Chapter 4   Operational Verification and Calibration

Operational Verification Testing

Prior to using the Vela ventilator on a new patient the following checks should be carried out to ensure optimum performance. **Verification testing should always be performed "off patient".**

> **WARNING**
>
> Disconnect patient from the ventilator before performing verification testing.

Note

All personnel performing preventive maintenance and product repair must be trained and certified by VIASYS Healthcare to service the product

Note

If any portion of the following performance check fails, and you are unable to correct the problem, contact your VIASYS Healthcare Certified Service Technician.

First perform the User Verification Tests (UVTs). To access the UVTs, do the following'

1. After disconnecting the patient, turn the ventilator OFF (i.e., STANDBY).
2. Press and hold the **Accept** button.
3. While holding the **Accept** button, turn the ventilator ON. Continue to hold the button until the ventilator completes the Power On Self Tests (POST).
4. Release the **Accept** button when the UVT menu appears in the screen. The Audible Alarm sounds. Press Alarm Reset button to clear.
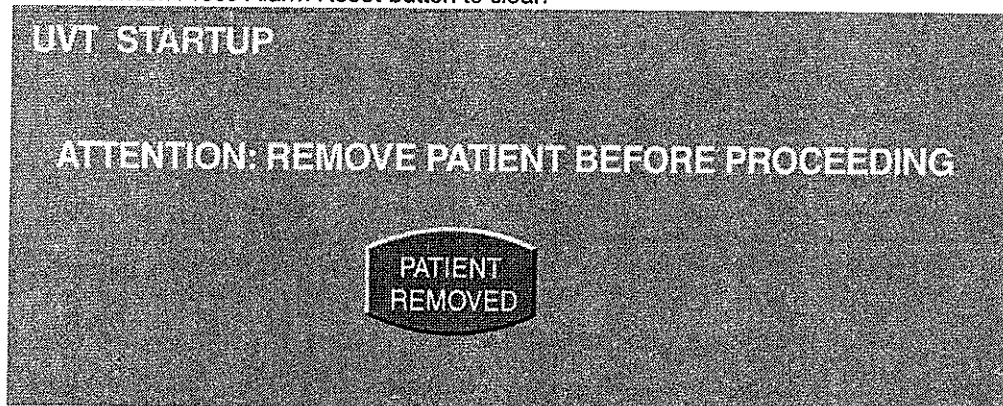

Figure 4.1 UVT Startup Screen

5. Press the **Patient Removed** touch screen icon, the UVT test selection screen displays (see figure 4.2).
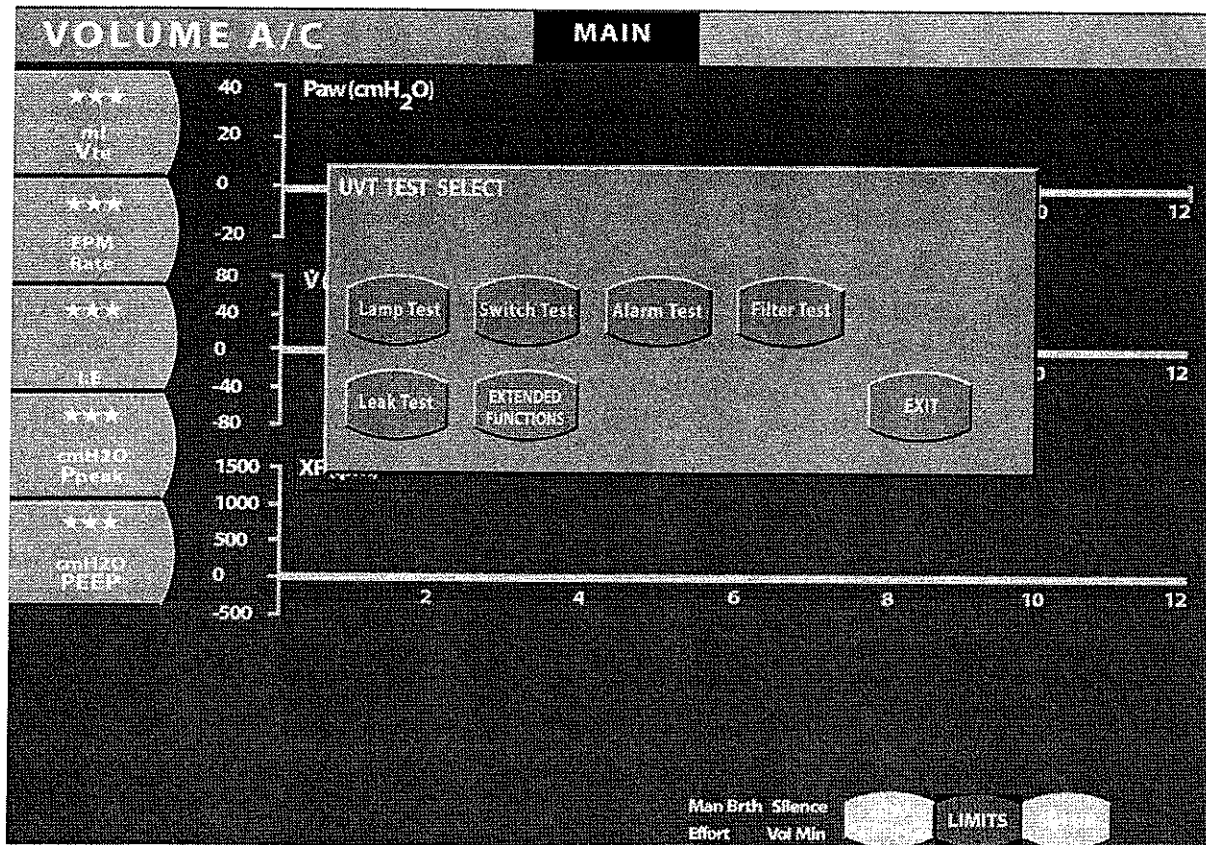
Figure 4 2 The UVT Screen with the Main screen in Service mode

6. Press the appropriate touch screen icon to begin a test.

Lamp Test

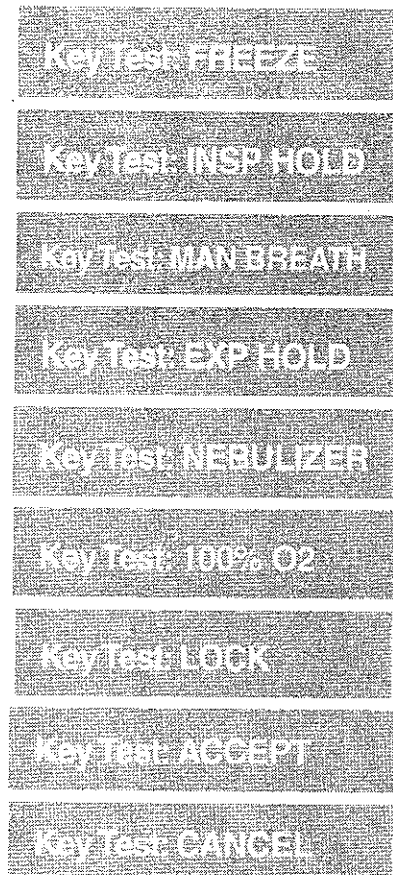Run this test to check the front lamps to make sure they are functioning properly.

