

10. System Checkout Procedures

This chapter details the test procedures that should be performed by the clinician prior to connecting the device to the patient. Test both the active and passive circuits if you want to do a complete checkout on the device. The tests should be performed as described in order to verify proper operation of the device. Some of the procedures in this chapter require you to change settings on the device. If you are not familiar with the procedures for accomplishing this, please refer to Chapter 4, *Ventilator Setup* and Chapter 5, *Viewing and Changing Settings*.

Note: The actual circuit configuration to be used on the patient should be used to perform the system checkout procedure.

Tools Required

- Active Exhalation Porting Block with PAP
- Passive Exhalation Porting Block
- Active PAP Exhalation Device
- Passive Exhalation Device
- Test Lung
- Small Flat Head Screwdriver

Visual Inspection

1. Verify that the enclosure is not broken and that all applicable screws are in place.
2. Verify that the device handle, SD Card door, and detachable battery are secure and in good working order.

WARNING

If you notice any unexplained changes in the performance of the device, if it is making unusual sounds, if the device or detachable battery are dropped, if water is spilled into the enclosure, or if the enclosure is cracked or broken, discontinue use and contact Philips Respironics or an authorized service center for service.

3. Verify that the rubber feet are on the bottom of the device.

Initial Setup

1. Connect the power cord to the device and then to an AC outlet.
2. Attach the test lung to the patient connection end of the desired circuit (Active PAP or Passive).
3. Follow the instructions in Chapter 5 to access the Setup Screen.

Settings and Alarms Tests

Complete the following steps to set up the settings and alarms tests.

1. Setup

A. Settings And Alarms Menu

Modify the settings in the Settings and Alarms menu to match those shown below in Table 1. If necessary, refer to Chapter 5 for instructions on modifying ventilator settings.

Setting	Value
Dual Prescription	Off
Circuit Type	Active PAP or Passive
Therapy Mode	S/T
AVAPS (passive circuit only)	Off
IPAP	20 cm H ₂ O
EPAP	4 cm H ₂ O
Breath Rate	12 BPM
Inspiratory Time	1.6 seconds
Trigger Type (passive circuit)	Auto-Trak
Flow Trigger Sensitivity (active PAP circuit)	6.0 l/min
Flow Cycle Sensitivity (active PAP circuit)	20%



Table 1 - Ventilator Settings in the Settings and Alarms Menu

Setting	Value
Rise Time	1
Ramp Length	Off
All other alarms	Off

B. Options Menu

Modify the settings in the Options menu to match those shown below in Table 2.

Setting	Value
Menu Access	Full
Detailed View	On
All other settings	Discretionary



Table 2 - Ventilator Settings in the Options Menu

C. Turn Device Power On

Press the Start/Stop button on the front of the ventilator. The system will begin operating using the defined ventilation settings.

2. Verify the High Tidal Volume Alarm

This procedure verifies that the High Tidal Volume alarm is working properly. For passive circuits, this will verify the High Vte alarm. For active with PAP circuits, this will verify the High Vti alarm. It assumes that you have attached the test lung, verified the ventilator settings, and turned on ventilator power as described in the Initial Setup section.

A. Change Alarm Ventilator Setting

Modify the High Tidal Volume alarm setting to match the one shown below in Table 3.

Setting	Value
High Vte/High Vti	50 ml



Table 3 - High Vte/High Vti Alarm Setting

B. Verify the Alarm

Wait up to 40 seconds and verify the following alarm signals:

- The High Priority audible indicator sounds
- A red light flashes on the Alarm Indicator/Audio Pause button
- The High Tidal Volume alarm condition appears on the screen, highlighted in red

C. Modify Ventilator Alarm Settings

Modify the High Tidal Volume alarm setting to match the one shown below in Table 4.

Setting	Value
High Vte/High Vti	500 ml

Note: Do not use the "Reset" button to manually reset the alarm. Instead, use the "Modify" button to change ventilator settings. This applies to all tests.



Table 4 - Modify High Vte/High Vti Alarm Setting

D. Verify Reset

Wait 40 seconds and verify the following auto-reset conditions:

- The High Priority audible indicator has stopped sounding
- The red light on the Alarm Indicator/Audio Pause button has stopped flashing

E. Restore Ventilator Settings

Modify the ventilator settings and change the following value shown in Table 5.

