



**PERCUSSIONAIRE®  
CORPORATION**

## **ADDENDUM**

**FOR THE BRONCHOTRON® TRANSPORT F00038-2  
High Frequency Percussive Ventilator**



# New Universal Monitron



New Universal Monitron



Previous version  
Universal Monitron

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



Digital Multimeter

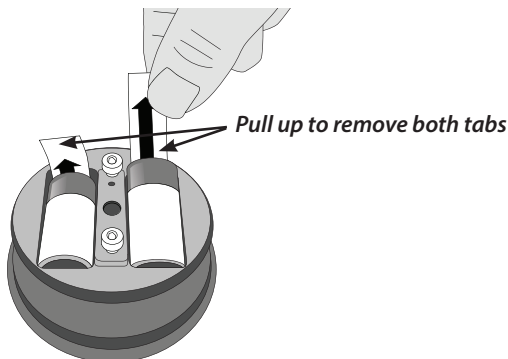
*The Percussionaire Digital Multimeter PDM has six different operating modes : Post, Wake, Active, Report, Sleep, and Fault.*

- 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.

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

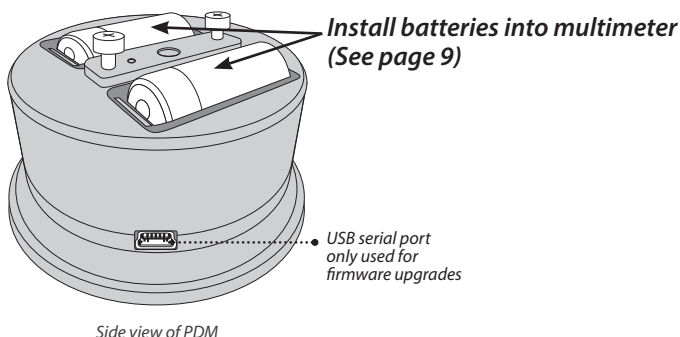
### NOTE

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



## 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.



## 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.)

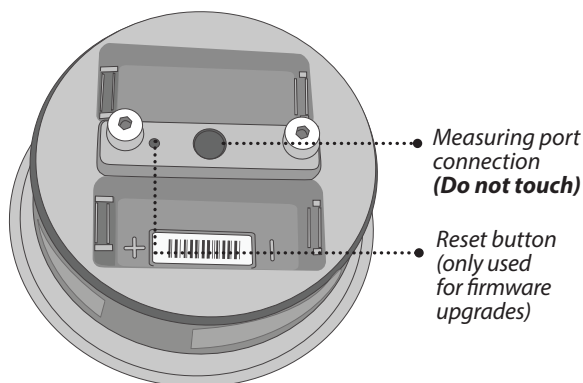
The POST checks require that the measurement port be left disconnected and exposed to the atmosphere for the entire duration.

## NOTE

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

```
Percussionaire  
Digital Multimeter  
(C) 2014, RDI  
Bat: 3.05V  
Total Time: 23,075h 27  
Code Rev: 2.XX  
Serial #: 2140604-001
```

System Information display



Rear view of PDM

## 2 Wake Mode

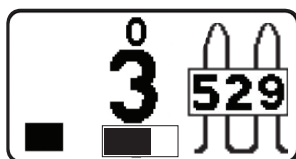
To wake up the PDM, ensure the ventilator pressure is greater than 2.5 cmH<sub>2</sub>O or 2 hPa at the Phasitron® patient delivery port for more than 1 second.