1. Press the **LampTest** touch screen icon to start the test. The ventilator illuminates all front panel LEDs.

2. Press the **LampTest** touch screen icon again to turn the LEDs off and exit the test.

Switch Test

Run this test to check the front panel membrane switches to make sure they are working properly.

1. Press the **SWITCH TEST** icon.

2. Press each membrane switch control in turn. Watch for the name of the control to appear in the message bar at the bottom left of the touch screen as follows:

Key Test: FREEZE

Key Test: INSP HOLD

Key Test: MAN BREATH

Key Test: EXP HOLD

Key Test: NEBULIZER

Key Test: 100% O2

Key Test: LOCK

Key Test: ACCEPT

Key Test: CANCEL

3. Press the **SWITCH TEST** icon again to exit the test.

Alarm Test

Run this test to check the audible alarm.

1. Press the **Alarm Test** touch screen icon to start the test. The audible alarm sounds.
2. Press the **Alarm Test** touch screen icon again to silence the audible alarm and exit the test.

Filter Test

Run this test to check the differential pressure across the turbine inlet filter. A high differential pressure may indicate a dirty or occluded filter.

1. Press the **Filter Test** touch screen icon. The turbine accelerates flow to 140 lpm and checks the differential pressure to make sure it is within range. At the end of the test, the ventilator displays a pass or fail message. If the test passes, the following message appears:

    x.x   Passed

    where x.x is the average turbine differential pressure and P indicates the test passed.

    If the test fails, the following message appears:

    x.x   Failed

    where x.x is the average turbine differential pressure and F indicates the test failed:

2. If the test fails, check the rotation of the turbine inlet filter to make sure that the seam is horizontally oriented and run the test again. If the test fails again, contact a Bird Certified Service Technician.

Leak Test

Note

*This test should be performed with **all circuit accessories installed** (e.g., humidifier, water traps, and so on.) Make sure all connections are secure and all openings occluded before beginning the test.*

Run this test to make sure the patient breathing circuit is not leaking.

1. Attach a one-liter test lung (P/N 33754) at the patient breathing circuit wye. (SIEMENS LUNG)

2. Press the **Leak Test** touch screen icon to run the test. The test begins by increasing the pressure in the patient breathing circuit to 60 cmH2O. The ventilator then displays the following messages in sequence:

> Leak test requested
> Leak test in progress

3. The ventilator then waits 10 seconds and measures the circuit pressure again. If the difference between the starting and ending measurements is less than or equal to 6 cmH2O, the test passes and the ventilator displays the following message:

> xx.x   Passed

where xx.x is the ending measurement.

4. Otherwise, if the difference is more than 6 cmH2O, the test fails and the ventilator displays the following message:

> xx.x   Failed

5. If the test fails, check all connections to make sure there are no leaks and repeat the test.

6. It the test fails again, refer to Chapter 5, for troubleshooting procedures

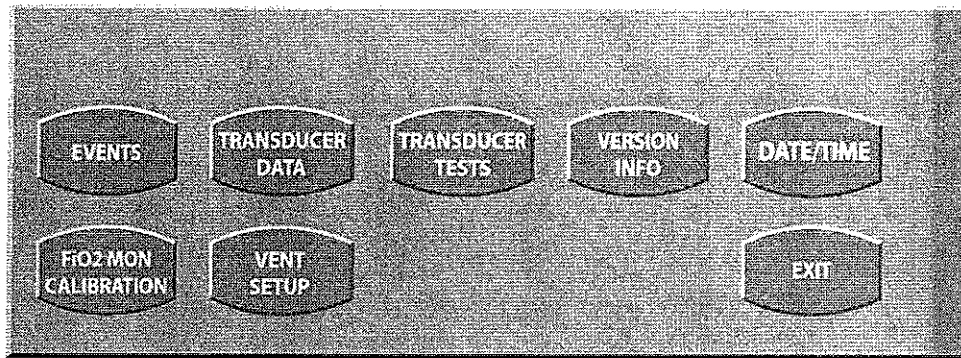## Exit

To exit the UVTs press the **EXIT** touch screen icon.

Extended Functions

The Extended Functions menu may be accessed via the UVT Test Select screen as described in the previous section. Press the EXTENDED FUNCTIONS icon from the UVT screen.

Figure 4.3 Accessing the Extended Functions Screen from the UVT menu

You can also access the extended functions screen via the Screens menu during normal operation.

Press the screen display area on the top center of the touch screen to activate Screen Select menu.

Figure 4.4 Accessing the Extended Functions screen from the Screen Select menu

Press the EXTENDED FUNCTIONS touch screen icon to display the Extended Functions screen.

Figure 4.1 Extended Functions screen menu

Events

To access the Events list, press the Events screen icon
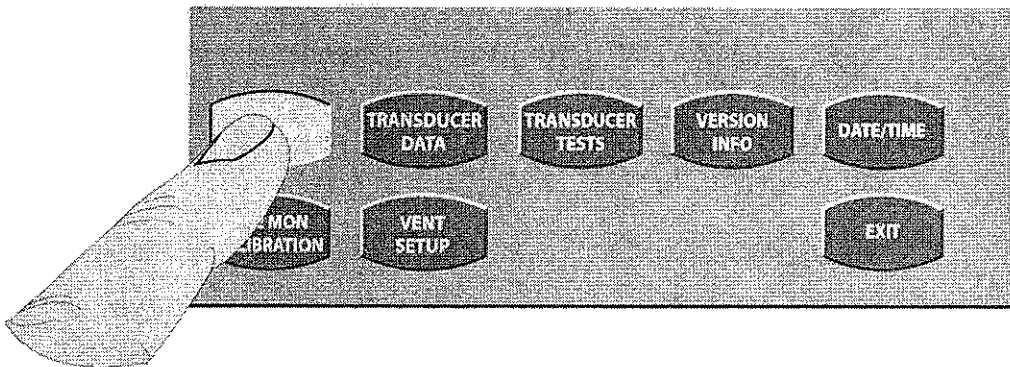
Figure 4.2 Press the Events touch screen icon

