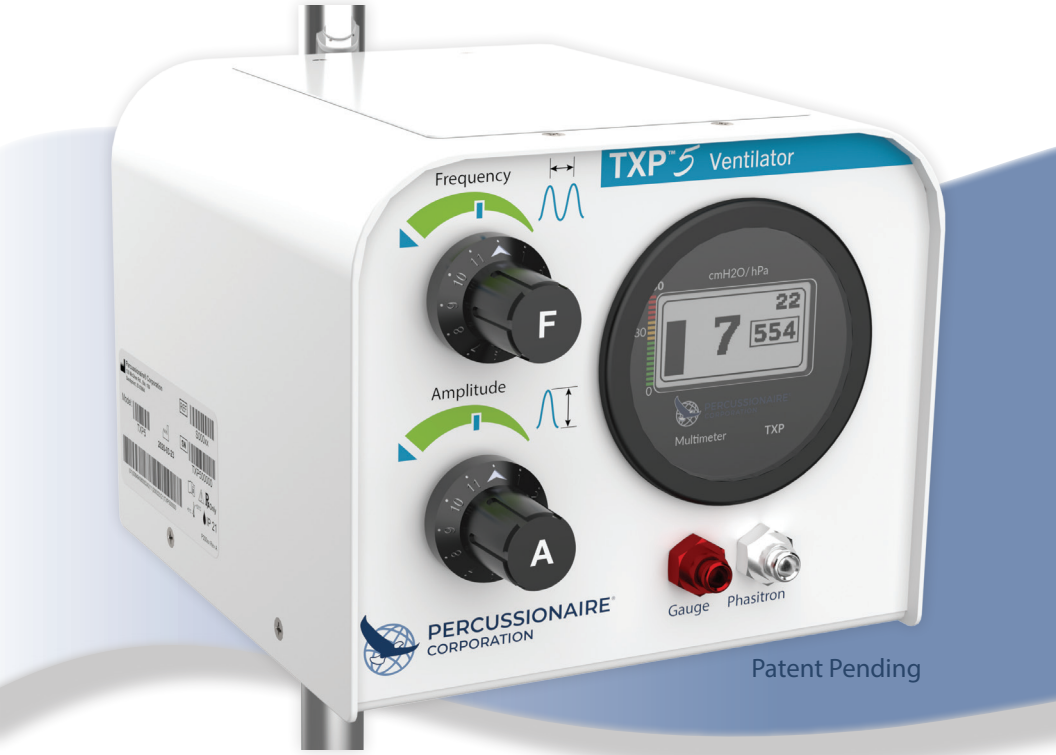
PERCUSSIONAIRE®

TXP™5

User Manual



High Frequency Percussive Ventilator (HFPV)

This device is

***NOT* an oscillator (HFOV) *NOT* a jet (HFJV)**

***NOT* a Conventional Ventilator**

1st Edition
First Printing April 2020

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@percussionaire.com

All ventilators should be operated and serviced only by trained professionals. Percussionaire® Corporation's sole responsibility with respect to its ventilators, accessories, components, and software, and their use, are 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

Chapter 1: Introduction TXP™ 5

This chapter provides an overview of the TXP™ 5 emergency high frequency ventilator.

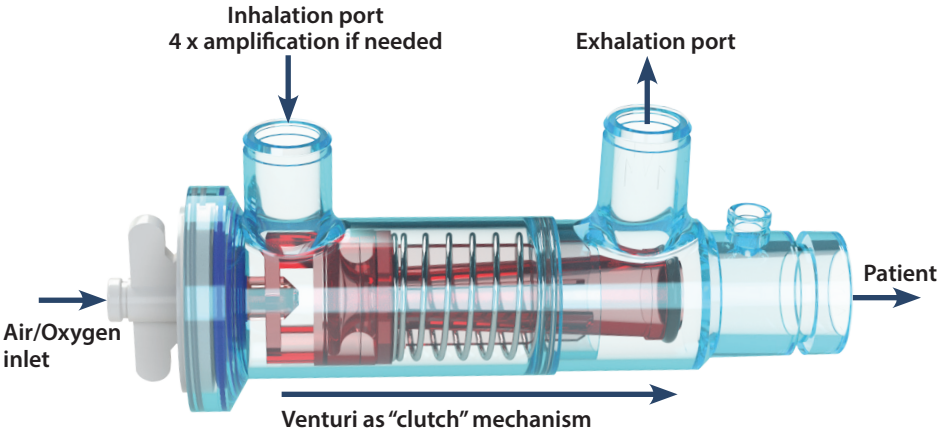
High Frequency Percussive Ventilation

High Frequency Percussive Ventilation (HFPV) can be lifesaving for patients with fragile, congested, or stiff lungs weakened by barotrauma or infection. HFPV is a solution that requires neither the pressure of mechanical ventilation nor the breathing action of the patient.

Phasitron® Breathing Circuit A50606-TXP

HFPV provides respiratory assistance as the patient breathes through the Phasitron®. The patented Phasitron® uses a unique venturi as a "clutch" mechanism to protect the lung from over pressure. By automatically adjusting to the resistance of the lung, the Phasitron® precisely, and safely delivers the optimal amount and pressure of air required by the alveolar space. When lung resistance is low, as in a compliant lung, all the pulsed air from the TXP™ 5 enters the mouth of the venturi. Each air pulse draws up to four times as much additional air into the venturi tube. This low-pressure entrained air automatically fills the available space in the lung. The Phasitron® continuously and instantaneously adjusts to keep a gentle and safe air pressure even in a compromised lung.

Phasitron® Breathing Circuit A50606-TXP



Effects of HFPV

The effects of HFPV occur with or without the cooperation of the patient. HFPV provides a sub-tidal 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.

