

# 6

## Disassembly and repair

This chapter provides the instructions for removing and replacing serviceable modules in the Spot Vital Signs.

Unless otherwise noted, re-assembly procedures are the reverse order of the disassembly procedures.



**WARNING** Electric shock hazard. There are no user-serviceable parts inside Spot Vital Signs other than battery replacement (see “Battery removal and replacement” on page 70). An operator may only perform maintenance procedures specifically described in this manual. For service, refer the device to an Authorized Service Center.

**WARNING** Follow the ESD procedures on see “Electrostatic discharge (ESD)” on page 7.

**Note** Always disconnect the sealed lead-acid battery in the Spot Vital Signs before performing any repair function.

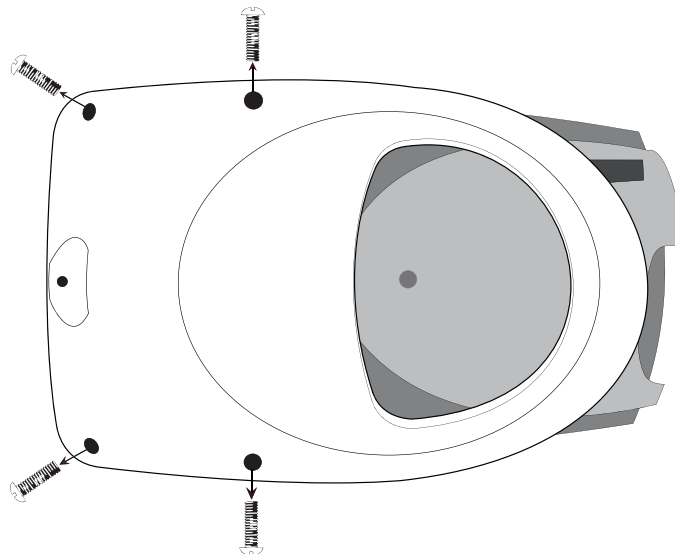
Have the following tools available during the procedures.

Description	Part Number	Source
Bulb and valve	5088-01	Welch Allyn
Pneumatic tubing (3 ea.)	5089-12	Welch Allyn
Test Cable (IR)	66P824	Welch Allyn
Test Cable (Service Cable Kit)	130S60	Welch Allyn
Repair Software	716948	Welch Allyn
Welch Allyn 9600+ Calibrator	01800-210	Welch Allyn
Welch Allyn Calibration Key	06137-000	Welch Allyn
Spot Vital Signs Service Manual	4200-145E	Welch Allyn
Pneumatic clamps (3)	21730-001	VWR Scientific 800-932-5000
Pliers		Tool/Supply Store
Wire Cutter		Tool/Supply Store
Tweezers		Tool/Supply Store
Torque Bit (T8)		Tool/Supply Store
Phillips screw driver		Tool/Supply Store
T10 Torx Bit		Tool/Supply Store
3/8 Hex Socket		Tool/Supply Store

Description	Part Number	Source
Cable Tie Tool		Tool/Supply Store
Setra Pressure Meter (1-10 PSIG)	2270-01	Setra +1 800 257 3872
Netech Pressure Meter	20-200IN	Netech +1 800 547 6557
Masimo SpO <sub>2</sub> Tester	11593	Masimo +1 800 326 4890
Masimo Extension Cable - 4 ft	PC-04-WA	Masimo +1 800 326 4890
Nellcor Patient Simulator	SRC-2 for MP205	Nellcor +1 800 6355267
Nellcor Patient Simulator	SRC-MAX for MP506/NELL-3	Nellcor +1 800 635 5267
Nellcor Test Cable	8-Dec	Nellcor +1 800 635 5267
Calibration Volumes	401028	Welch Allyn
IBM compatible computer 486 133 MHz computer or better.		
Digital Multi-Meter (qty 2) with 4.5 digit displays for accuracy.		
Power Supply: 0-20 Vdc adjustable with 0-3A output.		