A list of chronological events displays with the latest event at the top as shown in figure 4.11
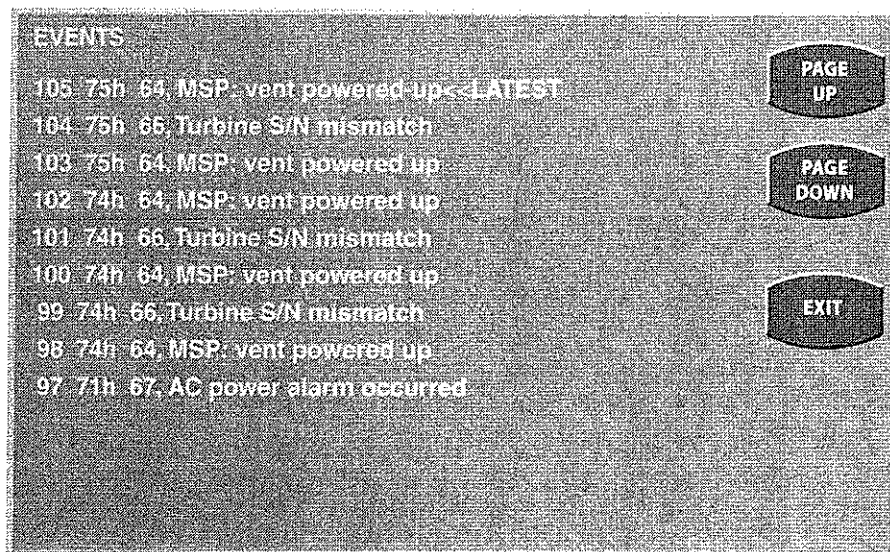
Figure 4.3 The Events screen

Transducer Data

Press the Transducer Data screen icon.
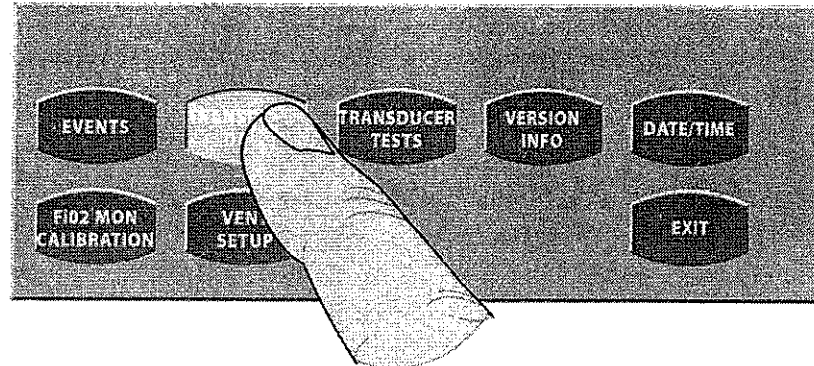
Figure 4.4 Press the Transducer Data screen icon

The Transducer Selection screen displays.
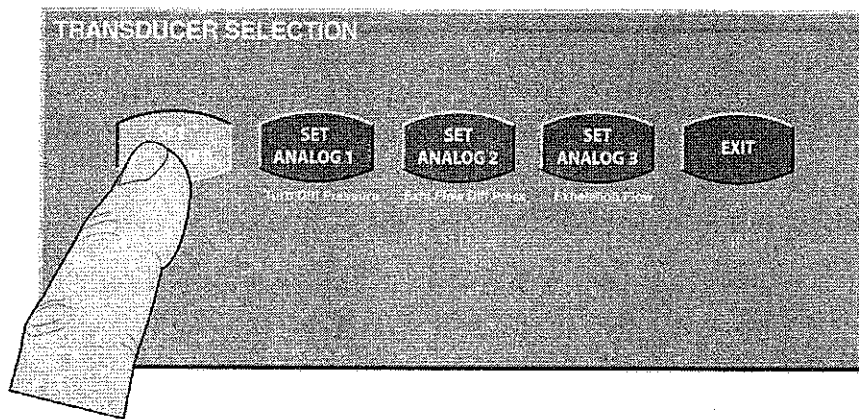
Figure 4.5 Transducer data selection screen

From here you can set the analog data display associated with each transducer. For example, if you press the SET ANALOG 0 screen icon as shown in figure 4.X, the following options display in a drop down menu.

    Exhl Flow Diff Press
    Exhalation Flow
    Turbine Flow
    Turbine Speed
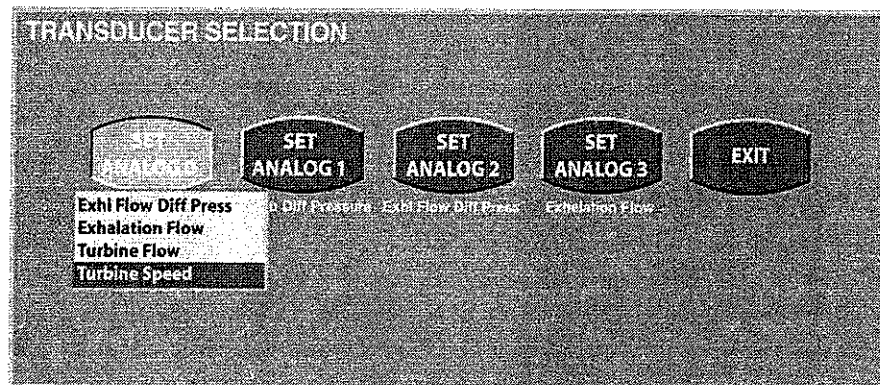
Figure 4.6 Transducer data selection options

In this example, the transducer associated with Analog 0 is set to display Turbine Speed.

Set each analog value to one of the transducers in the drop down menu. Press EXIT to return to the Extended Functions screen.

For instructions on how to view this data as a displayed waveform, see Chapter 5, Maintenance & Troubleshooting.

Transducer Tests

To access the transducer test screen press the Transducer Tests screen icon.
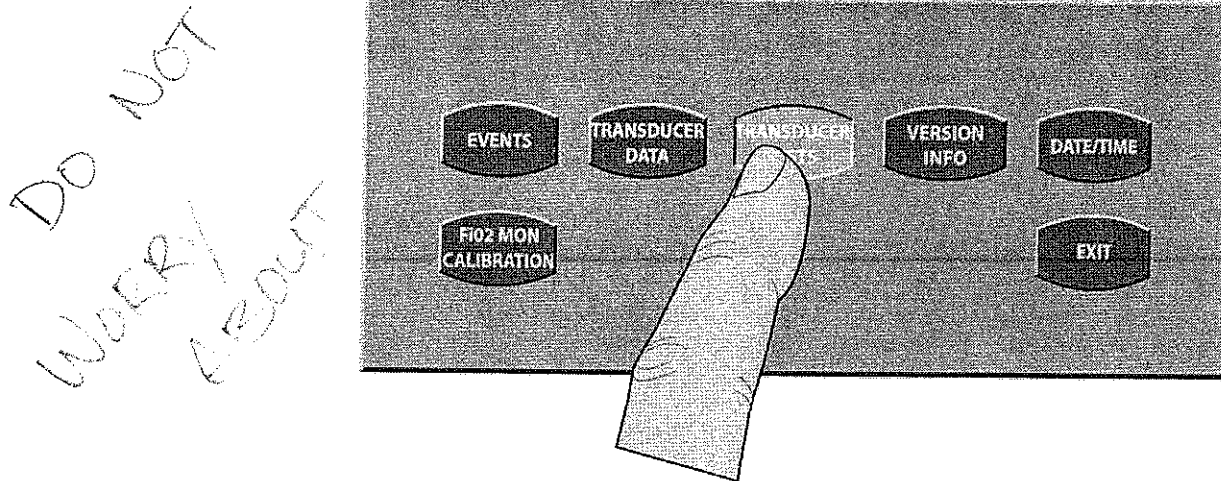
Figure 4.7 Press transducer tests icon