Document Symbols

	WARNING		Type BF Applied Part
	CAUTION		Single Patient Use
	Read the manual before use		Prescription Only
	CE marking		Catalog Number
	Manufacturer		Lot Number
	Manufacture Date		European Representative
	Non-Sterile		Not Made with Natural Rubber Latex
	Does Not Contain the Phthalate Plasticizers DEHP, DIBP, DBP, or BBP		Disposal

Warnings and Cautions

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

⚠ Warnings

It is the user's responsibility to follow the instructions given in this manual.
Keep the operating instructions near the device to ensure correct operation.
If the safety instructions are not followed, the patient may be at risk.

Artificial Airway	If the HFPV device is used on a patient with an indwelling airway (i.e. endotracheal of tracheostomy tube), a clinician must be present so that a one-to-one relationship exists. These devices enhance secretion clearance. Patients must be assessed for a reduced functional residual capacity (FRC).
Patient Monitoring	Prior to placing a patient on the TXP™ 5 ventilator, a clinical assessment should be completed.
Personnel Qualifications	The operator of the TXP™ 5 is responsible to read and understand the manual before use. TXP™ 5 is a medical device designed for hospital use by trained clinicians under the supervision of a physician. The prescription and other device settings should only be changed on the order of the supervising physician.
Pre-Use Check	Always conduct a pre-use check before starting HFPV with the TXP™ 5.
Suctioning	Perform suctioning as necessary; pulmonary alveoli cannot be ventilated when their transmitting airways are obstructed.

⚠ Cautions

A **CAUTION** icon indicates a risk of equipment damage.

Cleaning	Do not use any steam cleaning methods to clean the device or Phasitron®A50606-TXP breathing circuit. Always follow hospital/institutional protocols for cleaning and disinfection.
Maintenance	The TXP™5 must not be opened by anyone other than Percussionaire® authorized service personnel. Maintain and service the TXP™ 5 device according to the recommendations provided in this manual. Only use Percussionaire® accessories designed specifically for use with the TXP™ 5 device.
Malfunctions	If the TXP™5 malfunctions, it should not be utilized any further. Report any malfunctions immediately.
Read and Understand Manual	All persons providing HFPV therapy must be trained in the use of the TXP™ 5.
Safety	Do not place objects on top of the TXP™ 5. Do not cover the device during use. Do not lean on device.

Chapter 2: Intended Use

Indications for Use

The TXP™ 5 is designed for emergency ventilation of adult, pediatric or neonatal patients. The device is intended for either hospital or pre-hospital use where emergency care is being provided, including intra-hospital or external hospital transport. The TXP™ 5 is intended for use under the supervision of a licensed physician, by both properly trained clinicians and personnel with limited training. The TXP™ 5 requires a 50 psi source capable of maintaining 15 LPM. A medical source of compressed oxygen or air is preferred but other emergency sources may be used. The device is not intended for an MRI environment.

Patient Population

TXP™ 5 ventilator is intended for use on neonatal, pediatric and adult patient populations.

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 HFPV

• Recruitment of atelectatic lung	• Mechanical ventilation
• Improved FRC	• May improve breathing pattern
• Decreased work of breathing	• Increased secretion mobilization

Clinical Limitations/Restrictions

Use of the TXP™ 5 is limited to qualified individuals who have received training.

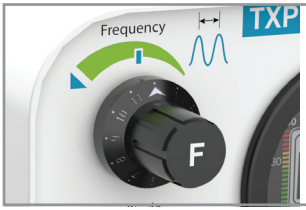
⚠ **WARNING:** Suctioning should be performed as necessary; pulmonary alveoli cannot be ventilated when their airways are obstructed.

⚠ **WARNING:** When used 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-ventilation for a reduced functional residual capacity (FRC) or the need for assistance in clearing airway secretions.

Chapter 3: System Description

The TXP™ 5 ventilator provides High Frequency Percussive Ventilation (HFPV) as the patient breathes through the Phasitron® breathing circuit.

Frequency Control Knob



The Frequency knob controls the frequency rate from 200-700 pulses (inflations) per minute.

Amplitude Control Knob

The Amplitude control knob determines the pulse amplitude delivered to the patient during inspiratory time.

NOTE: *Amplitude is affected by lung compliance and resistance.*
NOTE: *Amplitude is attenuated by resistance and compliance to an airway pressure.*

Tubing Connectors

Connect the Phasitron® breathing circuit easily by inserting the tubing connectors into the bulkhead fittings.

⚠ **CAUTION:** Ensure connection is straight to prevent crimping the o-ring and causing a leak.

Percussionaire® Digital Multimeter (PDM)

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

Numbers for reference only.

Power-On Self-Test (POST) Mode

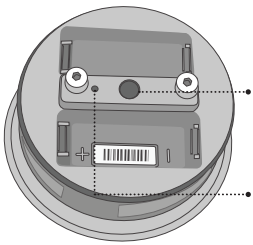
When batteries are installed in a system, the PDM software displays the software revision, battery voltage, total usage time and serial number for 15 seconds. This start-up mode allows the software to perform additional tests on the hardware that are part of the **Power-On Self-Test**. If any errors are detected the PDM enters Fault mode. It is required that the measurement port be left disconnected and exposed to the atmosphere for the entire duration of the Power-On Self-Test.

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

System Information Display

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

Rear view of PDM



Measuring port connection

⚠ **CAUTION:** Do not touch or insert any object into this port.

Reset button (only used for firmware upgrades)

Wake Mode

To wake up the PDM, ensure the ventilator pressure is greater than 2.5 cmH_2O or 2 hPa at the Phasitron® patient delivery port for more than 1 second, while connected to patient, test lung or by occluding the Phasitron®.

