Precision Flow® Plus

Technical Service Manual

For Precision Flow Devices with serial numbers starting with 'PFPC' or 'PFP'

This Technical Service Manual is subject to change without notification.

Revision/Change Record:

REVISION	ECO NUMBER
A	16-293
B	18-240

Important Safety Information

This manual is subject to periodic review, update and revision. Always obtain and consult the latest revision before undertaking any service of the equipment. Before performing any service on the Precision Flow® Plus read and review this entire manual. After performing any service or repair always perform the pre-use checkout in section 5 of this manual. All tests must pass before a unit can be put back in service. Always disconnect the electrical power and gas supplies before performing service or maintenance procedures detailed in this manual. Reconnect only if you are specifically instructed to do so as part of the procedure. Genuine replacement parts manufactured or sold by Vapotherm must be used for all repairs.

Technical Competence
The procedures described in this service manual should only be performed by competent individuals who have a general knowledge of and experience with devices of this nature. No repairs should ever be undertaken or attempted by anyone not having such qualifications.

Use a static strap and/or a static control work station to ensure that static charges are safely conducted to ground and not through static sensitive devices. Whenever this Electrostatic Discharge (ESD) symbol appears beside a procedure, follow appropriate static control precautions.

LIMITED WARRANTY

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1.1 Introduction

The Vapotherm Precision Flow® Plus is intended to heat and humidify patient respiratory gases from a source of compressed air and oxygen gases. Warm, humidified gas is delivered from the Vapotherm Precision Flow® Plus to the patient via a proprietary tube-set and Disposable Water Path that is attached to a nasal cannula at the patient. The user can set the oxygen percentage, temperature, and flow rate of the delivered gas.

The unit is intended to be mounted on a Vapotherm approved IV pole, attached to an overhead bag of sterile water for inhalation. Heat and humidification are provided through the Vapor Transfer Cartridge that is placed between the Disposable Water Path and the capital side of the unit. The Vapor Transfer Cartridge acts as an interface to transfer heat and humidity to the gasses being delivered to the patient using the water that is pumped through the cartridge and by molecular passage of water vapor across the cartridge membrane surfaces.

To minimize water condensation, the proprietary delivery tube-set and Disposable Water Path insulates and maintains warm water, with heat from the Precision Flow® Plus's internal heater, surrounding the gas inside the delivery tube which maintains the gas temperature as the gas makes its way from the Precision Flow® Plus to the patient cannula.

1.2 Principles of Operation

The Precision Flow® Plus unit is designed to blend and meter oxygen and air to set flow rates and oxygen percentages, to warm and humidify that flow, and then deliver it to the patient.

The Vapor Transfer Cartridge is designed to receive the unconditioned breathing gas, from the capital side of the unit, and add warm water vapor to it. Two separate pathways, one for the breathing gas and the other for the water, intersect when fibers of a special membrane material allow water vapor to pass from the outside of the fiber into the gas stream.

A second unique feature of the Precision Flow® Plus unit is the heated vapor delivery tube. The delivery tube delivers the humidified and warmed gases from the Vapor Transfer Cartridge to the patient. The heated delivery tube allows the breathing gas to pass through an inner tube that is surrounded by circulating warm water. This insulates and maintains the inner tube to the same temperature as the gas flowing through it, thereby, keeping the gases at the desired temperature and eliminating condensation.

The water circuit begins at the auto feed reservoir where it is pumped into a process controlled heater. The heated water then flows through the outbound outer lumen in the delivery tube. After the heated water has passed through the entire length of the outbound outer lumen of the delivery tube, it returns to the unit via the inbound outer lumen in the delivery tube and is passed through the Vapor Transfer Cartridge. From there, it completes the loop by flowing back to the input side of the pump. Note: The temperature of the water is sensed directly after the water is heated, as well as after the water returns to the Disposable Water Path via the inbound outer lumen in the delivery tube.