## Battery disassembly

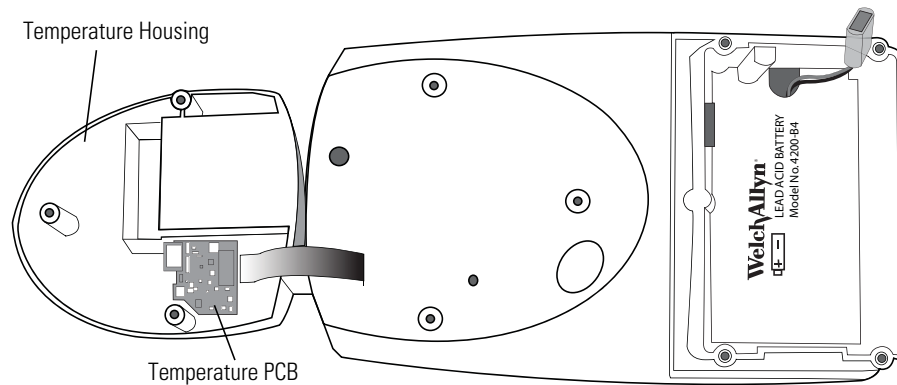
1. Disconnect the power and all accessories from the Spot Vital Signs.
2. Remove the four screws holding the battery door using a phillips-head screwdriver.
3. Remove the battery door to expose the battery and lift it out. Disconnect the one-way connector.



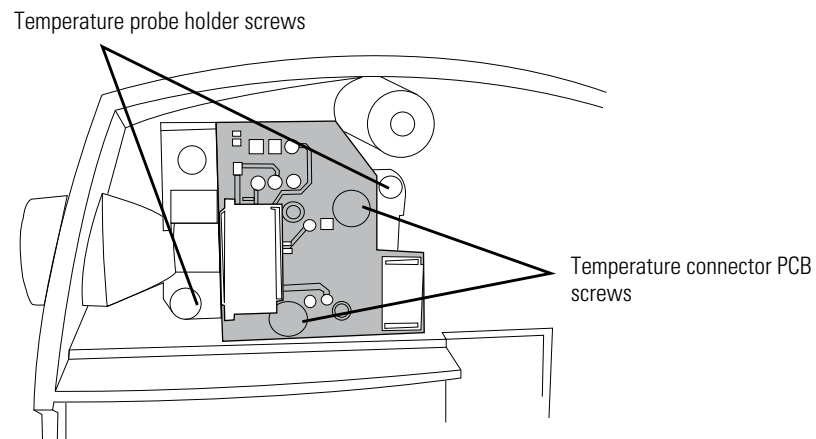
# Temperature disassembly

Follow the previous steps and then:

1. Remove the three #10 Torx screws from the temperature housing.
2. Roll the temperature housing toward the top of the Spot Vital Signs and carefully lay it on the bench.



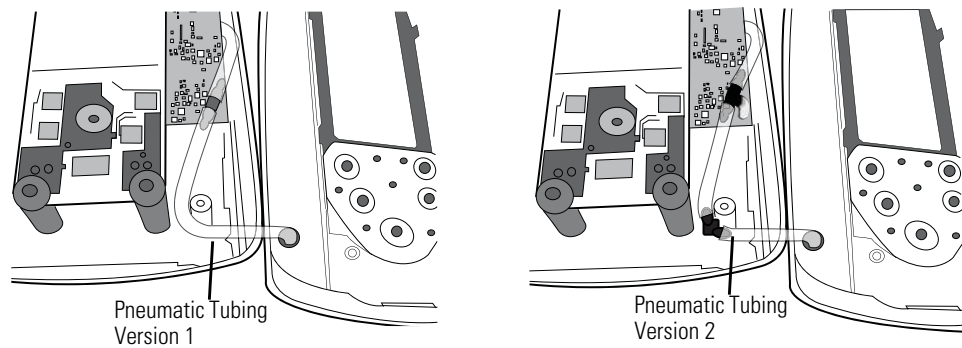
3. Unplug the flex cable from the connector on the temperature PCB.
4. Remove the two #10 Torx screws from the temperature PCB from the temperature housing.
5. Remove the two #10 Torx screws on the temperature probe holder and gently pull out.