The PDM remains on for the first 15 seconds, showing the 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.

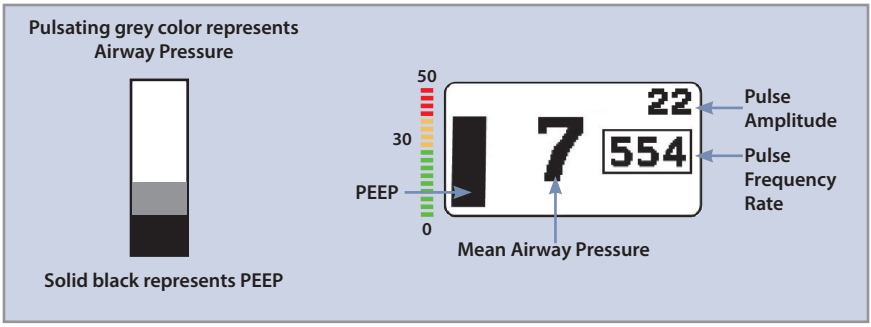
PDM display screen in Wake mode

NOTE: *Display numbers are for reference only.*

Active Mode

Software Version: TXP
Device: TXP™ 5
Display Metrics: Pulse Amplitude, Mean Airway Pressure, Pulse Frequency (inflations) and Pulse Amplitude Bar-Graph

At 16 seconds, the PDM enters Active mode. Pulse Amplitude is displayed at the top right, calculated at the instantaneous moment of peak and trough amplitude pressure. Mean Airway Pressure (MAP) averages pulse amplitude over 5 seconds. At 100 samples per second, this is an average of 500 measurements.

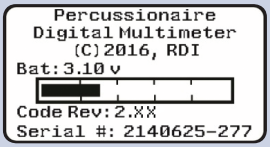


Report Mode

A.

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. Alternating page display continues for 5 minutes or until usage resumes and the PDM enters **Active** mode.

B.



During the 5-minute period, a horizontal bar graph indicates the time by moving from left to right at a fixed rate.

C.

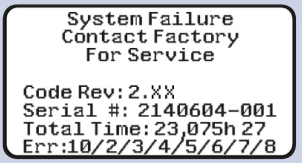
After 5 minutes of no usage, the System Information page is no longer displayed and the time display flashes (2 seconds on, 2 seconds off) for an additional 25 minutes. The PDM enters **Sleep** mode after 25 minutes.

Sleep Mode

Blank screen, indicating PDM 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® patient delivery port, for more than 1 second, the PDM enters Wake mode.

Fault Mode



The PDM displays an error message on the LCD stating, "Contact Factory for Service" and stays in **Fault** 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.

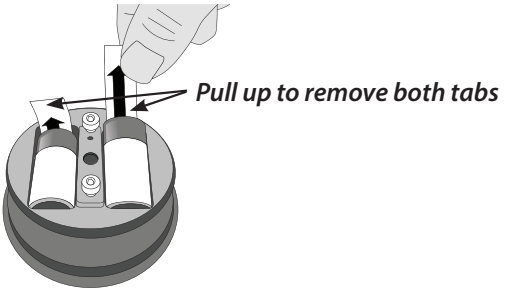
NOTE: *If System Failure screen is displayed, remove batteries for 30 seconds. Replace batteries (note that positive terminals face same direction) and wait 30 seconds. If POST check runs correctly, PDM may be used. If System Failure screen recurs, contact Percussionaire® Corporation for factory service.*

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.

Chapter 4: Setup

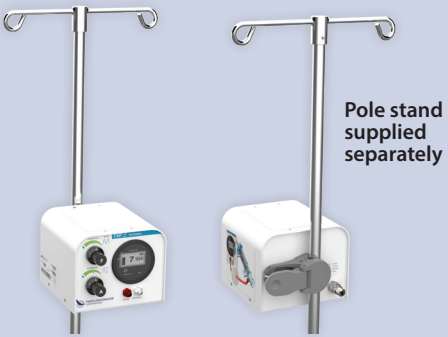
Percussionaire® Digital Multimeter (PDM) Setup

NOTE: *Remove the PDM from the TXP™ 5 device, to access battery pull tabs, by turning the PDM counterclockwise.*

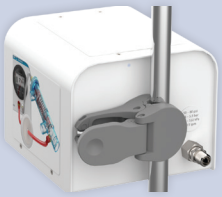


NOTE: *To ensure correct atmospheric pressure calibration at start up, remove batteries, wait 30 seconds and reinstall. Allow 15 seconds for Power-On Self-Test. When screen goes blank, the multimeter can be installed into the device.*

