ADDENDUM
FOR THE BRONCHOTRON® TRANSPORT F00038-2
High Frequency Percussive Ventilator
The Monitron® is totally independent of the Sinusoidal Brochotron® Transport functions, and any display failure within the Monitron® has no effect to the performance of the device.

**The Universal Monitron provides:**
- A Digital Multimeter.
- Audible indicator for failure to maintain a proximal airway pressure rise.
- An educational means of demonstrating unique programmable functions.

The Disconnect Audible Alarm is activated by the manual ON/OFF Switch. Failure to turn the switch off upon purposeful disconnect will result in an audible indication.

This device is powered by 9 volt battery for the disconnect alarm.

**NOTE**

*To ensure correct atmospheric pressure calibration at start up, remove batteries, wait 30 seconds and re-install. Allow 15 seconds for power on self test. When screen goes blank, the multimeter can be installed into the Bronchotron device.*
The Percussionaire® Digital Multimeter (PDM) installed on the Bronchotron Transport

The Percussionaire Digital Multimeter PDM has six different operating modes: Post, Wake, Active, Report, Sleep, and Fault.

1. The (POST) “Power-on self test” mode is active for 15 seconds after the batteries are installed and displays the System Information page (e.g., serial #, revision, etc.) and performs a Power-On Self-Test.

2. The Wake mode is active for the first 15 seconds of use. If usage is stopped within 15 seconds, the PDM enters Report mode and displays the session duration of the last usage. A bar graph gives a visual indication of elapsed time during the Wake mode phase.

3. In Active mode the PDM measures the pressure, computes the parameters and displays them on the display.

4. In Report mode, a page with the Session Timer and Total Usage Time are displayed, alternating with the System Information page.

5. In Sleep mode, the LCD display is off, but the PDM continues to measure the pressure at the measuring port. If the PDM senses the preset startup pressure, it becomes active.

6. The Fault mode displays the Fault page.

NOTE

A Low Battery indicator is displayed when battery capacity is estimated to be low.

The PDM has a USB serial port that is used for manufacturing, calibration, and firmware upload. It is not enabled during normal operation.

Pull up to remove both tabs
**NOTE**

To ensure correct atmospheric pressure calibration at start up, remove batteries, wait 30 seconds and re-install. Allow 15 seconds for power on self test. When screen goes blank, the multimeter can be installed into the Bronchotron device.

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1. **Power-On Self-Test (POST) Mode**

When batteries are installed in a system, the Percussionaire Digital Multimeter (PDM) software displays the software revision, battery voltage, total usage time and serial number for 15 seconds. This **Start-Up** mode allows the software to perform additional tests on the hardware that are part of the Power-On Self-Test (POST). If any errors are detected in the POST, the PDM enters the **Fault** mode. (See page 16, #6 Fault Mode.)

The POST checks require that the measurement port be left disconnected and exposed to the atmosphere for the entire duration.

**NOTE**

Do not install PDM until the POST test is complete and the screen is blank, indicating Sleep Mode.
2 Wake Mode

To wake up the PDM, ensure the ventilator pressure is greater than 2.5 cmH₂O or 2 hPa at the Phasitron® patient delivery port for more than 1 second.

PDM remains on for the first 15 seconds, showing bar-graph timer.

If usage is stopped within 12 seconds, the PDM enters Report mode.

After 15 seconds, the current session continues counting from 16 seconds which turns into Active mode.

See below for PDM display screens in Wake mode

![Display Screens](image)

NOTE

Display numbers are for reference only.

3 Active Mode

**Model:** SBRO

**Device:** Sinusoidal & Transport Bronchotron®

**Display metrics:** Pulse Frequency Rate, Mean Airway Pressure, Dynamic Pressure (AIP) and (AEP), Usage Timer, Pulse Amplitude Bar Graph.

Mean Airway Pressure (MAP) averages pulse amplitude over 5 sec. At 100 samples per second, this is an average of 500 measurements. Above the MAP is a Dynamic Pressure which changes between Average Inspiratory Pressure (AIP) and Average Expiratory Pressure (AEP) as the Bronchotron cycles. Range: 0 – 99 cmH₂O/hPa.
Report Mode

**NOTE**

*Represents an estimate of pressure in the lung (after resistance of ET tube etc).*

- 100 measurements per second at Phasitron®. Time duration of the average depends on time duration of pulsatile flow or O/CPAP.

Pulsating grey color represents AIP.
Solid black shows PEEP, only when adding peep with PEEP valve.

*NOTE*

When the Percussionaire® ventilator is turned off, the measurements will drop to zeros after a few seconds.
5 **Sleep Mode**

In **Sleep** mode, the LCD is off but the microcontroller continues to sample and calculate the pressure at the measuring port 5 times a second. Over any 3 second period, if the pressure is greater than 2.5 cmH\(_2\)O or 2 hPa at the Phasitron® patient delivery port, for more than 1 second, the PDM enters the **Wake** mode.

![Blank screen, indicating PDM sleep mode.](image)

6 **Fault Mode**

The PDM displays an error message on the LCD stating “Contact Factory for Service” and stays in this mode until both batteries are removed. The displayed information includes the software revision, PDM serial number, the Total Usage Time and an error code for the exclusive use of the factory.

