PERCUSSIONAIRE®

# Impulsator®
# User Manual


## Home Care
## TRUE-IPV® Therapy Device

EN

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The devices and products contained in this manual may be covered by one or more patents.

This manual was originally released and supplied in English.
For a list of available translations, contact customerservice.us@sentec.com.

The Impulsator should be operated and serviced only by trained professionals. Sentec's sole responsibility with respect to its ventilators, accessories, components, and software, and their use, is as stated in the warranty provided in the manuals. The information set forth herein is believed to be accurate; it is not a substitute for the exercise of professional judgment.

## Table of Contents

# 1. Introduction

This chapter provides an overview of the Impulsator® device and TRUE-IPV® therapy.

## Intrapulmonary Percussive Ventilation (IPV®)

Designed specifically for non-continuous home and institutional use, the Impulsator® is a pressure-limited, flow-interrupted, and time-cycled ventilator which delivers TRUE-IPV® therapy, a modality of mechanical ventilation, "Intrapulmonary Percussive Ventilation." The Impulsator delivers high-frequency percussive pulses approximately 60-400 cycles per minute. These high-frequency percussive pulses ramify throughout the airways and alveolar ducts, augmenting diffusive ventilation in the gas exchange regions of the lungs, allowing airway clearance and lung recruitment.

The Impulsator® system also supplies a dense aerosol mist that is delivered into the lungs during therapeutic percussion, serving to reduce the adhesive and cohesive forces of retained airway secretions.

### Impulsator® Control Functions

**i:e RATIO**

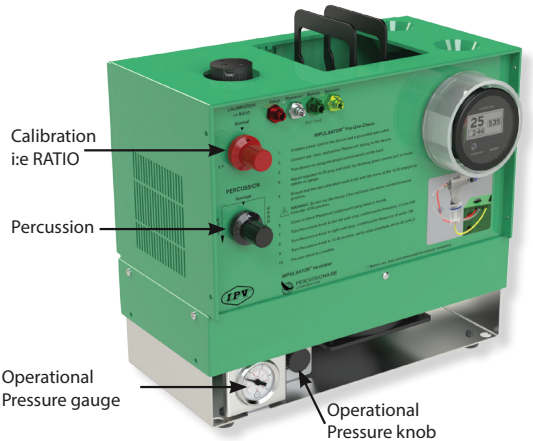
Used to adjust i/e percussion ratios. Kept in 12:00 position for patient use.

**Percussion**

Determines frequency of delivered breaths.

**Operational Pressure**

Determines amplitude of percussive subtidal breath deliveries.



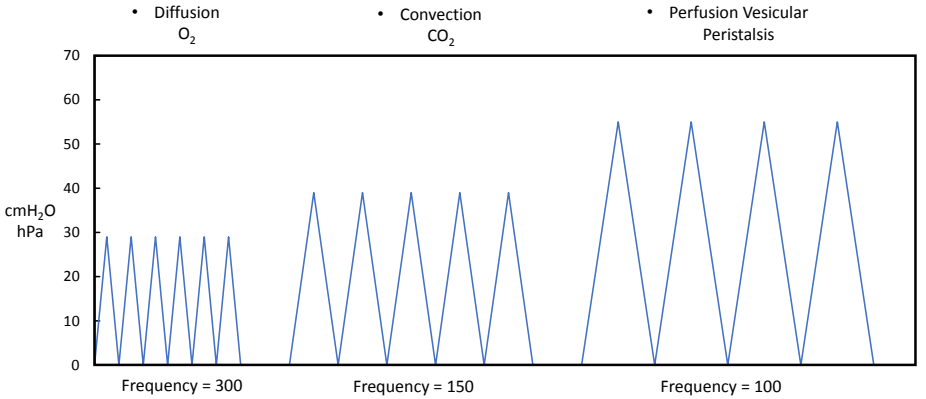


On/Off Switch


Power Plug

The Impulsator® home care device provides intrapulmonary percussive ventilation either invasively, through an artificial airway, or non-invasively, by mouthpiece or mask.

## Three Components of TRUE-IPV®




| f=300 | f=150 | f=100 |
|---|---|---|
| Percussive Mechanical Mixing Diffusion | Percussive Convective Ventilation with Diffusion | Percussive Perfusion Vesicular Peristalsis |

## Effects of TRUE-IPV®


The effects of TRUE-IPV® therapy occur with or without the cooperation of the patient.

TRUE-IPV® provides a percussive, subtidal gas exchange within the respiratory bronchioles with associated alveolar recruitment, maintaining a minimal mean intrathoracic expiratory pressure increase for peripheral lung stabilization. This allows for mechanical ventilation to provide for peripheral lung recruitment while minimizing the potential for induced barotrauma.

# 2. Intended Use

## Indications for Use

The Impulsator® is indicated for mobilization of secretions and raising of endobronchial secretions, bronchodilation, reducing mucosal edema, and the resolution of diffuse patchy atelectasis.

## Patient Population

The Impulsator® is for use on patient populations from pediatric through adult.

## Absolute Contraindications

| | |
|---|---|
| • Untreated tension pneumothorax | • Untrained or unskilled operator |

## Relative Contraindications

| | |
|---|---|
| • History of pneumothorax | • Lack of patient cooperation |
| • Recent pneumonectomy | • Vomiting |
| • Pulmonary hemorrhage | • Pulmonary air leak (without functioning chest tube) |
| • Myocardial infarction | |

## Possible Adverse Reactions

| | |
|---|---|
| • Decreased cardiac output | • Increased intracranial pressure |
| • Pneumothorax | • Increased air trapping |
| • Hyper-oxygenation | • Pulmonary air leak |
| • Pulmonary hemorrhage | • Hyperventilation |
| • Gastric distension | |

## Physiological Benefits of TRUE-IPV®

| | |
|---|---|
| • Recruitment of atelectatic lung | • Mechanical bronchodilation |
| • Improved FRC | • May Improve breathing pattern |
| • Decreased work of breathing | • Increased secretion mobilization |

## Clinical Limitations/Restrictions

Use of the Impulsator® is limited to patients, caregivers, respiratory therapists/clinicians who have received proper training and who have read and understand this manual.