Controller and Stand

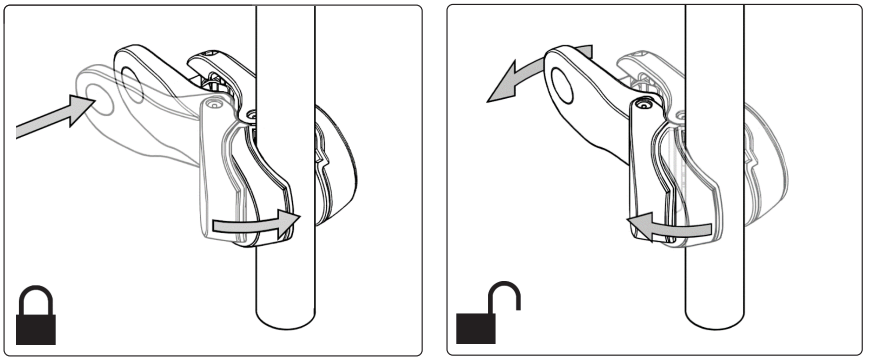


DISS Gas Connection

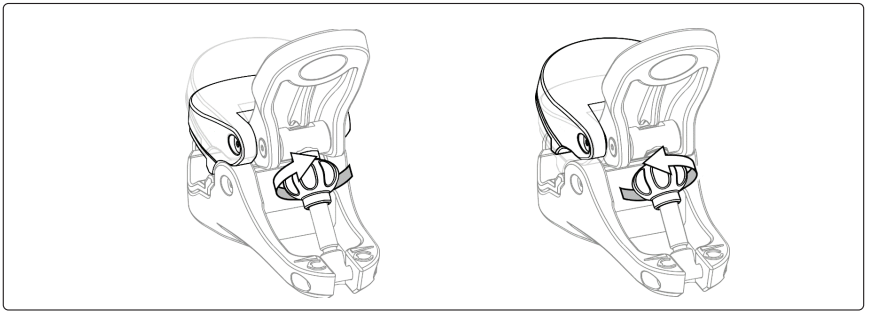


Blended Gas/Air Connection
The ventilator can be connected to hospital wall gas/air, blended gas, oxygen cylinders, or mobile compressor.

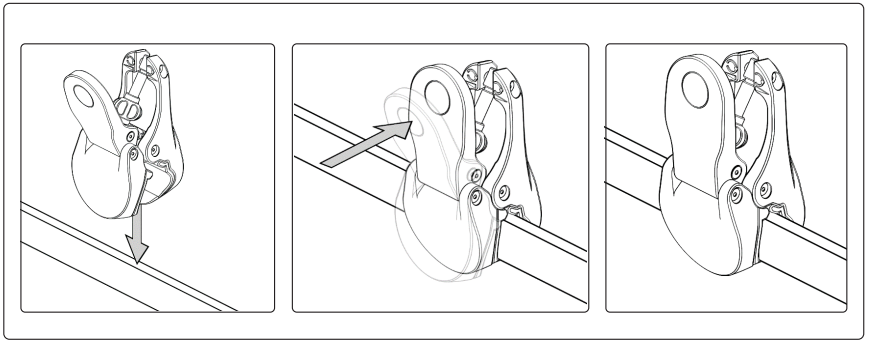
Mounting to Pole/Post



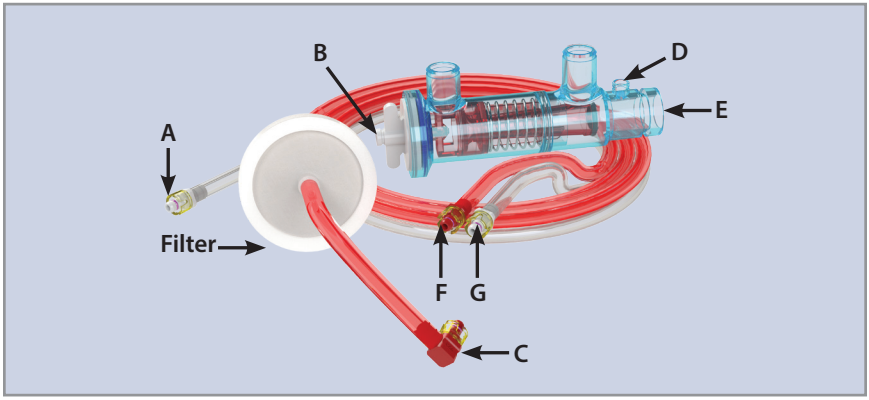
Adjusting Clamp Range and Tension



Mounting to Rail



Phasitron® A50606-TXP Assembly



The Phasitron® A50606-TXP is the mechanical/physiological breathing circuit interface. The Phasitron® has a sliding venturi that acts as both the inhalation and exhalation valve.

1.	Connect clear tubing connector **(A)** to white cap on rear of Phasitron® **(B)**.
2.	Connect red tubing connector **(C)** to front measuring port on Phasitron® **(D)**.
3.	Connect Phasitron® delivery port **(E)** to patient interface.

Connect Tubing Harness

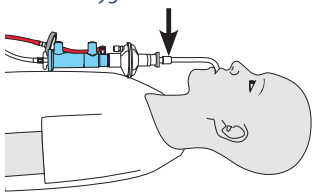
4.	Connect red connector on breathing circuit harness **(F)** to red bulkhead connector labeled "gauge".
5.	Connect clear connector on breathing circuit harness **(G)** to silver bulkhead connector labeled "Phasitron".

Configurations

The Phasitron® A50606-TXP kit can be used invasively using standard endotracheal tubes.

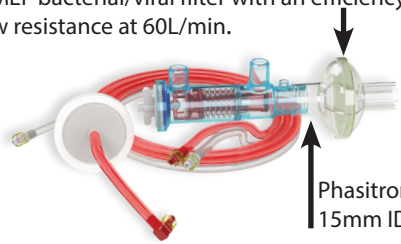
Intubated Patient with Phasitron®

Supplemental oxygen can be added after filter.



Standard Circuit

Recommended HME/HMEF bacterial/viral filter with an efficiency of >99.999% and 2 cmH_2O or less flow resistance at 60L/min.



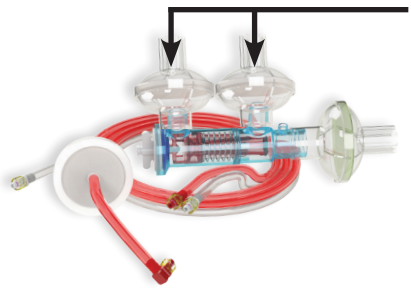
Phasitron patient port standard 15mm ID, 22mm OD

Optional PEEP Valve

Optional PEEP valve with or without filter

Optional one way valve used as balancing gate when PEEP valve is used

Optional Secondary Filters

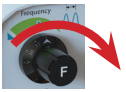


Optional secondary filters may be added to the two 15mm OD ports

Chapter 5: Pre-Use Check

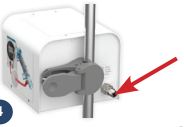
1. Connect the Phasitron® to the TXP™ 5 red and clear connections.

