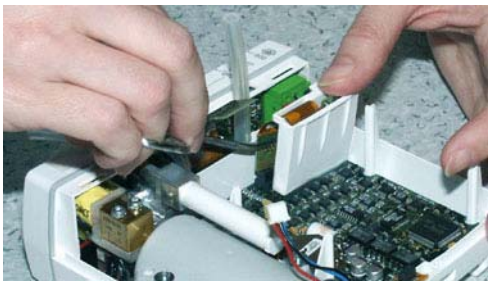
- Hold down the STP board while disconnecting the STP input flex connector.



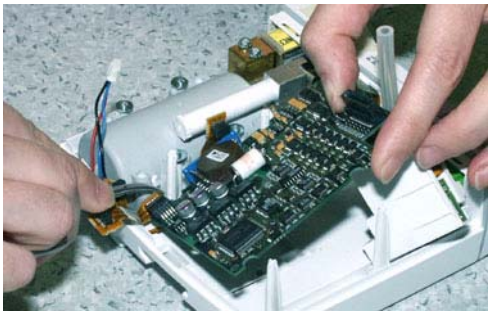
7. Lift the STP board a little to disconnect the module bus connector. Remove the STP board.



8. Remove the STP-ECG insulator plate. Be careful not to damage the NIBP hoses.

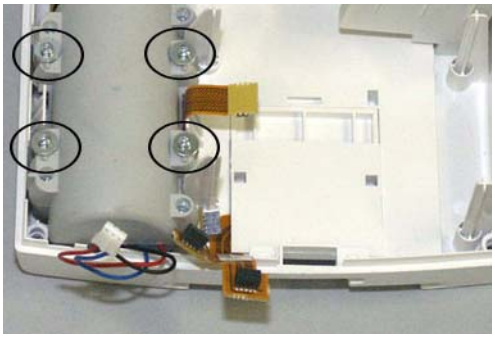


9. Hold down the ECG board for example by pressing the ECG input unit and use pincers to disconnect the ECG input flex connector from the ECG board.

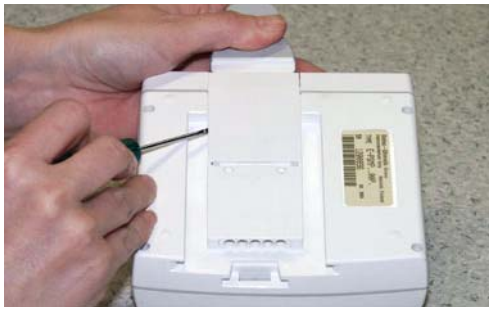


10. To remove the ECG board
- While holding the ECG input unit out of the way, lift the ECG board a little and disconnect the module bus connector.
- Remove the ECG board.

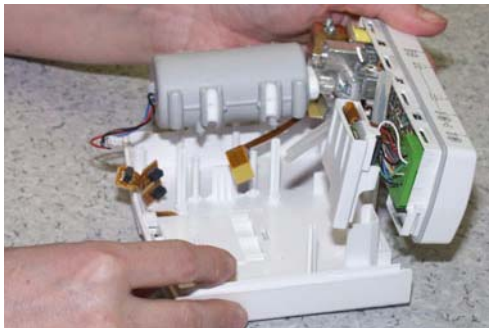
11. Remove the NIBP filter cover and the filter. (If not removed already.)



12. Remove the four screws (T6) with washers holding the NIBP pump to the frame.



13. Flip the module over and remove the two (T6) screws holding the lock unit to the frame. While pulling the tab push the lockers with a screwdriver to remove the lock unit.



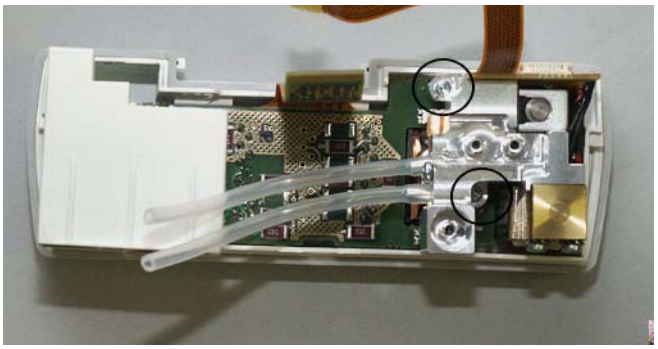
14. Carefully lift up the front unit together with the NIBP pump.

15. To remove the front unit
- Pull the flex board carefully downwards through the holder.

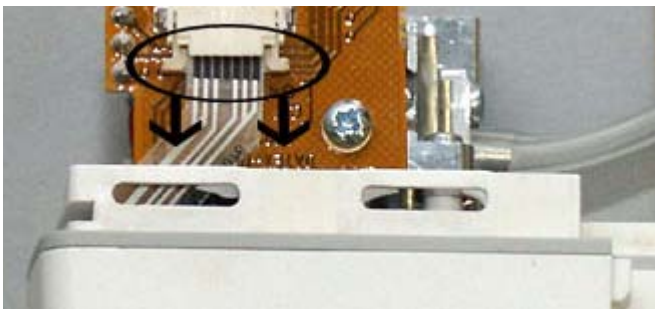
To remove the pump unit

16. Disconnect the hoses from the manifold. The hoses follow the pump.

To remove the manifold unit



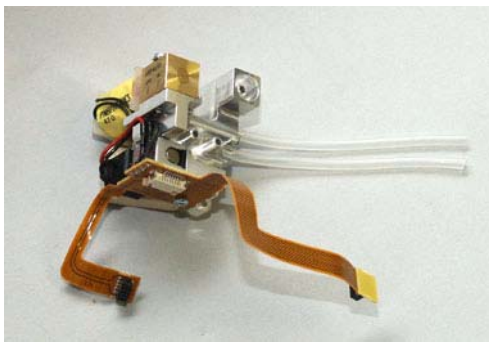
17. Disconnect the two (T6) screws holding the manifold to the front cover unit.