⚠ WARNING: When used on a patient with an artificial airway (i.e., endotracheal or tracheostomy tube), a clinician must be present so that a one-to-one relationship exists. These devices enhance secretion clearance. Patients must be assessed pre- and post-treatment for a reduced vital capacity/FRC or the need for assistance in clearing airway secretions.

⚠ WARNING: Because pulmonary alveoli cannot be ventilated when their transmitting airways are obstructed, suction should be performed as necessary.

**NOTE:** *A **WARNING** icon indicates a risk of injury to patient or operator.*
*A **CAUTION** icon indicates a risk of equipment damage.*

## Document Symbols

| | | | |
|---|---|---|---|
| ⚠ | WARNING | | Type BF Applied Part |
| ⚠ | CAUTION | | Single Patient - Multiple Use |
| | Read the manual before use | Rx Only | Prescription Only |
| | Manufacturer | REF | Catalog Number |
| | Manufacture Date | LOT | Lot Number |
| NON STERILE | Non-Sterile | LATEX | Not Made with Natural Rubber Latex |
| PHT DEHP DIBP DBP BBP | Does Not Contain the Phthalate Plasticizers DEHP, DIBP, DBP, or BBP | | Disposal |

# 3. Setup

## Impulsator® Controller

Place the Impulsator® controller on the table or floor, in a place with good unrestricted airflow. Make sure the controller is away from curtains, sheets, bedspreads, or anything that might block the vents and airflow.

Plug the male end of the power cord into the back of the controller. Plug the male end of the power cord into a wall outlet.

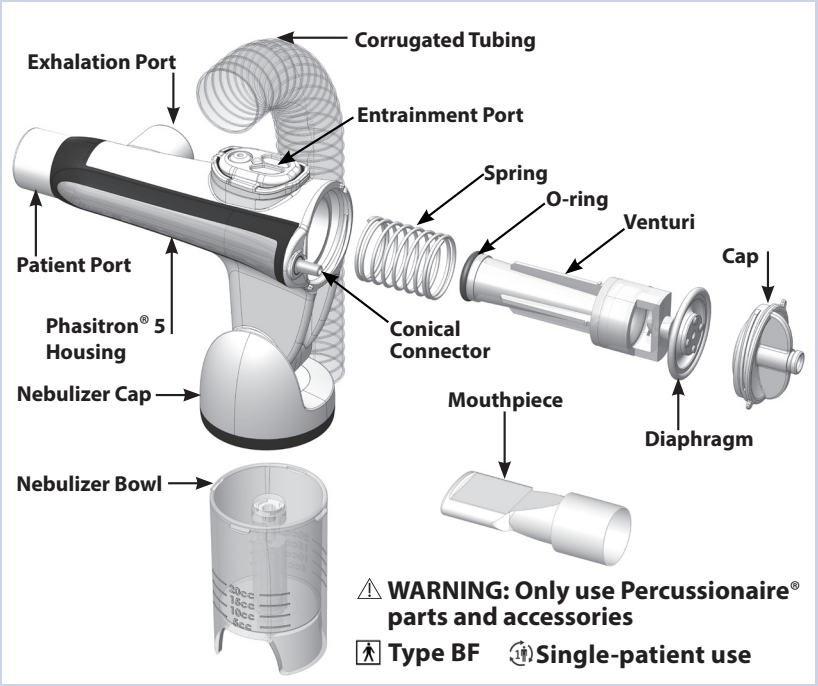
## Phasitron®5 Breathing Circuit Setup

The patented Phasitron® 5 with unique sliding venturi is an open system that dynamically responds to the resistance and compliance of the patient lung during therapy.

Only use Sentec accessories designed specifically for use with the Impulsator device. Performance is not guaranteed with any third-party equipment.

NOTE: *TRUE-IPV® therapy can only be achieved using the Phasitron®5.*

## Phasitron®5 Diagram

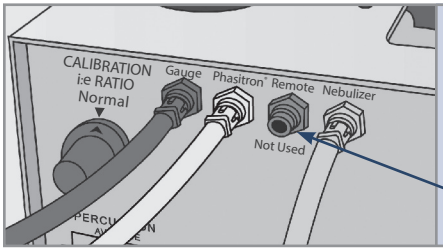



## Configurations

Phasitron®5 kit can be used with or without a mouthpiece or standard mask (as shown below). Connection sizes: 15mm ID or 22mm OD.


| Phasitron®5 without mouthpiece or mask | Phasitron®5 with mouthpiece (included) | Phasitron®5 with face mask (sold separately) |
|---|---|---|

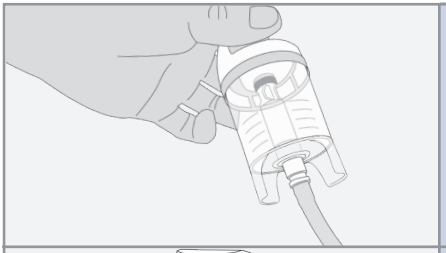
## Connecting to the Impulsator®



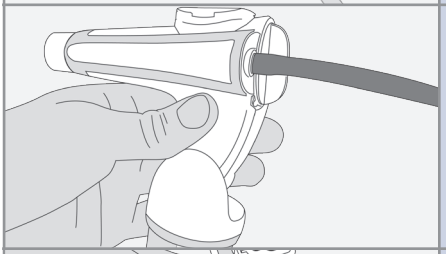

Connect red, clear, and yellow tubing connectors to the Impulsator® Model F00012 controller device.