## Front housing and key pad disassembly

Follow all the previous steps and then:

1. Remove the two screws inside the battery housing that are identified with arrows molded into the housing and the two screws underneath the temperature housing.
2. Hold the device together and lay the back housing on the bench.
3. Carefully roll the front housing to the right.
4. Disconnect the tubing from the front housing.

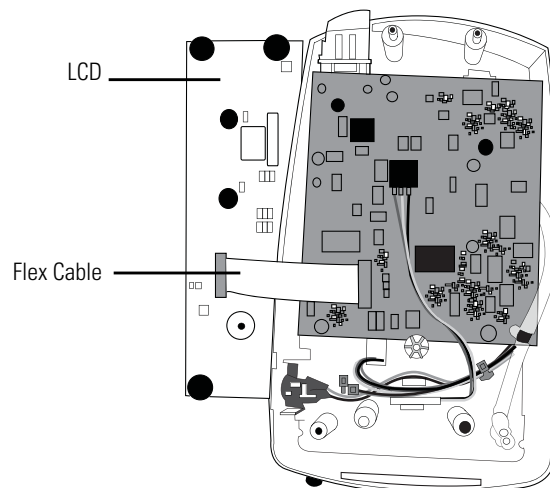


5. Gently pull the button switch array out of the cover.
6. Align and push the new button switch array into place.

## LCD disassembly

Follow all the previous steps and then:

1. Gently lift the LCD module from the posts.
2. Roll the LCD to the left of the Spot Vital Signs and lay it on the bench.

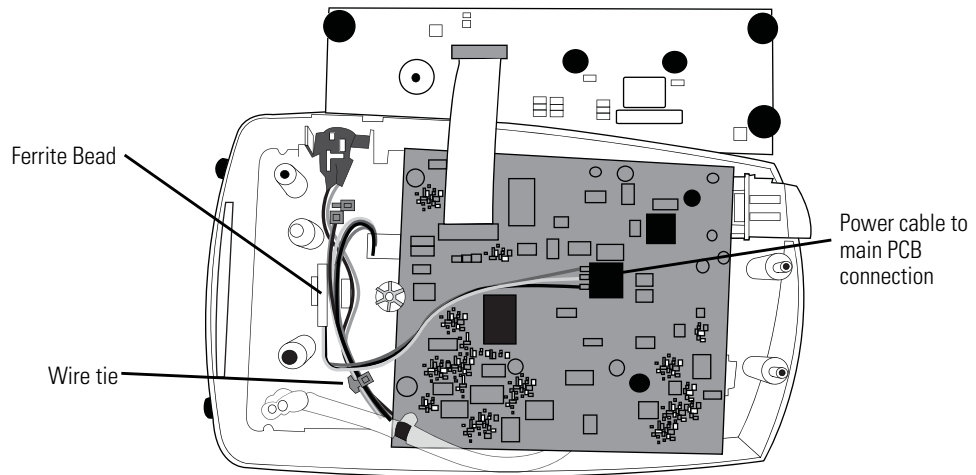


3. Remove the flex cable from the LCD and set the LCD aside.

## Power and battery cable disassembly

Follow all the previous steps and then:

1. Push down on the tab that connects the power cable to the main PCB and pull it toward the bottom of the Spot Vital Signs.