1.3 Functional Description

The Precision Flow® Plus warms and humidifies a flow of breathing gas for delivery by nasal cannula at flows from 1 to 40 L/min (denoted as LPM earlier generation Precision Flow Units). The unit incorporates an electronic blender and flow sensors that allow the oxygen percentage and total gas flow to be set independently

The Precision Flow® Plus consists of two parts:

Main unit

- The main unit contains all the electrical and electronic components, including the electronic blender and flow controllers, and sensors to monitor the Disposable Water Path.
- Flows of oxygen and air are regulated by proportional solenoid valves in the gas metering manifold. The flows of oxygen and air are measured by two mass flow sensors in the flow control manifold. Lookup tables stored in the processor convert A-D values to flow in units of liters per minute. For any setting of flow and oxygen percentage, the operating software calculates the target flows for oxygen and air. The proportional solenoid valves are then adjusted until the measured flow for each gas equals the target flow. The system continually monitors the flows and makes small adjustments to the solenoid valves as necessary to maintain the target flows. As a check on the mixing and metering system, an oxygen cell continually reads a sample of the mixed gasses, except when the oxygen cell is self-calibrating. Alarms occur if either oxygen and/or air cannot be adjusted to the target flow, if a mass flow sensor is out of range, or if there is a discrepancy between the oxygen setting and the oxygen cell reading.
- Firmware running in the main unit uses sensors to monitor gas pressure, water level and water temperature, and air leaks in the water circuit (bubble detector). Alarms are displayed if any parameters are outside their normal range. Separate indicator icons are displayed to show backup battery charge status and the type of cartridge installed. See Mode Diagram for a description of the firmware states and transitions.
- An internal backup battery will maintain the set flow and oxygen blend for at least 15 minutes without AC power. However, the water pump and heater will stop. The backup battery is designed to power the Precision Flow® Plus during temporary power loss, and is not intended for transport.

Disposable Patient Circuit

- The Disposable Patient Circuit is comprised of the Disposable Water Path, Vapor Transfer Cartridge, and the delivery tube. Conditions in the circulating water and gas streams are sensed remotely via the interface between the main unit and the Disposable Water Path.
- Vapor Transfer Cartridge. In the cartridge, blended gas passes through the lumens of hundreds of parallel hollow fibers made of a specially developed polymer. Warm water circulates around the fibers and diffuses as vapor through the fiber material into the gas stream flowing through each fiber. There is no direct contact between the water and gas streams. The gas stream leaves the cartridge essentially saturated with vapor at the set temperature.

Note: Use only approved cartridges from Vapotherm Inc.

- Patient delivery tube. The warmed humidified gas passes through the center of a triple-lumen heated delivery tube. The center lumen is surrounded by two outer lumens carrying warmed water to maintain the temperature of the inner lumen and to minimize rain-out. A proprietary short nasal cannula is connected to the end of the delivery tube and passes the humidified breathing gas to the patient's nares.