The transducer tests screen appears with icons for the Turbine Differential, Exhalation Differential and Circuit Pressure transducers.
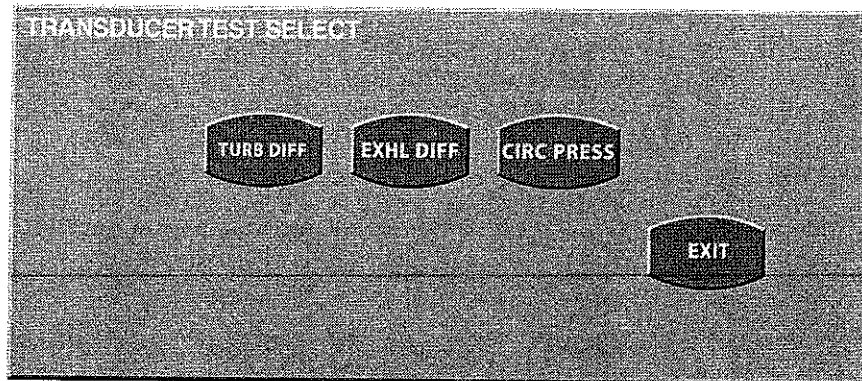
Figure 4.8 Transducer test screen

Press the Turbine Differential (TURB DIFF) screen icon.
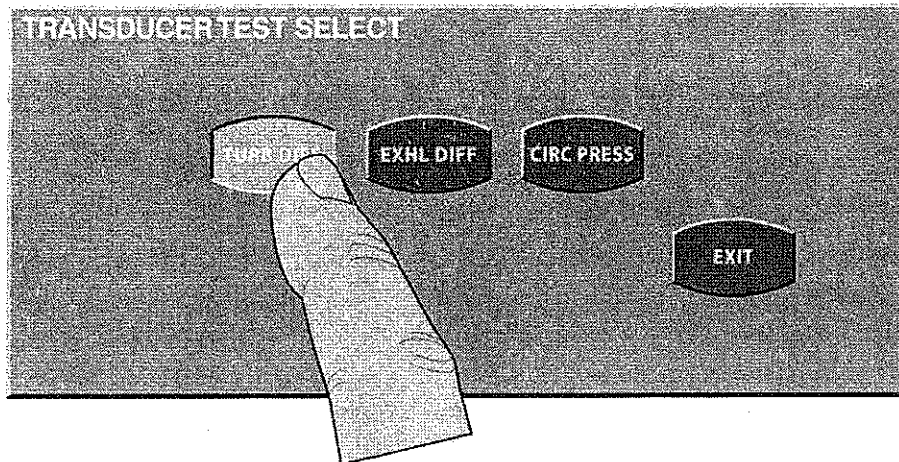
Figure 4 9 Press TURB DIFF icon

The following messages appear in sequence in the message area at the bottom left of the touch screen.

Turb Diff Pressure Xdcr Test – Requested

Turb Diff Pressure Xdcr Test – In Progess

Turb Diff: XXX Passed (where XXX is the transducer reading within range)

Or

Turb Diff: XXX Failed (where XXX is the transducer reading OUT of range)

Press the Exhalation Differential Pressure (EXHL DIFF) screen icon.

The following messages appear in sequence in the message area at the bottom left of the touch screen.

Exhl Diff Pressure Xdcr Test – Requested

Exhl Diff Pressure Xdcr Test – In Progess

Exhl Diff: XXX Passed (where XXX is the transducer reading within range)

Or

Exhl Diff: XXX Failed (where XXX is the transducer reading OUT of range)

Press the Circuit Pressure (CIRC PRESS) screen icon.

The following messages appear in sequence in the message area at the bottom left of the touch screen.

Circ Pressure Xdcr Test – Requested

Circ Pressure Xdcr Test – In Progess

Circ Press: XXX Passed (where XXX is the transducer reading within range)

Or

Circ Press: XXX Failed (where XXX is the transducer reading OUT of range)

Version Information

To access the software version information screen, press the VERSION INFO screen icon.
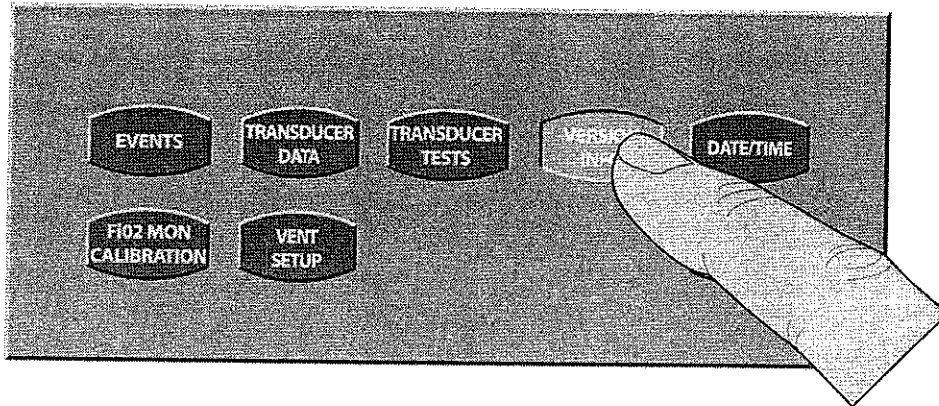

Figure 4.10 Press the Version Info icon

The Versions screen, showing the versions of all software installed on the machine, displays.