2. Rotate the **Frequency** knob to full clockwise position.

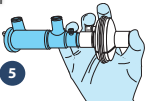


3. Rotate the **Amplitude** knob to full clockwise position.

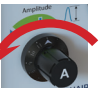
4. Connect TXP™ 5 to 50-80 psi gas source.



5. With a gloved hand, occlude the Phasitron® A50606 patient port, making sure there is a tight seal.

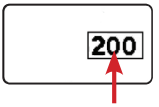


6. Rotate the **Amplitude** knob to full counterclockwise position.



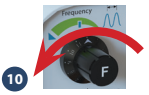
7. Observe gray bar pulsing up and down on left side of multimeter display.

8. Observe frequency on right side of multimeter 180-210 pulses per minute.

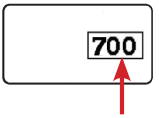


9. Observe Mean Airway Pressure on multimeter over 20 cmH_2O.

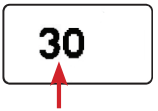
10. Rotate the **Frequency** knobs to the left, full counterclockwise position.



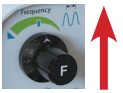
11. Observe a smooth increase in pulse frequency to a rate over 700 pulses per minute.



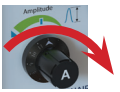
12. Observe Mean Airway Pressure on multimeter display over 20 cmH_2O.



13. Rotate the **Frequency** knob to arrow up 12:00 position.



14. Rotate the **Amplitude** slowly clockwise. Observe a gentle decrease in amplitude until "off" at the full clockwise position.



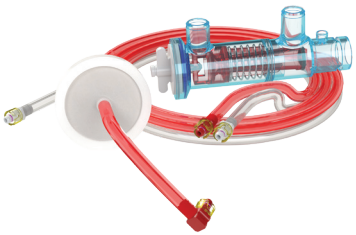
15. Check complete.

Chapter 6: Ventilation Settings

Standard Circuit Initial Settings

1.	Set Frequency by turning arrow straight up (rate of 500 +/- 25)
2.	Attach Phasitron® to patient hospital approved HMEF.
3.	Start with Amplitude control knob turned full clockwise (right).
4.	Slowly turn Amplitude control knob counterclockwise (left), until patient's chest is observed to be moving (wiggle). Ensure that the chest is moving, just below the ribs.
5.	Observe patient SpO_2 and CO_2.
6.	After 30 minutes, draw an ABG.
7.	Record mean airway pressure (MAP), high frequency rate, and amplitude along with SpO_2 and CO_2.

Adjustment Options: Standard Circuit



Increase pO_2 if CO_2 is OK

- Increase amplitude in steps of 2-4 cmH_2O.

Increase O_2 if CO_2 is OK

- If device is plugged into an O_2 outlet, the delivered FiO_2 will be 60%.
- If more than 60% FiO_2 is needed, oxygen may be added between the Phasitron® and the patient to achieve close to 100%.
- Increase frequency by 100 (repeat to a maximum of 700). This may increase MAP which may affect PO_2.

Decrease CO_2 if O_2 is OK

- Increase amplitude in steps of 2-4 cmH_2O (while keeping MAP within desired range).
- Decrease frequency by 100 pulses in a stepwise fashion to a low of 300.

Adjustment Options: Standard Circuit with Optional PEEP Valve and Inspiratory Valve

Increase pO_2 and Decrease CO_2

- Increase amplitude in steps of 2-4 cmH_2O. Watch for increase in MAP.

Increase O_2 if CO_2 is OK

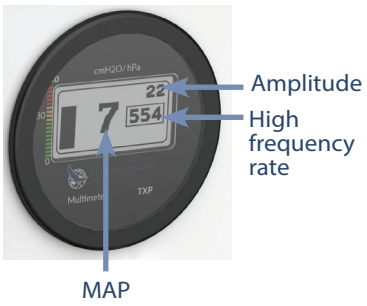
- If device is plugged into an O_2 outlet, the delivered FiO_2 will be 60%.
- If more than 60% FiO_2 is needed, oxygen may be added between the Phasitron® and the patient to achieve close to 100%.
- Increase MAP by 2 cm with the mechanical PEEP valve.
- Increase frequency by 100 (repeat to a maximum of 700); this may increase CO_2.

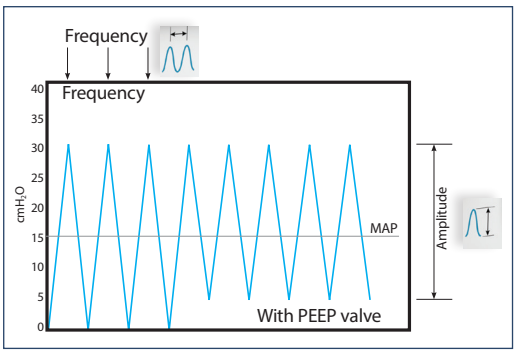
Decrease Patient's CO_2 if O_2 is OK

- Increase amplitude in steps of 2-4 cmH_2O (while keeping MAP within desired range).
- Decrease frequency by 100 pulses in a stepwise fashion to a low of 300.

Increase CO_2 if O_2 is OK

- Decrease amplitude in steps of 2-4 cmH_2O (while keeping MAP within desired range). If MAP is decreasing, adjust PEEP valve to higher PEEP setting for similar MAP.
- Increase frequency by 100 pulses to a maximum of 700.