Note: Use only Vapotherm approved interfaces.
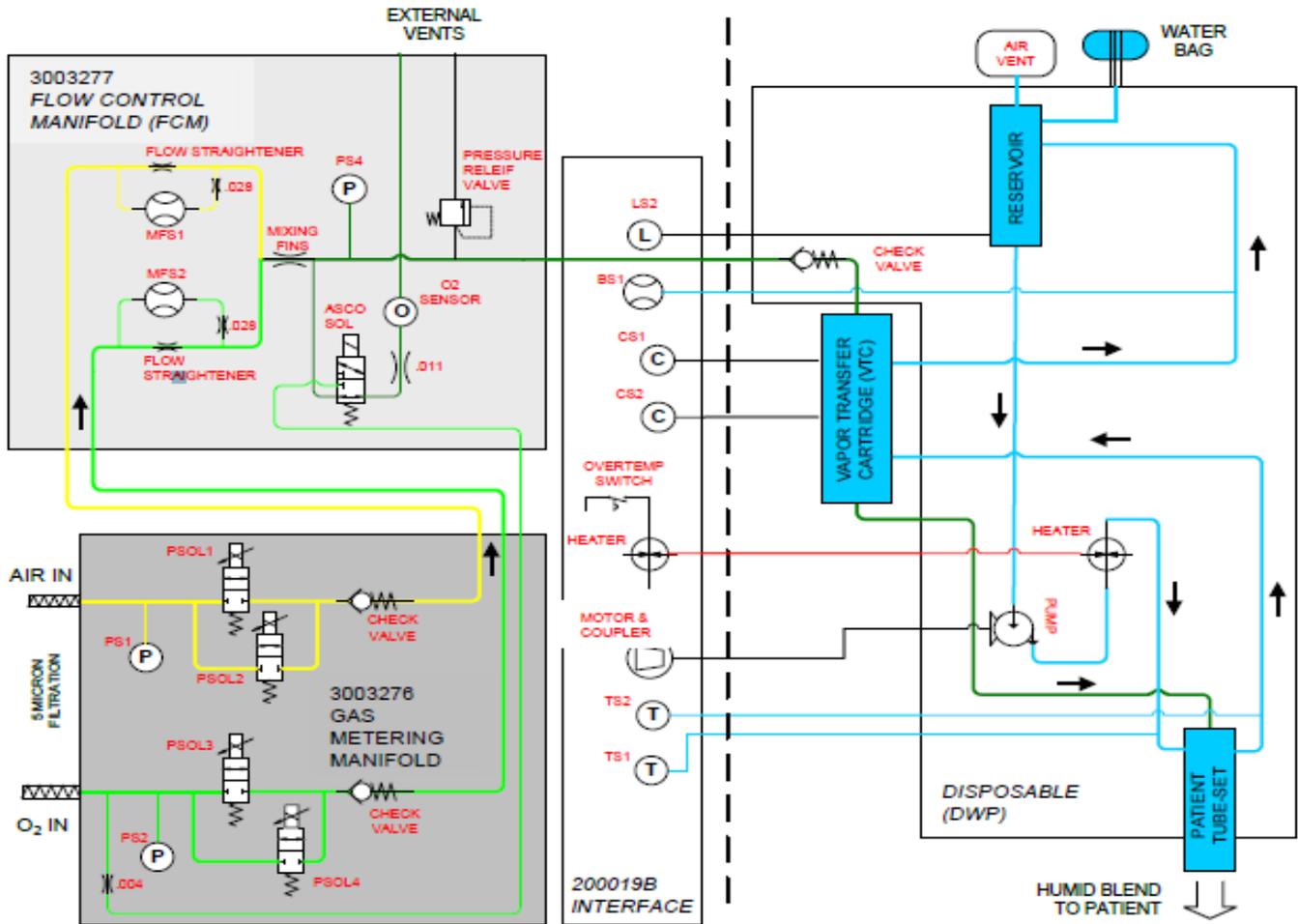
Figure 1 - System Block Diagram

- Disposable Water Path. The Disposable Water Path houses a water reservoir, water pump connections for the Vapor Transfer Cartridge, the capital unit's air-in port, and the delivery tube, as well as sensor interfaces to the main unit.
- Water is pumped past the Disposable Water Path's heater plate and circulates through the outer lumens of the delivery tube. Returning water passes through the outer jacket of the Vapor Transfer Cartridge where some water is lost as vapor to the gas stream. There is no direct contact between water and gas flows. The water then returns to the reservoir.
- Heater power is regulated continuously to maintain the set temperature.
- Water replaces evaporative losses in the system via a gravity fed sterile water (for inhalation) supply. Excess gasses are purged to atmosphere from the top of the Disposable Water Path via an oleophobic filter membrane.