Note

The version information shown in figure 4.X is an example only. Your machine will have different versions of software depending on the date of sale and the updates loaded.
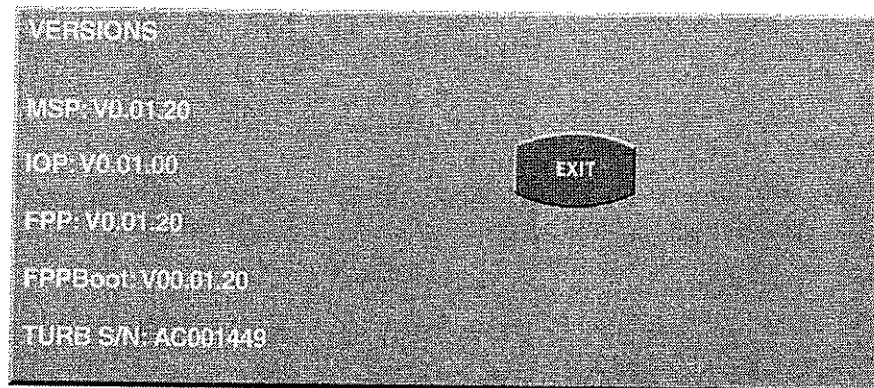

Figure 4 11 Sample Version information screen

Date & Time

The date and time can be set and the ventilator hours of use (Hour Meter) can be viewed by pressing the Date/Time screen icon.
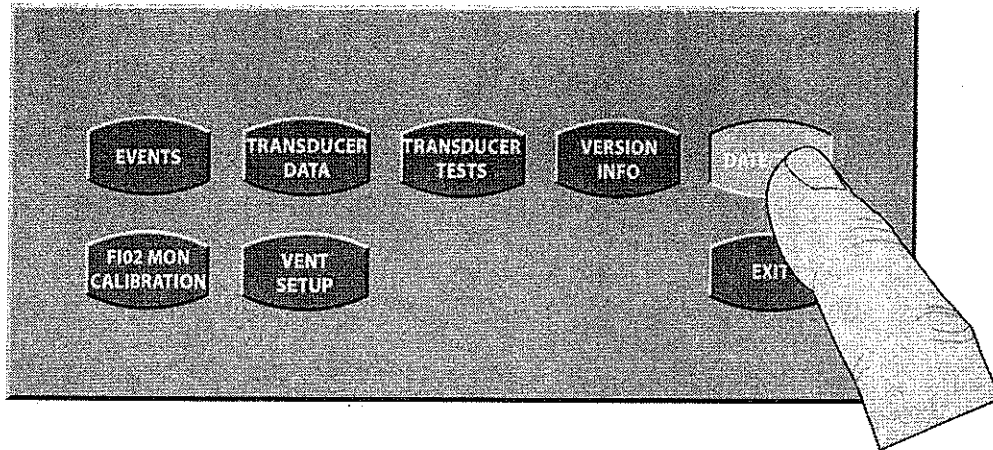
Figure 4.12 Press Date/Time icon
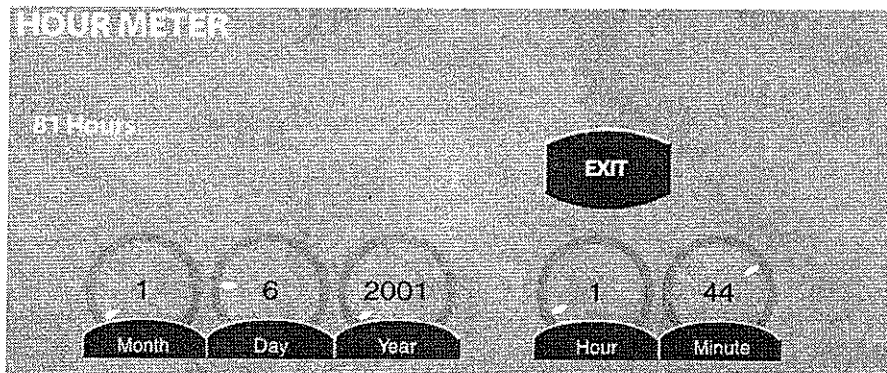
Figure 4.13 Date/Time and Hour Meter screen

To adjust the date and time, select by pressing the touch screen directly over the control to be adjusted (see figure 4.X).
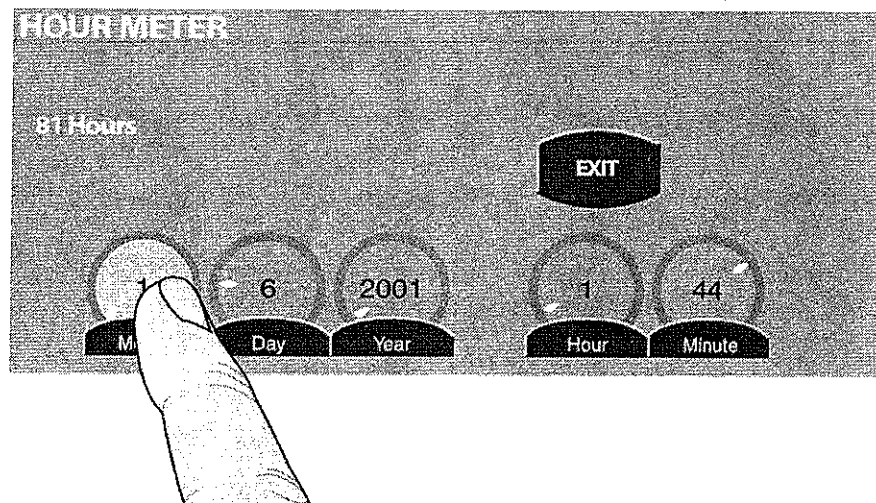

Figure 4.14 Select the month control

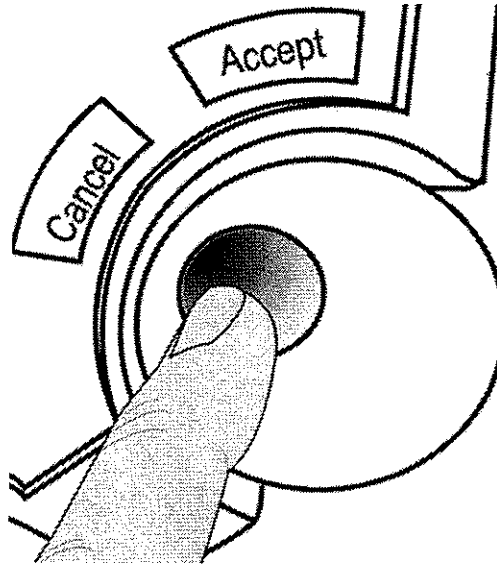Adjust by turning the Data Dial clockwise to increase, or counter clockwise to decrease, the value.

Figure 4.15 Data Dial

FiO2 Calibration

See the Calibration section of this Chapter.