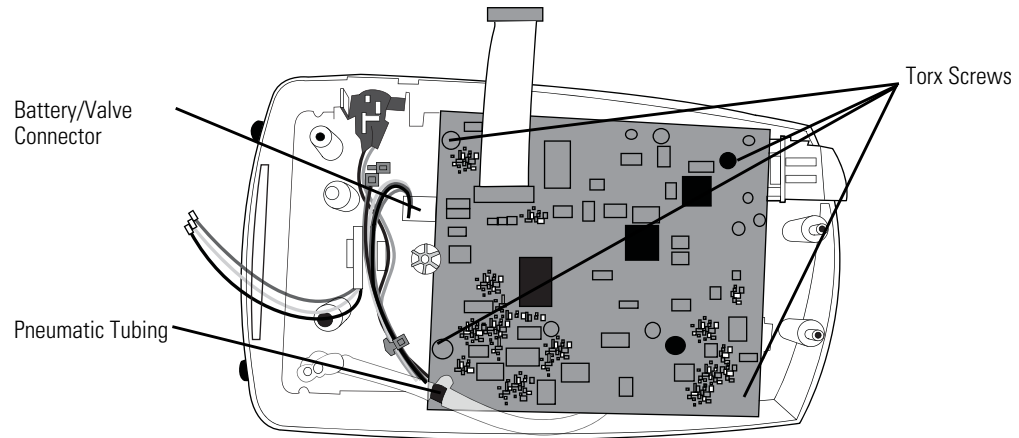


2. Lift the ferrite from its holder.
3. Use a 3/8" Hex socket to remove the nut from the outside of the transformer connector. Slide the cable through the rear housing opening.
4. Cut the wire tie and slide the battery connector out of the rear housing to remove the cable assembly.

## Main printed circuit board assembly

Follow all the previous steps and then:

1. Remove the pneumatic tubing from the transducer on the main PCB.



2. Remove the battery/valve cable connector from the bottom of the PCB.
3. Remove the 4 #10 Torx screws from the PCB.
4. Lift Main PCB from housing.  
If the Spot Vital Signs uses SpO<sub>2</sub> then remove the three screws on the underside of the Main PCB and lift the SpO<sub>2</sub> PCB off the main board (two main board connectors).
5. Attach the existing SpO<sub>2</sub> board to the new main board reusing all hardware.

## SpO<sub>2</sub> circuit board disassembly

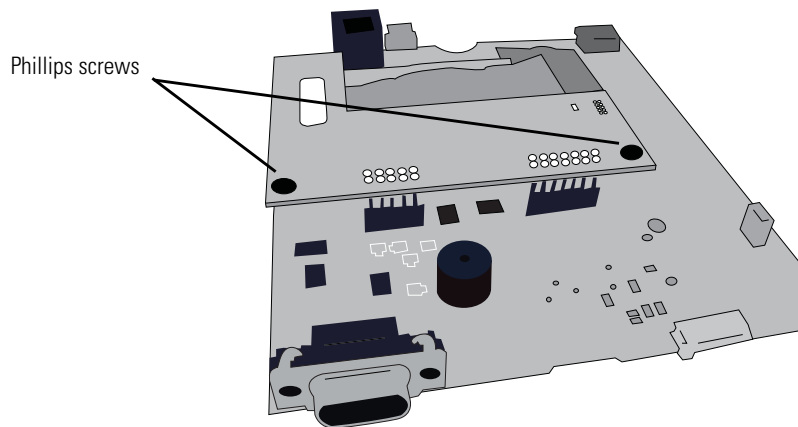
**Note** To assure proper SpO<sub>2</sub> operation, replace the SpO<sub>2</sub> board using only the Welch Allyn specified part.

To assure patient electrical isolation, after the main board is nearly back in position, verify that the SpO<sub>2</sub> flex cable is freely floating and not pressed up against the main board.

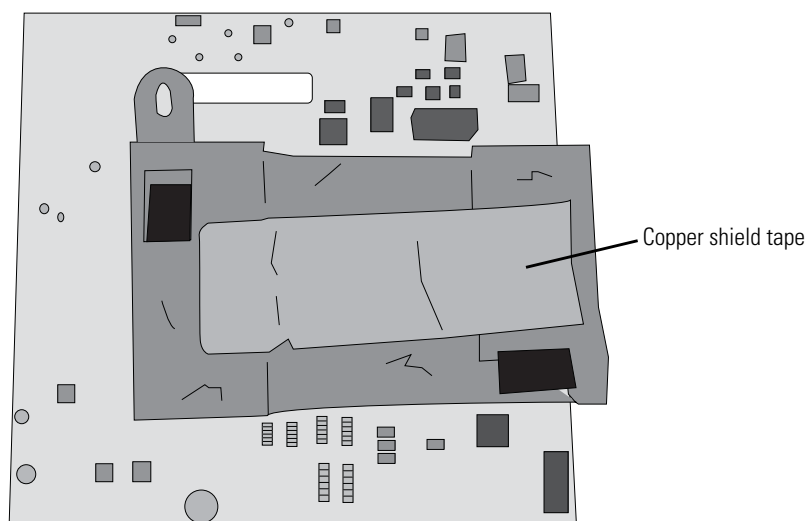
Follow all the previous steps and then:

### Masimo board

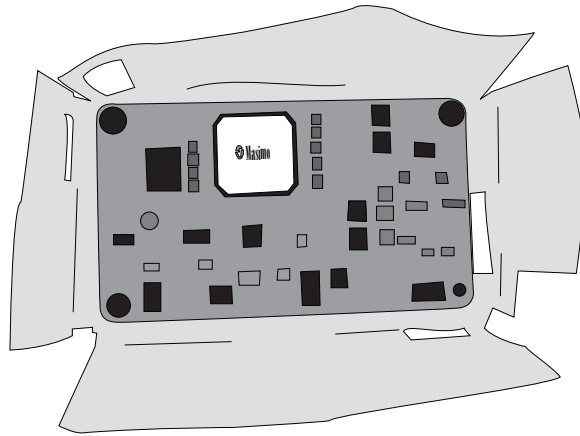
1. Remove the copper tape and unfold the shielding. This exposes the two screws that hold the PCB to the standoffs.



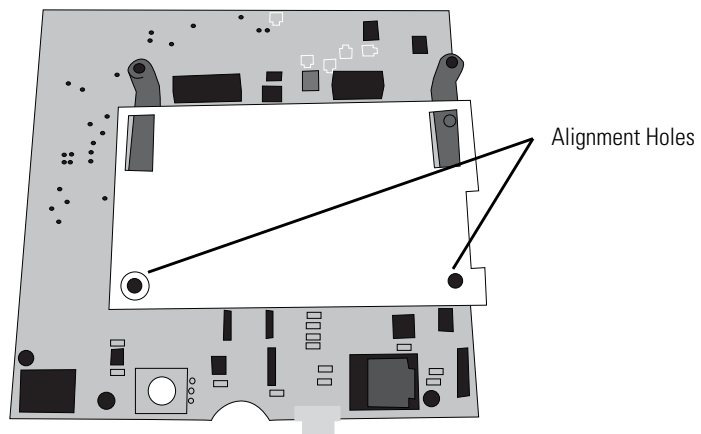
2. Remove the two phillips head screws and lift the Masimo adapter board straight up. There are four connectors on this board - two connect to the main PCB and the other two connect to the Masimo PCB.



3. Unfold the paper to expose the SpO<sub>2</sub> board and remove the two screws holding the board.



4. Remove the 2 screws and lift the board and shielding off the standoffs. This exposes insulating paper.
5. Verify the paper is properly aligned before re-installing the shielding and the new PCB assembly.