⚠ **WARNING:** Green REMOTE connector is a vent; do not obstruct.

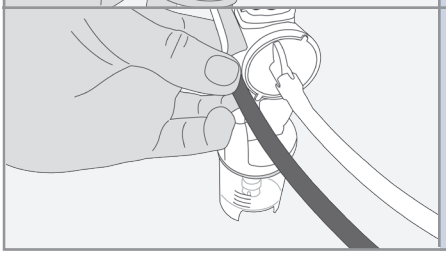
## Connecting the Tubing Harness to the Phasitron®5



Connect yellow tubing quick-connect fitting to nebulizer bowl.

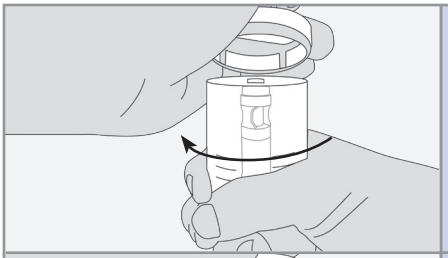


Press red tubing onto conical connector at rear of Phasitron® 5 body.

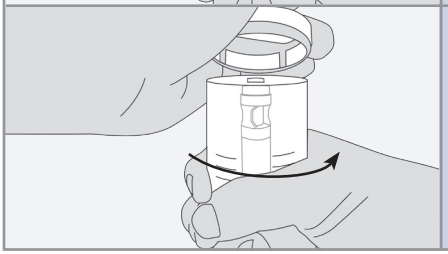


Connect the clear tubing quick-connect fitting to the cap at the rear of the Phasitron® 5 body.

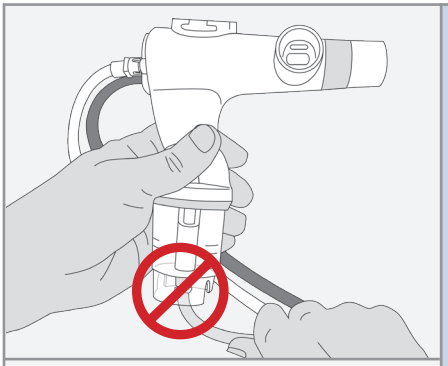
## Adding Saline, Sterile Water, or Medication



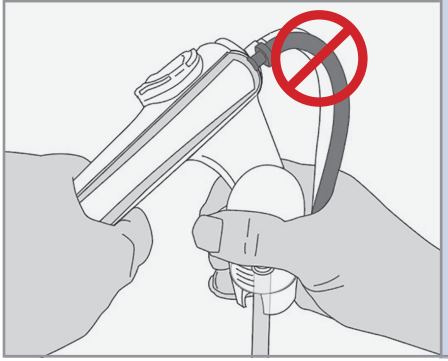
Twist clockwise to open nebulizer bowl. Add prescribed amount.



Reverse to close.



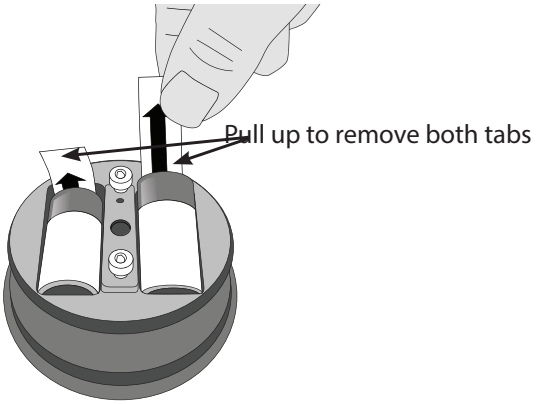
⚠ CAUTION: Ensure yellow nebulizer tubing is not bent. This may cause undue stress on connector.



⚠ CAUTION: Do not bend nebulizer bowl while holding the tubing. This may cause undue stress on the red line conical connector.

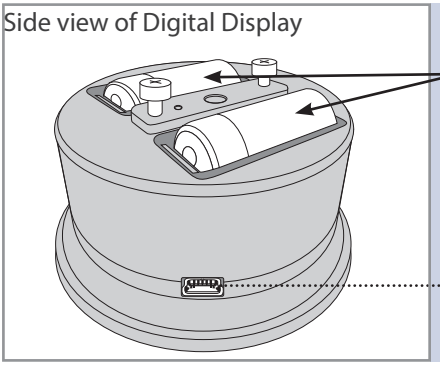
## Digital Display Setup

NOTE: *To access battery pull tabs, turn the digital display counterclockwise and remove from Impulsator® device.*




NOTE: T*o ensure correct atmospheric pressure calibration at start up, remove batteries, wait 30 seconds and reinstall. Allow 15 seconds for power-on self-test. When screen goes blank, the digital display can be installed into the device.*

Side view of Digital Display




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

## Changing Digital Display Batteries

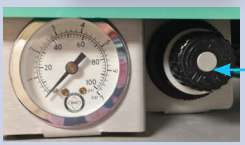
| | |
|---|---|
| 1. | Press on the digital display's bezel and twist counterclockwise approximately 20 degrees. |
| 2. | Gently pull on the display to remove it from the housing. |
| 3. | Remove the two old batteries. |
| 4. | Install two new batteries. Note that the positive terminals face the same direction. Wait 30 seconds until screen turns off. |
| 5. | Install the digital display back into the housing and twist clockwise until the stop is felt. |
| 6. | See instructions on Power-On Self-Test (POST) Mode section, to verify display operation. |

**NOTE:** *Do not install digital display until the POST check is complete and the screen is blank, indicating Sleep mode.*

 A Low Battery indicator is displayed when battery capacity is nearing depletion.