Ventilator Setup

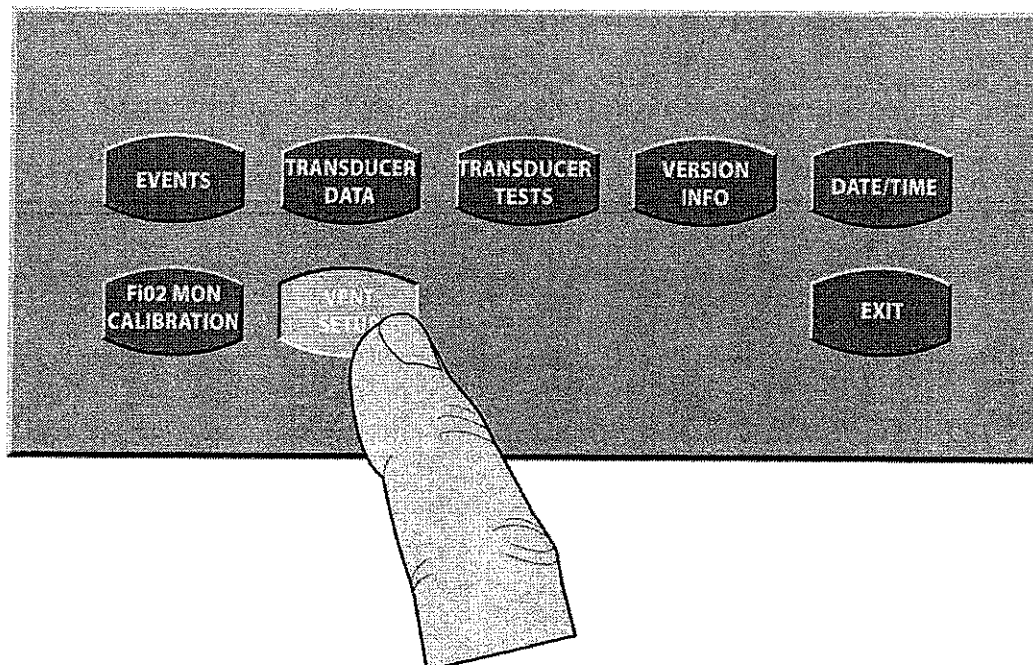To access the ventilator setup options, press the Vent Setup screen icon.
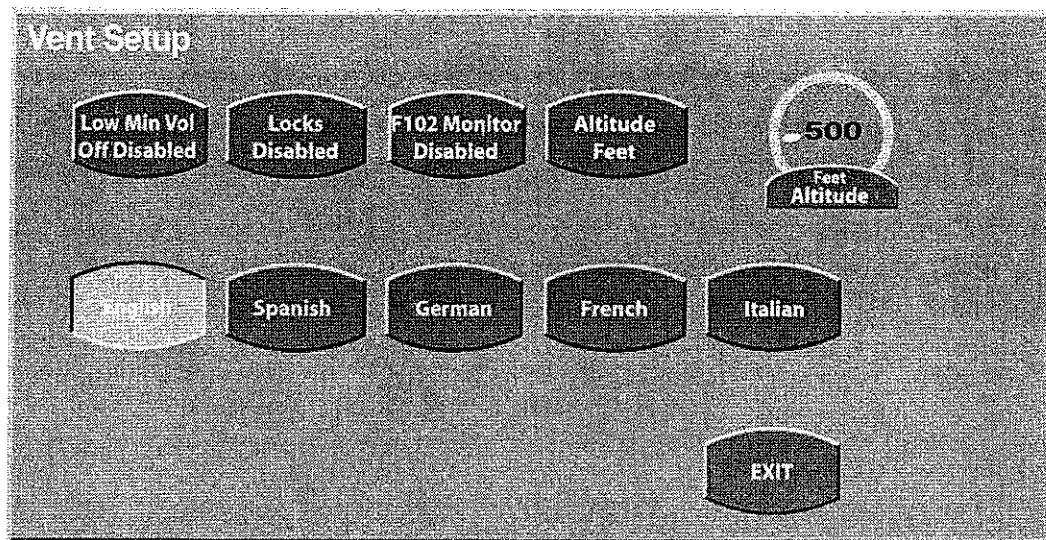

Figure 4.16 Press Vent Setup icon

Figure 4.17 Ventilator Setup Screen

Low Min Volume Off

There are two ranges possible for the Low Minute Volume Alarm. They are OFF to 99.9 liters and 0.1 to 99.9 liters. The Low Min Vol Off Disable/Enable screen icon, allows you to toggle between the two ranges.
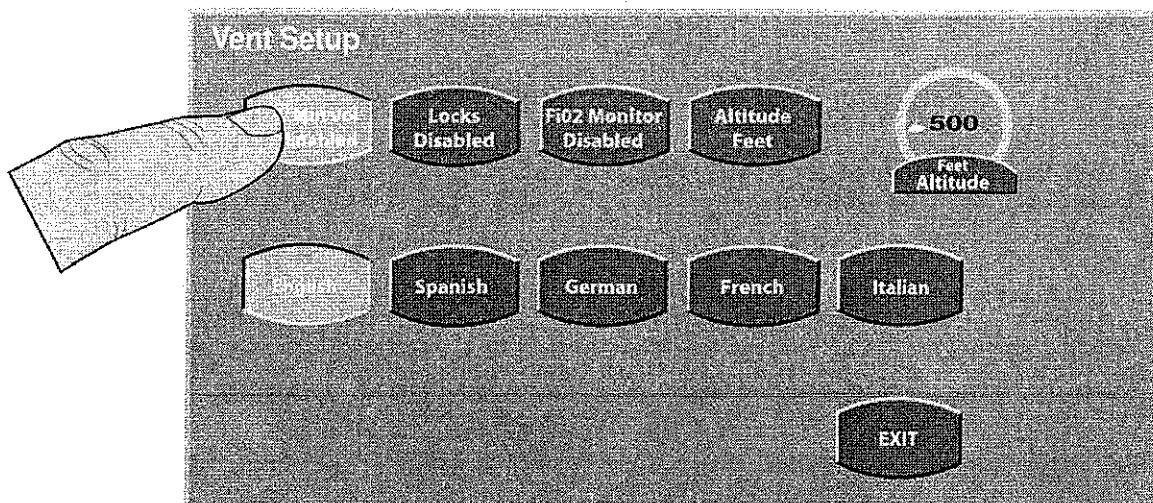