18. Open the connector lock from the NIBP flex board and disconnect the membrane keyboard flex.

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

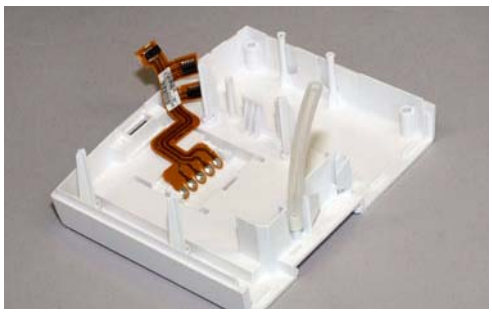
NOTE: When reassembling, make sure that the NIBP flex board connector is connected properly (all pins connected) to the STP input board.



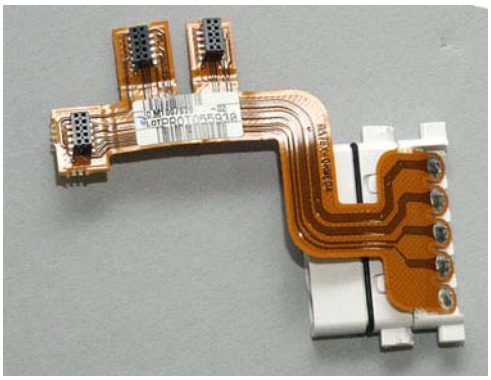
To remove the module bus connector

20. Use a flat blade screwdriver to unlock the module bus connector insulator cover.

    Put the screwdriver in the hole and move the blade backwards (away from the flex cable) until the insulator cover unlocks.



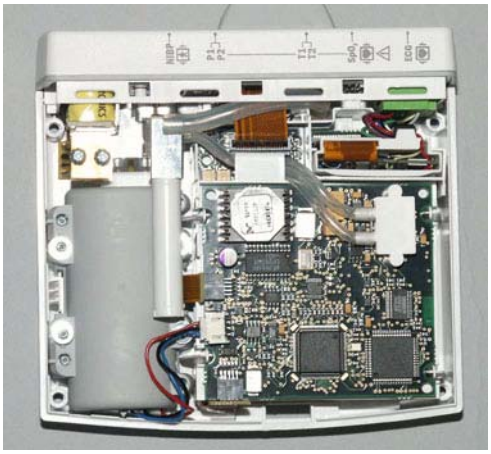
21. Pull the module bus connector carefully through the hole in the frame.



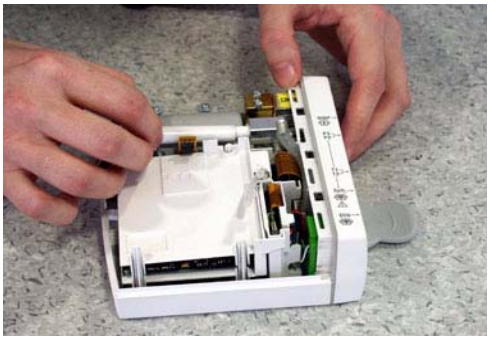
Reassemble the module in reverse order.

Always perform the "Service check" after reassembling the module.

3.3.4 To replace the NIBP filter



1. Follow the disassemble instruction steps 1, 2 and 3.



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.

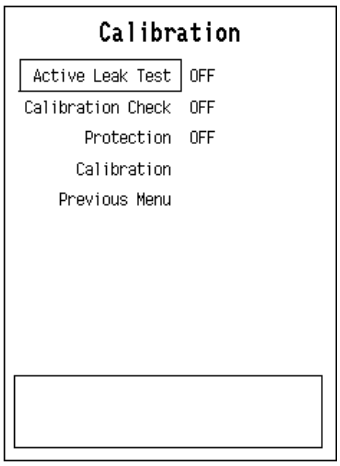
The calibration of the primary pressure channel can also be checked from the NIBP setup menu (***NIBP - NIBP Setup - Calibration Check***). In this case, the auto zeroing is performed at start - remove the hose before entering to ensure atmospheric pressure to the pressure transducers - the primary pressure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

Pressure	Max. error	Example
100 mmHg	100 ±2 mmHg	100 ±2
200 mmHg	200 ±3 mmHg	200 ±3
260 mmHg	260 +/-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-HEL.

A Dual temperature adapter cable, order code 2016998-001 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 the 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.

NOTE: For the Invasive pressure calibration a Dual InvBP adapter cable, order code 2005722-001, is needed.

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 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.