Patient Monitoring

Clinicians should evaluate how their patients tolerate the ventilation. Auscultation and observation of the mechanical vibrations of the chest and abdomen are primary indicators of effective treatment. During HFPV it is important to maintain an unobstructed and unrestricted airway.

⚠ **WARNING:** Proper suctioning procedures should be followed to maintain a patent airway.

⚠ **WARNING:** Regular patient assessment along with continuous monitoring of SpO_2, end tidal CO_2, are needed to ensure blood gases are at the proper level.

Assessment

• SpO_2	• Blood pressure and perfusion
• Chest wiggle	• Breath sounds
• Ventilator settings	• Phasitron® and ETT positioning
• Blood gas ~ 30 minutes after starting HFPV or after an adjustment and then prn per institution protocol	

Ventilation

Control over arterial PCO_2 is achieved by manipulating delivered volumes.

- $HF = VCO_2 + (VT)2 \times f$

Increase Ventilation

To increase ventilation and decrease PCO_2:

- Increase amplitude in 2-4 cmH_2O increments. Amplitude is directly related to volume delivery.
- Decrease frequency. This will increase pulse to pulse time, therefore increase volume.

Oxygenation

Control over arterial PO_2 is achieved by manipulating FiO_2 or increasing the mean airway pressure. The following will increase FiO_2 and/or mean airway pressure, thereby increasing arterial PO_2.

Increase Oxygenation

Increase FiO_2	This is accomplished if the unit is connected to a blended air/O_2 system and an accessory PEEP valve kit (PRT606) is used. If the TXP™ 5 is connected to an oxygen source between the patient and the filter, FiO_2 of approximately 98% can be expected. See page 33 for FiO_2 measurements.
Increase Amplitude	This will increase mean airway pressure, which will increase PO_2. There will also be an increase in volume which will decrease $PaCO_2$
Increase Frequency	This will increase mean airway pressure, which will increase PO_2. There may be an increase in $PaCO_2$.
Attach accessory PEEP valve to expiratory limb and one way balancing gate valve	This will increase FRC which in turn will increase mean airway pressure. This will increase MAP, without changing amplitude.

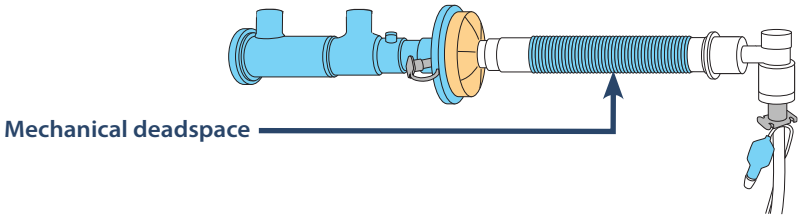
In the face of a difficult clinical scenario with worsening ventilation and/or oxygenation, a complete assessment of the patient is necessary to find the cause for V/Q inequality. Common V/Q problems associate with acute or chronic respirator injuries are noted below.

NOTE: *Any increase in MAP will increase PO_2. Any increase in Amplitude or Frequency will increase MAP.*

NOTE: *Amplitude and Frequency are interconnected, changing one parameter will affect the other.*

Decrease Ventilation: ↑ $PaCO_2$

a. Reduce amplitude (this will also decrease MAP)	Decrease in 2-4 cmH_2O increments
b. Frequency	Increase in 60 BPM increments
c. Mechanical deadspace	Add 6-inch corrugated tubing (as shown below)



NOTE: *In the face of a difficult clinical scenario with worsening ventilation and or oxygenation, complete assessment of the patient to find the cause of V/Q inequality.*

Chapter 7: Cleaning

TXP™ 5 Controller

Clean the controller according to hospital/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/disinfectant.

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

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

⚠ **CAUTION:** Use only approved cleaners.

Percussionaire® Digital Multimeter (PDM)

Clean the PDM according to facility protocols. Do not spray any type of cleaner directly onto the PDM. Clean the glass with a product or chemical approved for cleaning glass only.

⚠ **CAUTION:** Use of cleaning methods not outlined in these instructions may cause damage to the PDM.

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

At the end of useful life of an TXP™ 5 unit, disposal should be in accordance with local, state, federal and international laws.

Phasitron® A50606-TXP Breathing Circuit Kit

The Phasitron® A50606-TXP is a single patient device. Follow hospital guidelines for cleaning and disinfection. It is recommended to change the Phasitron® breathing circuit, not to exceed 7 days.

⚠ **WARNING:** The Phasitron® kit is for single patient use only.

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

⚠ **CAUTION:** Failure to follow the manufacturer's cleaning instructions could cause equipment damage.

Cleaning and Disinfecting Solutions

The Phasitron® breathing circuit has been tested for biocompatibility with the following cleaning and disinfecting solution:

Chemical Class	Active Ingredient
Bleach	5.25% Sodium hypochlorite
Alcohol	70% Isopropyl alcohol
Peroxide	3% Hydrogen peroxide
Benzyl Ammonium Chloride	N-alkyl dimethyl ethyl benzyl ammonium chlorides N-alkyl dimethyl benzyl ammonium chloride
Phenolic	Ortho-phenylphenol Ortho-benzyl-para-chlorophenol
Quaternary Ammonium Chloride	Didecyl dimethyl ammonium chloride Alkyl dimethyl benzyl ammonium chloride

⚠ **WARNING:** Always follow institutional/hospital protocols for cleaning and disinfection.