Figure 4.18 Low Min Vol Off Enabled

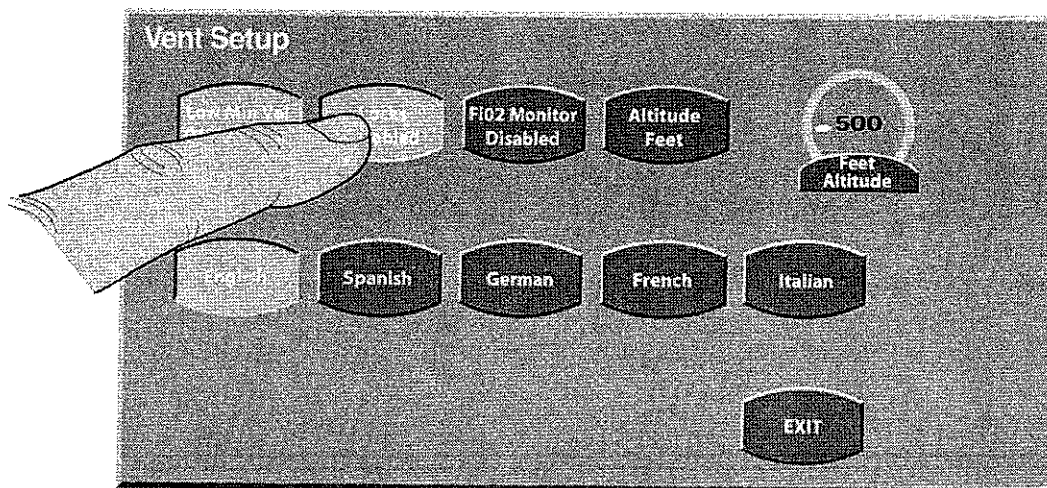## Locks Disabled

Toggles the control Locks on and off.

Figure 4.19 Locks Enable/Disable

FiO2 Monitor Disabled

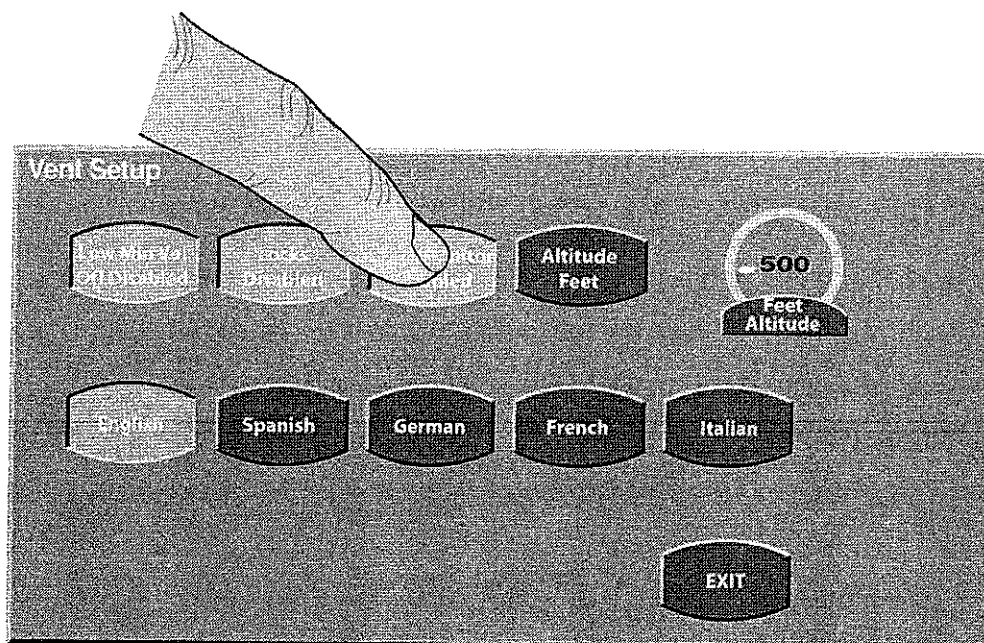Disables or Enables the FiO2 Monitor Function.

Figure 4.20 Monitor enable/disable

Altitude Adjustment

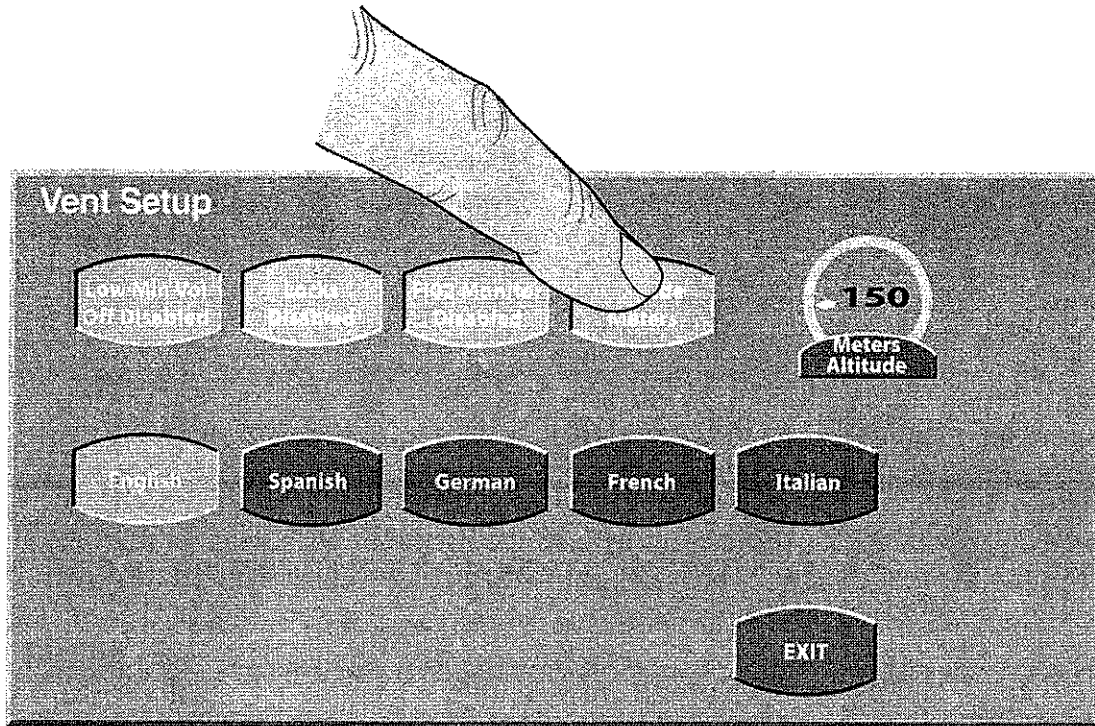Allows for adjustment of altitude in feet or meters above sea level.
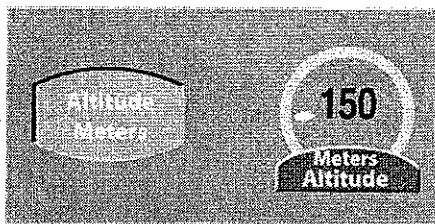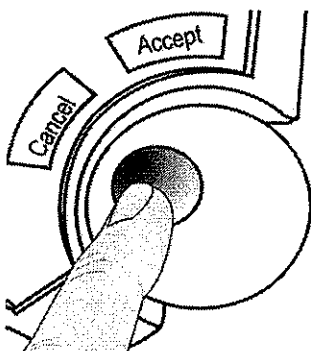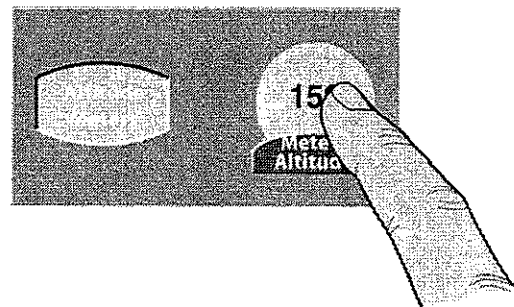

Figure 4.21 Altitude feet/meters

Figure 4.22 Altutude in Meters

The Altitude screen icon toggles between Feet and Meters and the selection is reflected in the control label (see figure 4.22)

To adjust the value, select the control,

then adjust using the data dial.