![System Failure Contact Factory For Service](image)

Pressure faults are triggered by a continuous pressure of more than 150 cmH\(_2\)O for more than 5 seconds during **Wake** and **Active** modes.
In all other modes, the software continuously monitors the hardware for errors, as well as verifying that each data sample has a valid value. If an error is detected, the software logs the error and reboots the processor, which would cause it to recover from a transient error. After reboot, the processor returns to the same mode it was in before the reboot. If more than one error is detected in any 10 second period, it is considered a fatal error and the software enters **Fault** mode.

**NOTE**

If system failure screen is displayed, remove batteries for 30 seconds. Replace batteries (note that positive terminals face same direction) and wait 30 seconds until the screen turns off. If POST check runs correctly, PDM may be used. If system failure screen recurs, contact Percussionaire Corporation for factory service.

**Fault Logging**

The software keeps track of several types of hardware and data faults. All faults are logged in the microcontroller’s memory and are retained even if the batteries are removed. If multiple faults happen within 10 seconds of each other, the PDM stops normal operation and enters **Fault** mode. In this mode, a subset of the collected fault information is displayed on the LCD. This data is intended for manufacturing and repair use only.

The user can exit the **Fault** mode by removing and replacing the batteries. This resumes normal operation of the PDM, but does not erase the faults stored in memory or fix the problem that caused the fault.

**Fault Detection**

The PDM has both hardware and software **fault detection**. This is a dedicated hardware “watchdog” that runs on an independent clock source and can continue to operate even if the **main** microprocessor’s clock fails or the **micro-controller** pauses in any way. The **Independent fault detection** is reset each time a valid pressure reading (free of hardware and software errors) is obtained.

In addition to the hardware **fault detection**, the software also implements a **fault-detection** watchdog. This “watchdog” detects if a software task fails to complete within the specified time, logs an error and resets the processor.
Changing Batteries:
Press on the Multimeter’s bezel and twist counter clockwise approximately 20 degrees.

1. Gently pull on the Multimeter to remove it from the housing.
2. Remove the two old batteries.
3. Install the two new batteries. Note that the positive terminals face the same direction. Wait 30 seconds until screen turns off.
4. Install the Multimeter back into the housing and twist clockwise until the stop is felt.
5. See instructions section 1 on page 5 POST mode, to verify display operation.

NOTE
Clean Multimeter when visibly soiled, or according to facility protocols. Do not spray any type of cleaner on to the Multimeter. We recommend cleaning the glass with a product or chemical approved for cleaning glass only. When cleaning outer bezel, use a moist cloth with warm soapy water. Use of cleaning methods not outlined in these instructions will cause damage to the multimeter.

NOTE
The cell used in this device may present a risk of fire or chemical burn hazard if mistreated. Do not recharge, disassemble, heat above 100°C (212°F) or incinerate. Replace cell with type recognized CR123A only, or Percussionaire® Part # B13350. Use of another cell may present a risk of fire or explosion. Dispose of in accordance with appropriate regulations, country, local, and state laws.
The Bronchotron® Transport gives clinicians a rugged and portable option for Flow Ventilation®. This pneumatic device uses a Phasitron® and runs with a single oxygen cylinder, or from a standard high flow blender with a gas consumption of 15 LPM. It does not depend on electrical power and has a built-in Universal Monitron® for real-time pressures and alarms.

Accessories

Phasitron Kit
A50605-D

Single Patient use only.
## Technical Specifications

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phasitron kit</td>
<td>A50605-D</td>
</tr>
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### Settings

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percussion frequency</td>
<td>200 - 800 pulses per minute</td>
</tr>
<tr>
<td>Pulse/interval ratio</td>
<td>Adjustment from 1:1 to 1:2 Automatic</td>
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</table>

### Operating Conditions

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating range</td>
<td>Temp., 0° C to 49° C (32° F to 120° F), humidity 5%-95%, Elevation 0-14000 ft</td>
</tr>
<tr>
<td>Storage and transport range</td>
<td>Temp., -40° C to 60° C (-40° F to 140° F), humidity &lt;93% non-condensing</td>
</tr>
<tr>
<td>Battery types</td>
<td>Multimeter uses (2) CR123A battery, Monitron Alarm uses 9v</td>
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</tbody>
</table>

### Run time

- Continuous

### Display/Output

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway pressure</td>
<td>Digital display, 0 to 150 cmH₂O</td>
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<tr>
<td>Pulse frequency</td>
<td>Digital display, 50-999 cycles/minute</td>
</tr>
<tr>
<td>Average Inhalation Pressure (AIP)</td>
<td>Digital display</td>
</tr>
</tbody>
</table>

### Alarm

- Audible indicator (Pneumatic Pressure failsafe) w/ Pressure Relief

### Gas Source

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen</td>
<td>50 - 60 PSI</td>
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<tr>
<td>Consumption</td>
<td>15 LPM</td>
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### Filters

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Red line filter</td>
<td>Hydrophobic</td>
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### Dimensions/Weights

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Dimensions (WxHxD)</td>
<td>19&quot; x 15&quot; x 7&quot;</td>
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<tr>
<td>Weight</td>
<td>13.8 lbs</td>
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</table>

### Service life

- Overhaul every 3 years from date of delivery.