# 4. Controller Functions

## Knob, Switch, Gauge

| Knob, Switch, Gauge | Function |
|---|---|
|  | The red **CALIBRATION** knob is kept in the 12:00 position (straight up). |
|  | The **PERCUSSION** control knob adjusts frequency of pulses at a fixed i:e ratio.<br>Controls the rate of high-frequency pulses. |
|  | The Operational Pressure knob controls the peak operating pressure of the entire unit. |
|  | The Operational Pressure gauge shows the operating pressure of the entire unit. |
|  | The digital display has six different operating modes: POST, Wake, Active, Report, Sleep, and Fault. See Digital Display section for detailed information on each mode. |
|  <br>  | The device uses an inner white felt filter and an outer gray/black foam filter. The filters must be in place at all times when the device is operating.<br>⚠ **CAUTION:** The foam inlet filters are required to protect the ventilator from dirt and dust. Wash both filters periodically. Replace every six months, or when damaged, for proper operation. |

## Digital Display

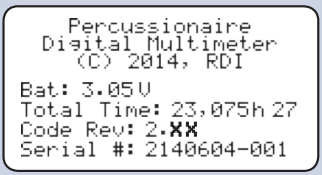

The digital display has six different operating modes: POST, Wake, Active, Report, Sleep, and Fault.

## Power-On Self-Test (POST) Mode

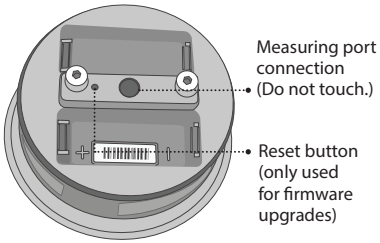
When batteries are installed in a system, the digital display software displays the software revision, battery voltage, total usage time and serial number for 15 seconds. This Start-Up mode allows the software to perform additional tests on the hardware that are part of the Power-On Self-Test. If any errors are detected in POST, the digital display enters the Fault mode (see Fault Mode section).

**NOTE:** *Do not install digital display until the POST check is complete and the screen is blank, indicating Sleep mode.*

System Information Display




Rear view of digital display



## Wake Mode

To wake up the digital display, ensure the ventilator pressure is greater than 2 $cmH_2O$/hPa at the Phasitron® 5 patient delivery port for more than 1 second, with patient port blocked.

The digital display remains on for the first 15 seconds, showing the Bar-Graph timer. If usage is stopped within 12 seconds, the digital display enters Report mode. After 15 seconds, the current session continues counting from 16 seconds, which turns into Active mode.


The digital display display screen in Wake mode

**NOTE:** *Display numbers are for reference only.*

**Model:** Home IPV
**Device:** Impulsator®
**Display Metrics:** Pulse Frequency Rate, Pulse Amplitude Pressure

## Active Mode


Home IPV: Impulsator® Display

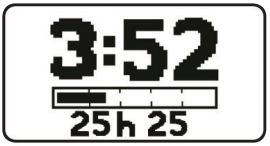
At 16 seconds, the digital display enters Active mode. The timer bar will change to a numeric display, showing the current usage Session Timer. Above the timer reading is the pulse amplitude display. This is calculated from the pressure measurements at the moment of instantaneous peak and trough amplitude, averaged over 5 seconds. The Active mode display also shows the currently measured percussion rate/pulse frequency.

The digital display displays the usage Session Timer in minutes and seconds. The Session Timer is the total time of the current usage. The Session Timer can display a maximum of 59 minutes and 59 seconds. If usage has been stopped for more than 5 minutes, the Session Timer will reset and start over.

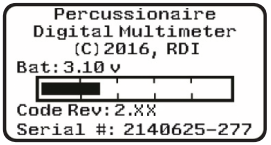
**NOTE:** *To display the most recent usage duration time, see Report mode.*

## Report Mode

A.



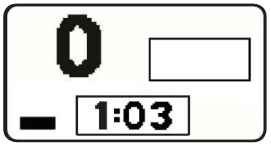

B.




C.


The Session Timer and the Total Usage Timer (A) are displayed for 2 seconds, followed by the System Information page (B) for 2 seconds, alternating. The alternating page display continues for 5 minutes, or until usage resumes and the digital display enters Active mode.

During the 5-minute period, a horizontal bar graph indicates the time by moving from left to right at a fixed rate. After 5 minutes of no usage, the system information page is no longer displayed, and the time display flashes (2 seconds on, 2 seconds off) (C) for an additional 25 minutes. The digital display enters Sleep mode after 25 minutes.



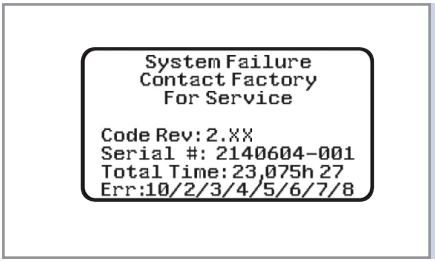

When the Impulsator® is switched off, the measurements drop to zero after a few seconds

## Sleep Mode

Blank Screen – digital display 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 $cmH_2O$ or 2 hPa at the Phasitron® 5 delivery port, for more than 1 second, the digital display enters the Wake mode.

## Fault Mode




The digital display 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, digital display serial number, the total usage time and an error code for the exclusive use of the factory.

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. Rebooting causes 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:** *Pressure faults are triggered by a continuous pressure of more than 150 cm$H_2O$ for more than 5 seconds during Wake and Active modes.*

**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, digital display may be used. If System Failure screen recurs, contact an authorized Percussionaire® service center.*

## 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 digital display 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 digital display but does not erase the faults stored in memory or fix the problem that caused the fault.