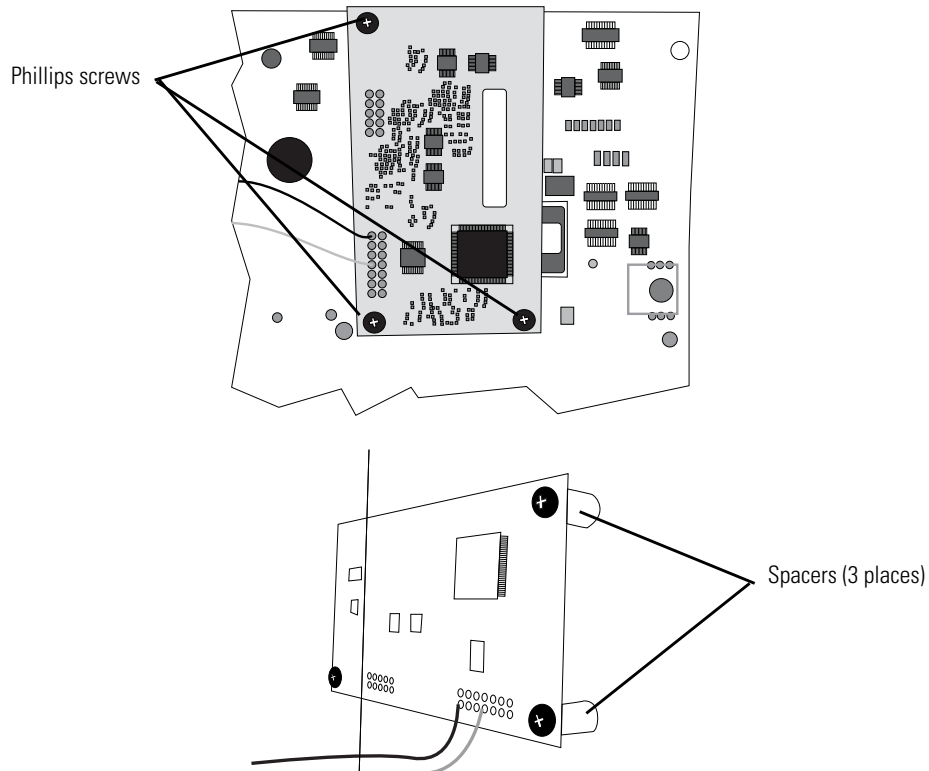
When reassembling, lay the shielding on top of the insulating paper and then replace the board. Verify shielding lays over top of standoff after folding.



## Nellcor board

Follow all the previous steps and then:

1. Remove the three phillips head screws along with the nuts and spacers from the SpO<sub>2</sub> PCB.



2. Remove the SpO<sub>2</sub> module (Nellcor MP205) from the main PCB.

**Note** If a failure occurs in the MP205 PCB (obsolete), update to a Nell-3 PCB (704870) and update the Main PCB (403290). The new Main PCB (403290) correctly operates an MP205, an MP506, or a Nell-3 PCB. If the Nell-3 is used with the old main PCB, an E7 error occurs after connecting the power.

For MP205 PCB: Verify the following:

- There are two shunts at the top of the jumper row on the PCB before installing on the Main PCB.
- The two locking tabs on the connectors of the Nellcor MP205 PCB are broken off before installing onto the Main PCB.
- The nylon washers are located on the main PCB when reassembling the SpO<sub>2</sub> PCB to the Main PCB.

For MP506 or Nell-3 PCB: Verify the following:

- The DIP switch positions are (1-on, 2-on, 3-off and 4-off) on the new PCB and the two locking tabs on the connectors of the Nellcor MP506 PCB are broken off before installing onto the Main PCB.
- Verify that the nylon washers are located on the main PCB when reassembling the SpO<sub>2</sub> PCB to the Main PCB.