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



*SBRO: Sinusoidal & Transport  
Bronchotron®*

### 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.

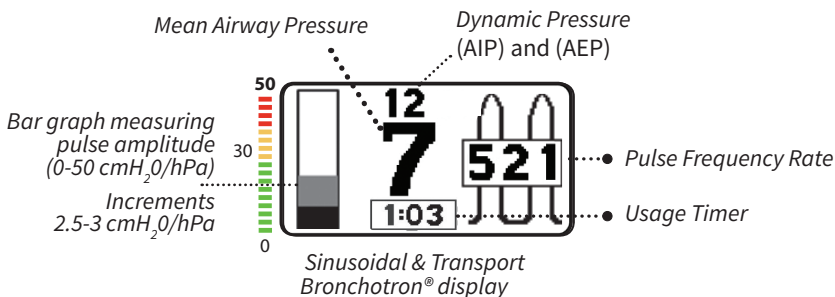
Mean Airway Pressure (MAP) averages pulse amplitude over 5 sec. At 100 samples per second, this is an average of 500 measurements. Above the MAP is a Dynamic Pressure which changes between Average Inspiratory Pressure (AIP) and Average Expiratory Pressure (AEP) as the Bronchotron cycles. Range: 0 – 99 cmH<sub>2</sub>O/hPa.

## 4 Report Mode

### NOTE

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

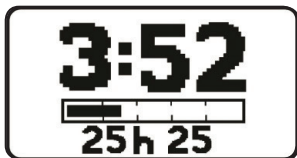
• 100 measurements per second at Phasitron®. Time duration of the average depends on time duration of pulsatile flow or O/CPAP.



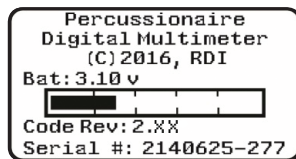
Pulsating grey color represents AIP.

Solid black shows PEEP, only when adding peep with PEEP valve.

(A)



(B)



(C)



### NOTE

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

## 5 Sleep Mode

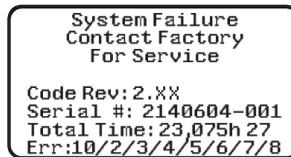
In **Sleep** mode, the LCD is off but the microcontroller continues to sample and calculate the pressure at the measuring port 5 times a second. Over any 3 second period, if the pressure is greater than 2.5 cmH<sub>2</sub>O or 2 hPa at the Phasitron® patient delivery port, for more than 1 second, the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



*Blank screen, indicating PDM sleep mode.*

## 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.



Pressure faults are triggered by a continuous pressure of more than 150 cmH<sub>2</sub>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 Monitor® for real-time pressures and alarms.

## Accessories

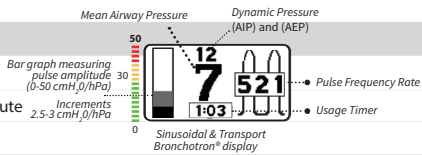
### Phasitron Kit A50605-D



Single Patient use only.

Technical Specifications

Accessories	Part No.
Phasitron kit	A50605-D
Settings	Specifications
Percussion frequency	200 - 800 pulses per minute
Pulse/interval ratio	Adjustment from 1:1 to 1:2 Automatic
Operating Conditions	Specifications
Operating range	Temp., 0° C to 49° C (32° F to 120° F), humidity 5%-95%, Elevation 0-14000 ft
Storage and transport range	Temp., -40° C to 60° C (-40° F to 140° F), humidity <93% non-condensing
Battery types	Multimeter uses (2) CR123A battery, Monitron Alarm uses 9v
Run time	Continuous
Display/Output	Specifications
Airway pressure	Digital display, 0 to 150 cmH <sub>2</sub> O
Pulse frequency	Digital display, 50-999 cycles/minute
Average Inhalation Pressure (AIP)	Digital display
Alarm	Indication
Airway pressure	Audible indicator (Pneumatic Pressure failsafe) w/ Pressure Relief
Gas Source	Specifications
Oxygen	50 - 60 PSI
Consumption	15 LPM
Filters	Description
Red line filter	Hydrophobic
Dimensions/Weights	Specifications
Dimensions (WxHxD)	19" x 15" x 7"
Weight	13.8 lbs
Service life	Overhaul every 3 years from date of delivery.





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