## Fault Detection

The digital display 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 microcontroller 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.

## 5. Pre-Use Check

Regularly perform this test before using the Impulsator® TRUE-IPV® device. If the Impulsator® has been stored in conditions outside the operational conditions outlined in the Technical Specifications section of this manual, allow the unit to acclimate for 2 hours before using.

| | |
|---|---|
| 1. | Check that the Impulsator® is clean on the outside and the power cord is in good condition. |
| 2. | Connect power cord to the device and a grounded wall outlet. |
| 3. | Connect Phasitron® 5 and tubing to the device. |
| 4. | Turn device on using electrical control switch on back of device. |
| 5. | Listen for the compressor to start. |
| 6. | Adjust the Operational Pressure knob to 30 psig. |
| 7. | Ensure that the red **CALIBRATION** control knob is set with the arrow at the 12:00 straight-up position (this control should not be adjusted during normal use). |
| 8. | Close Phasitron® 5 patient port using hand or thumb without mask or mouthpiece. |
| 9. | Turn **PERCUSSION** control knob to the left stop; confirm pulse frequency of over 300. |
| 10. | Turn **PERCUSSION** control knob to right stop; confirm pulse frequency of under 100. |
| 11. | Turn **PERCUSSION** control knob to 12:00; verify pulse amplitude above 20 $cmH_2O$. |
| 12. | Occlude the green port with finger and observe that the pulses stop. |
| 13 | Turn device off. |

## 6. General TRUE-IPV® Therapy Protocol for Adults

⚠ **WARNING:** Never run the Impulsator® without liquid in the nebulizer during your treatment. This is required for airway hydration.

| | |
|---|---|
| 1. | The patient should be in an upright comfortable armchair or lying with head and shoulders elevated by pillows. |
| | NOTE: *Patient's gravitational position is not a factor with TRUE-IPV®.* |
| 2. | Connect the Phasitron® 5 kit as indicated on package insert or Phasitron®5 Breathing Circuit section. |
| 3. | Add prescribed medications into nebulizer bowl as directed by physician, to a maximum of 20 ml. If no medications are prescribed, use normal saline or sterile water. |
| 4. | Ensure red **CALIBRATION** knob is at the12:00 position (straight up). |
| 5. | Turn the Impulsator® compressor switch on, rotate the Operational Pressure knob to an operating pressure of 30 psig. |
| 6. | If needed, allow patient to observe and feel pulses on their hand before either connecting to the airway or breathing through the mouthpiece. This will help familiarize the patient with the sensations they will experience during treatment. |
| 7. | When using a mouthpiece, the patient should be instructed to inhale and exhale through the pulses. Most patients will initially allow percussive bursts of air to leak through their nose at the expense of an observable chest movement (wiggle).<br><br>Start to notice the chest movement as the patient exhales through the mouthpiece. Advise the patient to take normal spontaneous breaths through the pulses whenever they desire. The objective is to complete a treatment session of 15 to 20 minutes. Initially, cheek fatigue might result in early termination of treatment. However, this is soon eliminated as the patient gets used to the treatment.<br><br>When a patient has an artificial airway, the process is similar. The patient must be observed for signs of distress. While cheek fatigue is less of a consideration, pauses or breaks may still be necessary for the patient. |
| 8. | The patient should be instructed to keep lips and cheeks tight to avoid nasal air venting. As the patient learns to prevent air from leaking out of the lip seal around the mouthpiece, the **PERCUSSION** control knob arrow can be gradually rotated clockwise toward the 12:00 position (straight up). |

| | |
|---|---|
| 9. | After the ability to prevent leaking of percussive air deliveries from the nose and mouth is learned, the entire percussion frequency band should be scanned by briefly rotating the **PERCUSSION** control knob arrow from easy to hard, back and forth (several times), returning the arrow to the 12:00 position (straight up). This will help raise secretions from the bronchial airways. |
| | NOTE: *Always pay attention to patient comfort.* |
| 10. | The selected source pressure may be increased for effective endobronchial percussion by assessing chest percussion (wiggle). Nominal operating pressure is 30-40 psig. |
| 11. | For prolonged therapy with mechanical airways, etc., additional diluents or medication may be used in the nebulizer, as prescribed by physician. |
| 12. | When treatment is complete, the Impulsator® controller should be turned off. The Phasitron® 5 should be rinsed, cleaned, and stored in the supplied bag until the next treatment. |
| | NOTE: *The Phasitron® 5 is for a SINGLE patient only, to be used multiple times.* |

# 7. Cleaning and Disinfection

## Controller

Clean the controller according to home care/institutional protocols. Always clean between patients, and when visibly soiled. Clean the controller with a clean, lint-free cloth or paper towel moistened with the cleaner. Use only approved cleaners.

⚠ **CAUTION:** Do not spray any cleaning solution directly onto the device.

⚠ **CAUTION:** Do not immerse or allow liquids to access the device.

## Digital Display

Clean the digital display when visibly soiled or according to facility protocols. Do not spray any type of cleaner directly onto the digital display. Percussionaire® recommends 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 digital display.

⚠ **WARNING:** *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 a CR123A only, or Percussionaire® part PRT- B13350. Use of another cell may present a risk of fire or explosion.*

Dispose of in accordance with appropriate regulations, local, state and country.

## Phasitron®5 Breathing Circuit

Cleaning is recommended daily for use of the Phasitron® with home devices.
For Hospital/Institutional use, a daily cleaning of the Phasitron® is optional.
Cleaning instructions are applicable for a single patient using a Phasitron® breathing circuit multiple times between applications.