Setting	Value
High Vte/High Vti	Off



Table 5 - Restore Ventilator Settings

3. Verify the Low Tidal Volume Alarm

This procedure verifies that the Low Tidal Volume alarm is working properly. For passive circuits, this will verify the Low Vte alarm. For active with PAP circuits, this will verify the Low Vti alarm. It assumes that you have attached the test lung, verified the ventilator settings, and turned on ventilator power as described in the Initial Setup section.

A. Change Alarm Ventilator Setting

Modify the Low Tidal Volume alarm setting to match the one shown below in Table 6.

Setting	Value
Low Vte/Low Vti	500 ml



Table 6 - Low Vte/Low Vti Alarm Setting

B. Verify the Alarm

Wait up to 40 seconds and verify the following alarm signals:

- The High Priority audible indicator sounds
- A red light flashes on the Alarm Indicator/Audio Pause button
- The Low Tidal Volume alarm condition appears on the screen, highlighted in red

C. Modify Ventilator Alarm Settings

Modify the Low Tidal Volume alarm setting to match the one shown below in Table 7.

Setting	Value
Low Vte/Low Vti	50 ml



Table 7 - Modify Low Vte/Low Vti Alarm Setting

D. Verify Reset

Wait 40 seconds and verify the following auto-reset conditions:

- The High Priority audible indicator has stopped sounding
- The red light on the Alarm Indicator/Audio Pause button has stopped flashing

E. Restore Ventilator Settings

Modify the ventilator settings and change the following value shown in Table 8.

Setting	Value
Low Vte/Low Vti	Off



Table 8 - Restore Ventilator Settings

4. Verify Circuit Disconnect Alarm

This procedure verifies that the Circuit Disconnect alarm is working properly. It assumes that you have attached the test lung, verified ventilator settings, and turned on ventilator power as described in the Initial Setup section.

A. Change Circuit Disconnect Ventilator Setting

Modify the Circuit Disconnect ventilator setting to match the value shown below in Table 9.

Setting	Value
Circuit Disconnect	10 seconds



Table 9 - Ventilator Settings

Note: The Low Inspiratory or Low Expiratory Pressure Alarm may also be detected.

B. Disconnect Test Lung

Disconnect the test lung from the circuit.

C. Verify the Alarm

Wait approximately 10 seconds and verify the following alarm signals:

- The High Priority Audible Indicator sounds
- A red light flashes on the Alarm Indicator/Audio Pause button
- The Circuit Disconnect alarm condition appears on the screen, highlighted in red

D. Reconnect Test Lung

Reconnect the test lung to the circuit.

E. Verify Reset

Wait at least 40 seconds and verify the following auto-reset conditions:

- The High Priority audible indicator has stopped sounding
- The red light on the Alarm Indicator/Audio Pause button has stopped flashing

F. Restore Ventilator Settings

Modify the ventilator settings and change the following values shown below in Table 10.

Setting	Value
Circuit Disconnect	Off



Table 10 - Restore Ventilator Settings

5. Verify the High Inspiratory Pressure Alarm

This procedure verifies that the High Inspiratory Pressure alarm is working properly. It assumes that you have attached the test lung, verified ventilator settings, and turned on ventilator power as described in the Initial Setup section.

A. Change Ventilator Settings

Modify the ventilator settings and change the following values shown below in Table 11.

Setting	Value
Mode	CV
Tidal Volume	500 ml
Breath Rate	12 BPM
Inspiratory Time	1.0 seconds
Flow Pattern	Ramp
PEEP	4 cm H ₂ O
Sigh	Off
Circuit Disconnect	Off
Low Inspiratory Pressure	6 cm H ₂ O
High Inspiratory Pressure	10 cm H ₂ O
Apnea	Off
All other alarms	Off



Table 11 - Ventilator Settings

Note: If this alarm is not reset within 3 occurrences, the alarm is elevated to High Priority, and the High Priority Indicators occur.

B. Verify the Alarm

Wait up to 40 seconds and verify the following alarm signals:

- The Medium Priority audible indicator sounds
- A yellow light flashes on the Alarm Indicator/Audio Pause button
- The High Inspiratory Pressure alarm condition appears on the screen, highlighted in yellow

C. Modify Ventilator Alarm Settings

Modify the High Inspiratory Pressure setting to match the one shown below in Table 12.