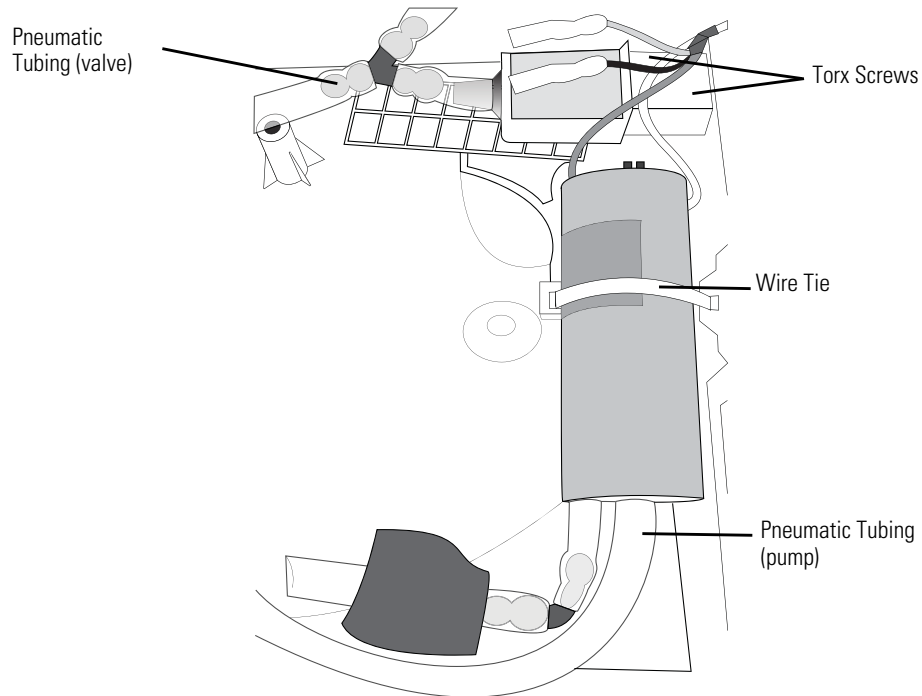
## Pump and valve disassembly

**Note** For proper blood pressure operation, replace the pump using only the Welch Allyn specified part.

To assure patient electrical isolation, do not modify the length of the pump wires.

Follow all the previous steps and then:

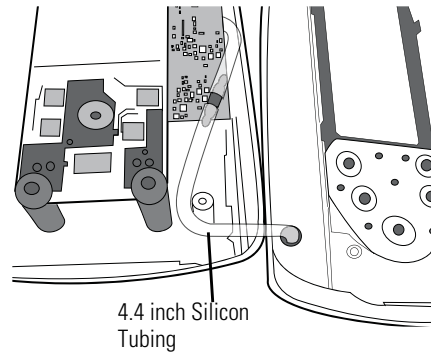
1. Disconnect the pneumatic tubing from the valve and pump.



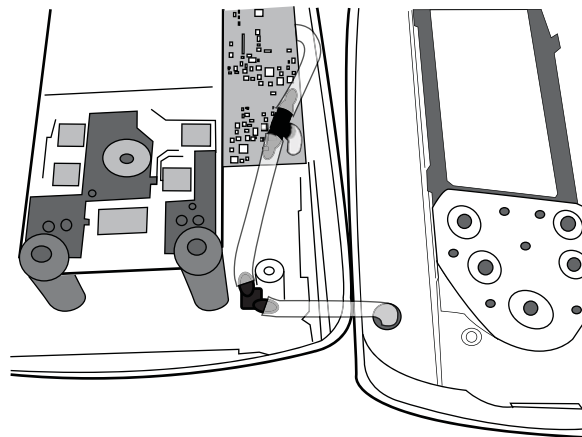
2. Cut the wire tie and remove the two Torx screws.
3. Lift the valve and the pump from their respective locations on the rear housing.

**To upgrade the pneumatic tubing:**

1. Verify you have two pieces of silicon tubing 1.5 inches in length (421051-11) and one elbow fitting (703843) available.
2. Remove the 4.4 inch silicon tubing from the "T" fitting.

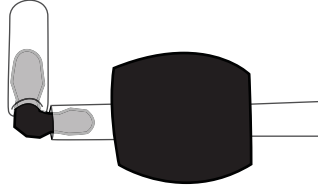


3. Insert one of the 1.5 inch silicon tubing pieces onto the "T" fitting.
4. Insert the elbow fitting into the 1.5 inch silicon tubing.
5. Insert the second 1.5 inch tubing onto the elbow fitting.
6. Connect the 1.5 inch tubing to the Spot Vital Signs.

**To assemble the pump filter:**

1. Verify you have three pieces of silicon tubing .8 inches in length (421051-5), one elbow fitting (703843), one NIBP filter (600-0520-00), and one foam sleeve (706327) available.
2. Connect one piece of the silicon tubing at each end of the elbow fitting, and then connect the NIBP filter to one of the open ends.
3. Connect the last piece of silicon tubing to the opposite end of the NIBP filter.

- Carefully slide and center the foam sleeve over the NIBP filter.



- Remove the open-ended tubing from the pump and replace with the pump filter assembly. Confirm proper pump fitting.