Language Selection

A choice of 5 languages is available (see figure 4.23). Select a language by pressing the appropriate screen icon. Press EXIT to leave the Ventilator Setup screen and return to the Extended Functions screen
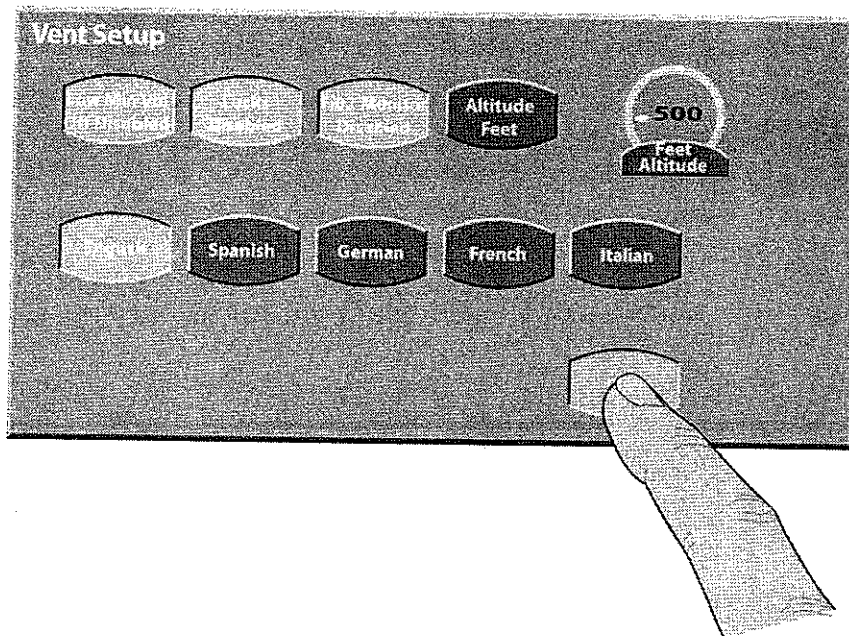

Figure 4.23 Exit Ventilator Setup

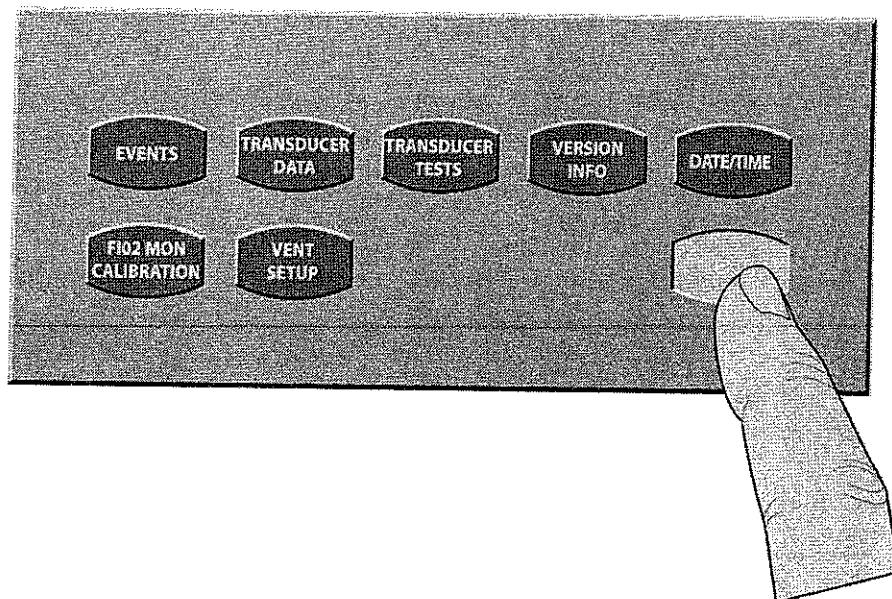Press EXIT again to exit the Special Functions menu

Figure 4.24 Exit Special Functions

The ventilator will begin operation at previously selected settings.

Set up the patient and ventilator operational settings per the instructions your Operator's Manual.

TESTING THE VELA

Verification tests

1. Before attaching the Vela to a new patient, perform the following Operational verification checks.

2. Turn on the Vela, choose New Patient and Accept. This will return all settings to the defaults.

3. To check monitor performance, allow the ventilator to operate for two minutes. View the monitored parameters. The values should appear as follows:

Parameter	Value
Minute volume	6 L + 1.2 L
Tidal Volume	500 ml + 100 ml
I:E Ratio	1:6.1 + 10%
Breath Rate	12 bpm + 2 bpm
PIP	Should equal manometer display + 5 cmH2O
MAP	N/A
PEEP	5 cmH2O + 2 cmH2O
Inspiratory Time	0.68 seconds + .05 seconds

3. Check the alarms as follows:

    a. Power Fail Check

        i. Remove the power cord from the wall. The ventilator should do the following:

1. Switch to battery power.
2. Sound the audible alarm.
3. Turn the AC Power Source indicator OFF.
4. Display the BATTERY ON message in the alarm window.
5. LED for internal battery will light.

        ii. Press the Alarm Reset button to clear the alarm.

        iii. Plug the AC power cord back into the wall socket.

    b. High Pressure Limit Check

        i. Lower the High Pressure Alarm setting to 5 cmH2O below the Peak Inspiratory Pressure (PIP). When the ventilator cycles to inspiration and the high pressure limit is violated, the high pressure alarm should occur. When this happens the ventilator should:

6. Immediately cycle into the expiratory phase.
7. Sound the audible alarm.

8. Display the HIGH PRES message in the alarm window.

    ii. Return the High Pressure Alarm setting to 5 cmH2O above PIP, and press the Alarm Reset button to clear the alarm.

This completes the performance check. The following Ventilator Performance Checklist may be used to document each Performance Check for your records.