Setting	Value
High Inspiratory Pressure	60 cm H ₂ O



Table 12 - Modify High Inspiratory Pressure Alarm Setting

D. Verify Reset

Wait 40 seconds and verify the following auto-reset conditions:

- The Medium Priority audible indicator has stopped sounding
- The yellow light on the Alarm Indicator/Audio Pause button has stopped flashing

6. Verify the Low Inspiratory Pressure Alarm

This procedure verifies that the Low Inspiratory Pressure alarm is working properly. It assumes that you have attached the test lung, verified ventilator settings, and turned on ventilator power as described in the Initial Setup section.

A. Change Ventilator Settings

Modify the ventilator settings and change the following values shown below in Table 13.

Setting	Value
Mode	CV
Tidal Volume	500 ml
Breath Rate	12 BPM
Inspiratory Time	1.0 seconds



Table 13 - Ventilator Settings

Setting	Value
Flow Pattern	Ramp
PEEP	4 cm H ₂ O
Sigh	Off
Circuit Disconnect	Off
Low Inspiratory Pressure	40 cm H ₂ O
High Inspiratory Pressure	60 cm H ₂ O
Apnea	Off
All other alarms	Off

B. Verify the Alarm

Wait up to 40 seconds and verify the following alarm signals:

- The High Priority audible indicator sounds
- A red light flashes on the Alarm Indicator/Audio Pause button
- The Low Inspiratory Pressure alarm condition appears on the screen, highlighted in red

C. Modify Ventilator Alarm Settings

Modify the Low Inspiratory Pressure setting to match the one shown below in Table 14.

Setting	Value
Low Inspiratory Pressure	6 cm H ₂ O



Table 14 - Modify Low Inspiratory Pressure Alarm Setting

D. Verify Reset

Wait 40 seconds and verify the following auto-reset conditions:

- The High Priority audible indicator has stopped sounding
- The red light on the Alarm Indicator/Audio Pause button has stopped flashing

Battery Function Verification

Make sure the batteries are functioning properly and fully charged before patient use.

1. Verify the Detachable and Internal (Lithium-Ion) Batteries Function

- A. Connect AC Power to the device and verify that the green AC LED on the front panel is lit.
- B. Verify that the detachable battery is properly installed.
- C. Turn the device on and verify that both the detachable and internal battery symbols appear on the display. Verify that if either battery is less than fully charged, the charge symbol will display on the respective battery.
- D. Disconnect the AC Power source from the device.
 - Verify that the AC Power Disconnected alarm message appears on the display and the green AC LED is not lit. Press Reset.
 - Verify that the detachable battery symbol shows the level of charge noted in the previous step and that the device continues to operate.
 - Verify that the detachable battery symbol has a black box around it to indicate that it is in use.
- E. Disconnect the detachable battery pack from the device.
 - Verify that the Detach Batt Disconnected alarm message appears on the display. Press Reset.
 - Verify that the internal battery symbol shows the same level of charge as noted in Step C and the device continues to operate.
 - Verify that the internal battery symbol has a black box around it to indicate that it is in use.
- F. Reconnect the Detachable Battery and AC Power source.

2. Verify the External Battery Function (Optional)

- A. Connect AC Power to the device and verify that the green AC LED is lit.
- B. Connect the external battery cable to the external battery and to the ventilator.
- C. Verify that the external battery symbol is shown on the display and some level of charge is present.
- D. Disconnect the AC Power source from the device.
 - Verify that the AC Power Disconnected alarm message appears on the display and the green AC LED is not lit. Press Reset.
 - Verify that the external battery symbol shows the level of charge as noted in the previous step and the device continues to operate.
 - Verify that the external battery symbol has a black box around it to indicate that it is in use.
- E. Reconnect the AC Power source.

Alarm and Event Log Clean-Up

1. In the Setup Menu, select **Alarm Log**.
 - A. Press **Clear** to clear the log file.
 - B. Press **Yes** to confirm.
 - C. Press **Finish** to complete.
2. In the Setup Menu, select **Event Log**.
 - A. Press **Clear** to clear the log file.
 - B. Press **Yes** to confirm.
 - C. Press **Finish** to complete.

Results

All portions of this checkout procedure should be completed prior to connection to the patient. If any of the tests fail to complete as indicated, if possible, correct the error, clear the alarm and resume testing. If correction of the failed portion is not possible, return the device to Philips Respironics or an authorized service center for service and repair.