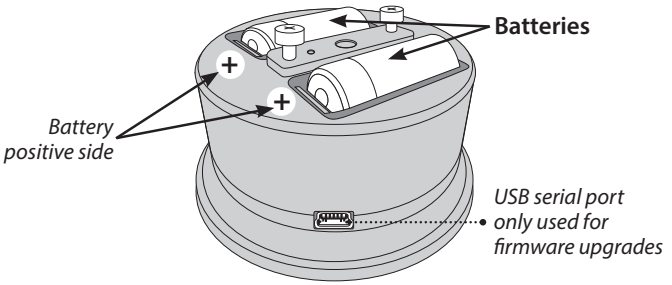
⚠ **CAUTION:** Do not immerse the tubing harness filter or filters.

Chapter 8: Maintenance

TXP™ 5 Ventilator

The TXP™5 should be checked by an authorized Percussionaire® service technician anytime clinical efficacy is not as expected. A pre-use check should be performed before any patient ventilation is performed. Perform preventive maintenance and functional evaluation annually.

Percussionaire® Digital Multimeter (PDM)



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

Changing PDM batteries

1.	Press on the PDM's bezel and twist counterclockwise approximately 20 degrees.
2.	Gently pull on the multimeter 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.
5.	Wait 30 seconds until screen turns off.
6.	Install the PDM back into the housing and twist clockwise until the stop is felt.
7.	See POST mode instructions to verify display operation.

NOTE: *The PDM USB port is used for firmware download only. It is not available during normal operation.*

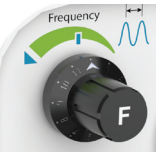
⚠ **WARNING:** The cell used in this device may present a risk of fire or chemical burn hazard if mistreated. Do not recharge, disassemble, heat above 100° C (212° F) or incinerate. Replace cell with a CR123A only (Percussionaire part PRT-B13350). Use of another cell may present a risk of fire or explosion.

Chapter 9: Troubleshooting

⚠ **WARNING:** *If there are any unexplained changes in the performance of the device, if the device makes unusual sounds or is damaged in any way, discontinue use. Begin troubleshooting process and contact distributor or an authorized Percussionaire® service center.*

Problem	Possible Cause	Corrective Action
No Percussion	No air or gas supply to the TXP™ 5	Confirm gas supply can deliver 50 psig pressure at 15 lpm flow rate. Connect to a different gas source to confirm pressure and capacity.
	TXP™ 5 has air or gas supply, but no percussion	Make sure Amplitude knob is turned up counterclockwise and the Phasitron® red and clear tubing is connected.
	Internal percussion valve failure	Send device to an authorized service center for repair.
Low Amplitude	Low air or gas supply pressure or flow capacity	Confirm gas supply connection can deliver 50 psig pressure at 15 lpm flow rate. Connect to a different gas source to confirm pressure and capacity.
	Gas supply air leak	Listen for air leaks. Visually inspect both the gas supply connections and the Phasitron® to TXP™ 5 connections. Inspect for damaged O-rings at the tubing connectors.
	Correct amplitude but multimeter indicating lower than expected pressure	The multimeter displays the Pulse Amplitude Pressure in the small upper-right part of the display. The numbers near the center of the display indicate Mean Airway Pressure. This is a lower number than the Pulse Amplitude Pressure. Check with test lung.

Continued on page 27

Problem	Possible Cause	Corrective Action
Frequency does not change	The Frequency knob is loose on the control shaft	Amplitude knob must be at the full counterclockwise position approximately 7 o'clock. Remove knob with 3/32" hex key wrench and rotate the valve shaft for a frequency of 200 ppm. Reinstall the knob and confirm the frequency is about 200 ppm at the full clockwise position. 
Multimeter has no display	No signal to multimeter	Phasitron® must be connected to clear and red tubing. Silver and red connectors on the TXP™ 5 face panel must be connected to the Phasitron®.
	Multimeter not activated	The Phasitron® patient port must see a pressure of 2.5 cmH_2O/hPa for more than one second to enter wake mode.
	Multimeter display does not stay on	Confirm Phasitron® is connected to patient, test lung, or occluded for more than 16 seconds to active multimeter.
	Multimeter not functional	Batteries are dead. Replace batteries with CR123A batteries, or Percussionaire part B13350. Note that positive terminals face the same direction.
Multimeter has wrong display	Power-On Self-Test and calibration was not allowed to complete before installing the multimeter into the TXP™ 5	Reinstall batteries. Remove both batteries and wait 30 seconds for multimeter to complete POST. Once complete, install multimeter back into TXP™ 5.
	Failed multimeter software	Send to authorized service center for repairs.

Chapter 10: Technical Specifications

TXP™ 5 Ventilator

Accessories	Phasitron® Kit A50606-TXP
Pulse/Interval Ratio	250-350 1:2 350-450+ 1:1.5 450+ 1:1
Operating Range	Temp., 0° C to 49°C (32°F to 120°F) Humidity 5%-95%
Storage and Transport Range	Temp., -20°C to 60°C (-4°F to 140°F) Humidity < 93% non-condensing
Battery Type	Multimeter uses (2) CR123A battery
Run Time	Continuous
Pulse Frequency	200-700 pulses per minute
Mean Airway Pressure (MAP)	Digital display, 0-99 cmH_2O/hPa
Pulse Amplitude	Digital display, 0-99 cmH_2O/hPa accurate to +/- 1 cmH_2O
Amplitude Bar Graph	Digital display, 0-50 cmH_2O/hPa
Gas Source	Hospital wall gas/air, blended gas, oxygen cylinders, mobile compressor
Gas Flow	15 LPM
Dimensions (W x H x D)	15.875cm H x 11.43cm W x 15.24cm D (6.25 in H x 4.5 in W x 6.0 in D)
Weight	0.5kg (1.16 lbs)
Service Life	5 years