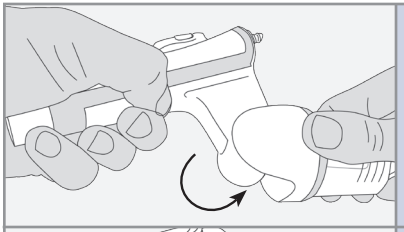
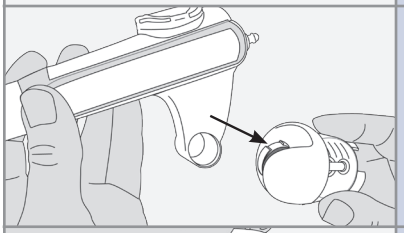
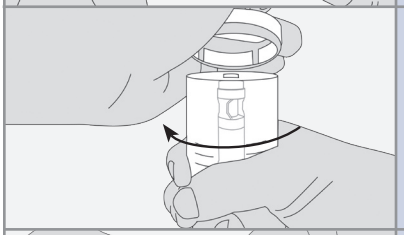
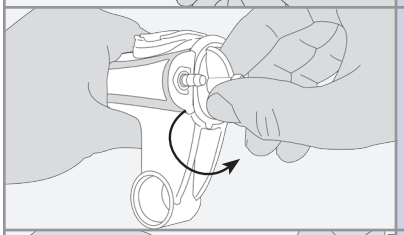
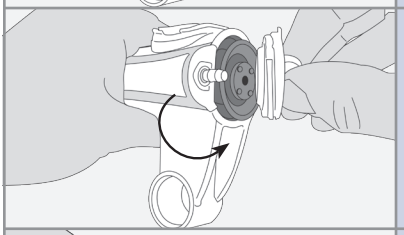
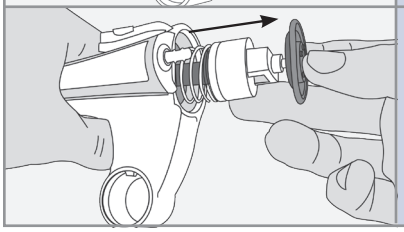
NOTE: If required, proceed to the disinfection procedure prior to reassembly.

**NOTE:** *Rinse the Phasitron® 5 after each use with water and allow to air dry. Visually inspect interior and exterior of all parts.*

**NOTE:** *When disassembling the Phasitron® 5 breathing circuit kit, visually inspect the exterior of all parts, including the tubing, for corrosion, discoloration, pitting, and missing O-rings.*

## Disassembly of the Phasitron® 5

Disconnect tubing from controller device and Phasitron® 5.

| | |
|---|---|
|  | 1. Rotate nebulizer bowl towards rear of Phasitron®5, moving gently past the stop to release. |
|  | 2. Gently lift nebulizer cap and bowl to separate from Phasitron®5. |
|  | 3. Holding the nebulizer cap, twist the nebulizer bowl to remove bowl from cap.<br><br>Discard any unused medication in accordance with physician orders. |
|  | 4. Twist white cap on the rear of Phasitron®5 to remove. |
|  | 5. Remove cap. |
|  | 6. Remove sliding venturi and spring from Phasitron®5 body. |

## Cleaning Phasitron® 5

| | |
|---|---|
| 1. | Thoroughly rinse each of the disassembled parts (except for the tubing and filter) under warm running water for approximately ten seconds. |
| 2. | Hand wash all parts of the Phasitron® (including accessories) in warm soapy water using a fragrance free Dawn® liquid soap.<br>⚠ **CAUTION:** Do NOT use "white" liquid dish soaps or antibacterial liquid dish soap as they may contain additives harmful to parts of the Phasitron® 5 kit. |
| 3. | Rinse thoroughly with water. |
| 4. | Gently shake all washed parts to remove as much water as possible; allow to air dry or wipe dry with clean, lint-free cloth. |
| 5. | Wipe the exterior of the tubing using an approved alcohol-based cleaner. |
| 6. | Inspect before reassembly for any remaining soil or damaged parts. |
| 7. | Repeat cleaning steps if needed. |

Once the Phasitron® is dry, reassemble and store in a sealable plastic bag in a dry, clean location.

⚠ **CAUTION:** Use of cleaning methods not outlined in this User Manual may damage the Phasitron® 5 and accessories.

⚠ **WARNING:** The Phasitron® 5 breathing circuit is for a SINGLE patient, multiple uses.

## Phasitron®5 Disinfection

## Disinfection Solution:

Use standard household bleach (sodium hypochlorite 5.25%) for disinfection.
Mix solution of 1-part household bleach and 8-parts water.

Example: 8 ounces of bleach to 64 ounces of water, or 250 ml bleach to 2 liters of water.

## Disinfection Procedure:

| | |
|---|---|
| 1. | Wear disposable gloves. |
| 2. | Pour bleach solution into an airtight container large enough to hold 64 ounces or 2 liters. |
| 3. | Completely immerse all the Phasitron® 5 parts, including mouth piece and mask, into bleach solution. Do not disinfect hydrophobic filter. |
| 4. | Let soak for 30 minutes minimum. Do not exceed 1 hour. |
| 5. | Rinse off cold-disinfection solution using sterile water or filtered water (less than or equal to 0.2-micron filter). Do not use tap water. |
| 6. | Gently shake all parts to remove as much water as possible. |
| 7. | Dry with a clean, lint-free cloth. Place on clean, lint-free cloth or paper towel and allow to air dry completely. |
| 8. | Insert all parts into sealable plastic bag and store in a dry, clean location. |

## Dry Inside of Tubing

Dry the inside of the tubing with air from the controller device. Connect each tube, one at a time, to the yellow connector on the controller device. Turn on device and run for two minutes at a time to remove moisture. Hang tubing to air dry.