Measured Performance

TXP 5 Frequency		R=50, C=10ml/cmH_2O		R=20, C=10ml/cmH_2O		R=5, C=10ml/cmH_2O	
300	MAP Amplitude	40 cmH_2O 99+cmH_2O	31LPM	30 cmH_2O 79 cmH_2O	56LPM	21 cmH_2O 47 cmH_2O	78LPM
500	MAP Amplitude	47 cmH_2O 99+cmH_2O	28LPM	39 cmH_2O 72 cmH_2O	48LPM	32 cmH_2O 54 cmH_2O	67LPM
700	MAP Amplitude	52 cmH_2O 99+cmH_2O	23LPM	48 cmH_2O 87 cmH_2O	36LPM	44 cmH_2O 66 cmH_2O	50LPM

Sampled from Phasitron® breathing circuit PN A50606-TXP, inline with TSI 4000 Flow Meter, inline with Ingmar Medical's QuickLung®.

[1]Resistance on QuickLung® set at each of the available resistance settings, while compliance remained set at 10ml/cmh20

[2]Frequency recorded from TXP™ 5 Multimeter

FiO_2 Measurements					
TXP-5 Frequency		R=50, C= 10ml/cmH_2O		O_2 Sat without added O_2	O_2 Sat with added O_2 post filter
300	MAP/AMPLITUDE	32/99+	31 LPM	67	94.6 @ 5 LPM
500	MAP/AMPLITUDE	37/92	28 LPM	67	100 @ 5 LPM
700	MAP/AMPLITUDE	39/89	25 LPM	66	100 @ 5 LPM
TXP-5 Frequency		R=20, C= 10ml/cmH_2O		O_2 Sat without added O_2	O_2 Sat with added O_2 post filter
300	MAP/AMPLITUDE	23/69	54 LPM	59.7	95 @ 8.5 LPM
500	MAP/AMPLITUDE	29/63	50 LPM	66.5	96.1 @ 8 LPM
700	MAP/AMPLITUDE	34/69	42 LPM	72.1	95.1 @ 4.5 LPM
TXP-5 Frequency		R=50, C= 10ml/cmH_2O		O_2 Sat without added O_2	O_2 Sat with added O_2 post filter
300	MAP/AMPLITUDE	14/33	80 LPM	55.8	91.5 @15 LPM
500	MAP/AMPLITUDE	20/38	75 LPM	62.3	100 @ 10 LPM
700	MAP/AMPLITUDE	25/46	68 LPM	73	96.1 @ 8 LPM

Sampled from Phasitron® breathing circuit PN A50606-TXP, inline with TSI 4000 Flow Meter, inline with Ingmar Medical's QuickLung®.

[1]Resistance on QuickLung® set at each of the available resistance settings, while compliance remained set at 10ml/cmh20

[2]Frequency recorded from TXP™ 5 Multimeter

Percussionaire® Digital Multimeter (PDM) Specifications

Size	73 mm (2.87 inch) diameter
Mass	165 g (0.36 lb)
Storage and Transport Range	Temp., -20° C to 60° C (-4° F to 140° F) Humidity <93% non-condensing
Operating Range	Temp., -20°C to 60°C (-4° F to 140° F), Humidity <93% non-condensing
Display	128 x 64 pixel FSTN chip on glass LCD with reflector
Fault Detection	Independent hardware and software watchdogs
Serial Port	USB (firmware upgrade)
Rate Range	50-999 pulses per minute
Pressure Range	1-99 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)
Battery Shelf Life	3.5 Years at 35°C (95°F)

Phasitron® A50606-TXP

Size	13.5 mm x 17 mm (5 ¼" x 6 ¾")
Weight	123 g (0.27 lb)
Operating Range	Temp., 0° C to 49° C (32° F to 120° F) Relative humidity range15% to < 90% non-condensing
Storage and Transport	Temp., -40°C to 5° (-40°F to 41°F),
Rate Range	0-999 pulses per minute
Pressure Range	0-150 cmH_2O/hPa
Filtration Efficiency	BFE 99.999% *VFE 99.9999%
Red Line Filter	0.027 micron hydrophobic
Disposal	Recycle according to local laws
Service Life	7 days
Shelf Life	2 years from date of manufacture

Chapter 11: Service and Repair

Percussionaire® Corporation recommends an annual preventive maintenance (PM) for TXP™ 5. An annual PM consists of a thorough cleaning, functional evaluation, and if necessary, recalibration.

To return device to factory service center for repair, contact customerservice@percussionaire.com or call (208) 263-2549.

Disposal of Equipment

At the end of useful life of an TXP™ 5 unit, disposal should be in accordance with local, state, federal and international laws.

Chapter 12: Limited Warranty

Percussionaire® warrants that the TXP™ 5 shall be free from defects of workmanship and materials and will perform in accordance with the product specifications for a period of 5 years from the date of purchase (proof of delivery will be required). The device must be run for 30 minutes annually if kept in storage conditions. Batteries carry a 12 month warranty. If the product fails to perform in accordance with the product specifications, Percussionaire® will repair or replace – at is option – the defective material or part. Percussionaire® will pay customary freight charges to and from Percussionaire® or an authorized Percussionaire service center. This warranty does not cover damage cause by non-approved cleaning or sterilization, accident, misuse, abuse, alteration and other defects not related to material or workmanship. Percussionaire® disclaims all liability for economic loss, loss of profits, overhead or consequential damages which may be claimed to arise from any sale or use of this product.

PERCUSSIONAIRE®
CORPORATION

130 McGhee Road., Suite 109, Sandpoint, Idaho 83864 USA
percussionaire.com +1.208.263.2549

P20092 Rev A