⚠ **WARNING:** Do not steam clean the controller or circuit. Injury or equipment damage could occur.

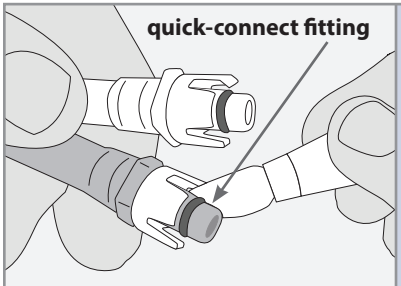
⚠ **WARNING:** Do not expose the unit to excessive moisture. Injury or equipment damage could occur.

⚠ **CAUTION:** Do not use harsh cleansers, solvents, or detergents. Equipment damage could occur.

⚠ **WARNING:** Percussionaire® makes no claims regarding the efficacy of the listed chemicals or processes as a means for controlling infection.

## Phasitron® 5 Lubrication After Cleaning and Disinfection

Lubrication is needed only after cleaning and/or disinfection of your Phasitron®5 breathing circuit.

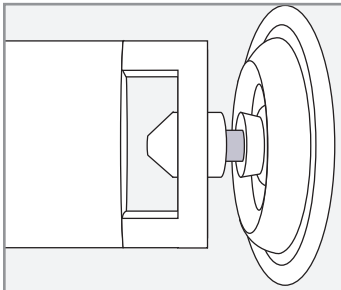



Wash hands thoroughly with soap and water or use an alcohol-based hand sanitizer before reassembly and lubrication.

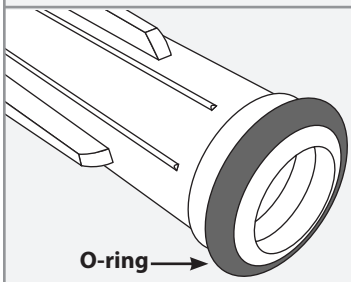
Lightly coat each quick-connect fitting O-ring with the Percussionaire® lubricant Lubetube, supplied with the Impulsator® device.

⚠ **CAUTION:** Use only Percussionaire®-approved lubricant.

## Reassembly of the Phasitron® 5

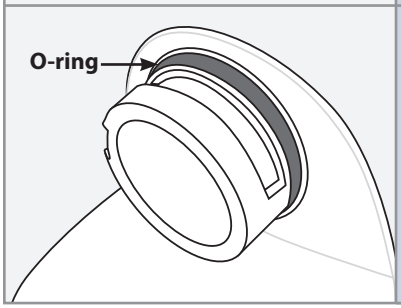


⚠ **CAUTION:** Do NOT lubricate diaphragm.




Visually inspect O-rings on sliding venturi for cracks and damage.

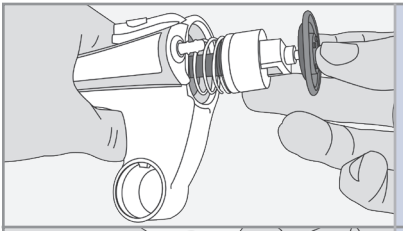
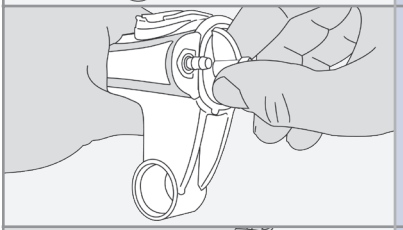
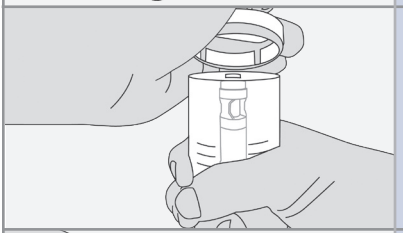
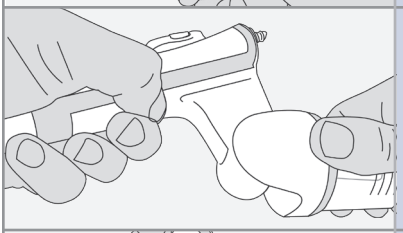
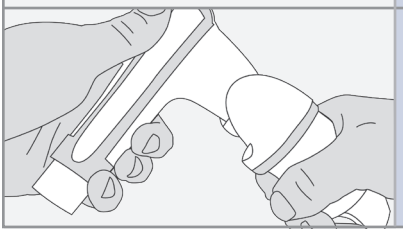
⚠ **CAUTION:** Do NOT lubricate sliding venturi O-ring.




Visually inspect O-rings on nebulizer cap for cracks and damage.

⚠ **CAUTION:** Do NOT lubricate nebulizer cap O-ring.

## Reassembly of the Phasitron® 5 (continued)

| | |
|---|---|
|  | Insert venturi and spring into Phasitron® 5 body. |
|  | Screw white cap onto rear of the Phasitron® 5 body until stop. |
|  | Holding the ring of the nebulizer cap, insert and twist nebulizer bowl until it locks. |
|  | Add mouthpiece, mask, and corrugated tubing to the Phasitron® 5 as needed. |
|  | By aligning the notch, insert the nebulizer housing into the Phasitron® 5 body, then rotate to lock. |

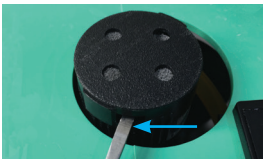
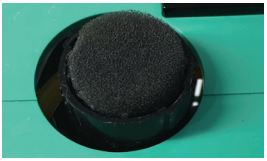
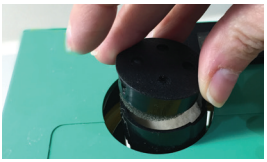
## 8. Technical Specifications

| | |
|---|---|
| **Controller** | |
| **Dimensions (W x H x D)** | 33.02 cm x 29.71 cm x 20.82 cm (13″ x 11.7″ x 8.2″) |
| **Weight** | 10.43 kg (23 lb) |
| **Operating Range** | Temp 0°C to 49°C (32°F to 120°F)<br>Humidity 5% - 95%<br>Elevation 0-9842 ft. |
| **Storage and Transport** | Temp -20°C to 60°C (-4°F to 140°F)<br>Humidity < 93% non-condensing |
| **Pulse Interval Ratio** | Average ratio 1:2.5 |
| **Power Supply** | 110V 60 Hz |
| **Run Time** | Intermittent for 15-to-20-minute treatments<br>⚠ **WARNING:** Do not exceed 20 minutes. |
| **Aerosol Flow** | Liquid consumption of .75 cc per minute |
| **Pulse Amplitude** | Digital display, 0 to 150 $cmH_2O$ |
| **Pulse Frequency** | Approximately 60-400 pulses per minute |
| **Required Maintenance** | Every 3 years from date of manufacture |
| **Display** | |
| **Pressure Range** | 1-150 $cmH_2O$/hPa |
| **Pressure Resolution** | 1 $cmH_2O$/hPa |
| **Pressure Accuracy** | Greater of ± 0.5% of reading or 1 $cmH_2O$/hPa |
| **Battery Type** | CR123A 3.0V (2) |
| **Battery Duration** | 3,250 Operational hours at 35°C (95°F) |
| **Accessories** | |
| **Breathing Circuit** | Phasitron® 5 (P5-10) |

# 9. Maintenance

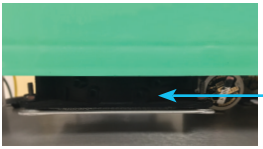
## Air Intake Filter Replacement

Check, clean, and/or change filters every 6 months (more often in dusty environments).

| | |
|---|---|
|  | To replace air intake filter, remove cap by pressing small flat blade screwdriver into slot and prying up. |
|  | Remove grey/black filter from inside top cap. |
|  | Remove white filter with screwdriver.<br><br>⚠ **CAUTION:** Do not wash white filter. |
|  | Filters removed |
|  | Install white filter first; grey/black filter installs into the cap. Align and reinstall cap. |

## Cooling Fan Maintenance


Wipe dust off fan as often as needed.

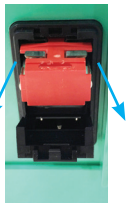


Cooling fan located near the bottom of device.

## Fuse Replacement

Locate fuse holder above power cord attachment.

With a small, flat-blade screwdriver, pry the fuse panel out by twisting screwdriver in the small slot at the top.



Fuse holder will release.
Pull out the red fuse carrier.

Remove and replace with new fuses, Percussionaire® part number B12792 (BK/MDL-5 115V), or equivalent.
Two extra fuses (B12792) are supplied in the Accessory Kit (A50162).

## Fuse Replacement Continued

| | |
|---|---|
|  | Replace red fuse carrier into the fuse panel by squeezing fuses together from sides and sliding fuse holder into housing. |
|  | Replace black cover by aligning it with the housing and pushing in until it snaps into place. Make sure both sides are engaged. |

## 10. Troubleshooting

| Problem | Examine | Repair |
|---|---|---|
| Impulsator® will not turn on. | Unit is not connected to an approved power source.<br><br>There is a loose wire connection or grounding defect.<br><br>Fuse not functioning properly. | Plug unit into an approved power source.<br><br>Service required.<br><br>Check Fuse. |
| Impulsator® has delayed start-up. | Capacitor failure<br><br>Compressor failure | Service required. |
| Impulsator® fails to pulse. | Working pressure is not set correctly.<br><br>Operational Pressure gauge malfunction | Set working pressure to achieve appropriate peak pressure.<br><br>Service required. |
| Phasitron® 5 breathing circuit will not function. | Remove white quick connector from Phasitron® 5. Check for pulse flow while device is running. | If no flow, service required. |
| Nebulizer is not aerosolizing properly. | Check to see if nebulizer baffle is in place.<br><br>Check yellow line for gas flow while device is running. | Replace Phasitron® 5.<br><br>If no gas flow, service required. |
| No change when frequency control knob is rotated. | Check if unit has been damaged (dropped, fallen, etc.).<br><br>Check last calibration or functional check performed. | Service required. |
| Digital display not functioning properly, or display is off. | Check that red conical connector is attached to port of Phasitron® 5. | Ensure the end of the Phasitron® 5 is blocked with patient thumb or finger. |

## 11. Service and Repair

It is recommended to perform an annual preventive maintenance service consisting of a thorough cleaning and a functional evaluation (contact customer service representative).

## Disposal of Equipment

At the end of useful life of a unit, disposal should be in accordance with local, state, federal, and international laws.

## 12. Limited Warranty

The manufacturer warrants to the initial purchaser that each new Impulsator will be free from defects in workmanship and materials for two years from date of first use (proof of delivery will be required). The manufacturer's sole obligation under this warranty is to, at its own choice, repair or replace any component – for which the manufacturer acknowledges the warranty coverage – with a replacement component.

Warranty Exclusions and System Performance
Sentec can neither guarantee nor verify product performance characteristics, nor accept warranty or product liability claims, if the recommended procedures are not carried out, if the product has been subject to misuse, neglect or accident, if the product has been damaged by extraneous causes, or if accessories other than those recommended by Sentec are used.

**NOTE:** *In the event that the operation of a Percussionaire® product is in any way adversely affected by using components other than those designed, manufactured, or approved by Percussionaire® Corporation, Percussionaire® shall not be liable under this warranty with respect to such product.*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