Nurse Call & EMR Connectivity

- The Nurse Call / EMR Communication Cable (Part No. 3100897) contains a 3 pin 3.5 mm Stereo Audio Jack (See P2 in Figure 1-2) for indicating an alarm condition on a hospital nurse call system and a DB9 female Data Jack for interfacing Electronic Medical Record capable technologies. An adapter or re-termination of the cable's 1/8 in. (3.5 mm) stereo audio jack connection will be necessary and shall be supplied by the user to connect the Nurse Call Interface Adapter to the hospital's nurse call system.
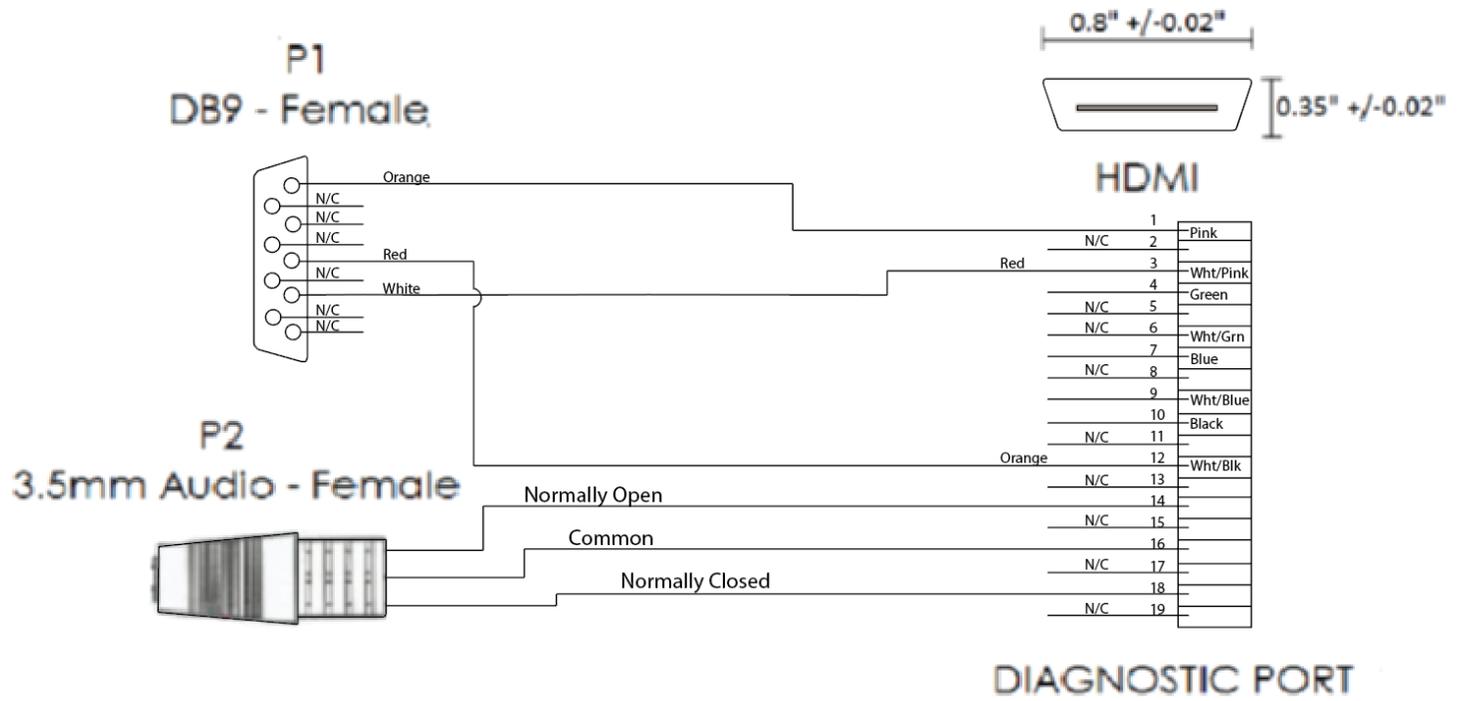
Figure 1-2 (Nurse Call & EMR Cable Schematic)

Figure 1-2.1 (3.5mm Stereo Audio Jack Male Pinout)
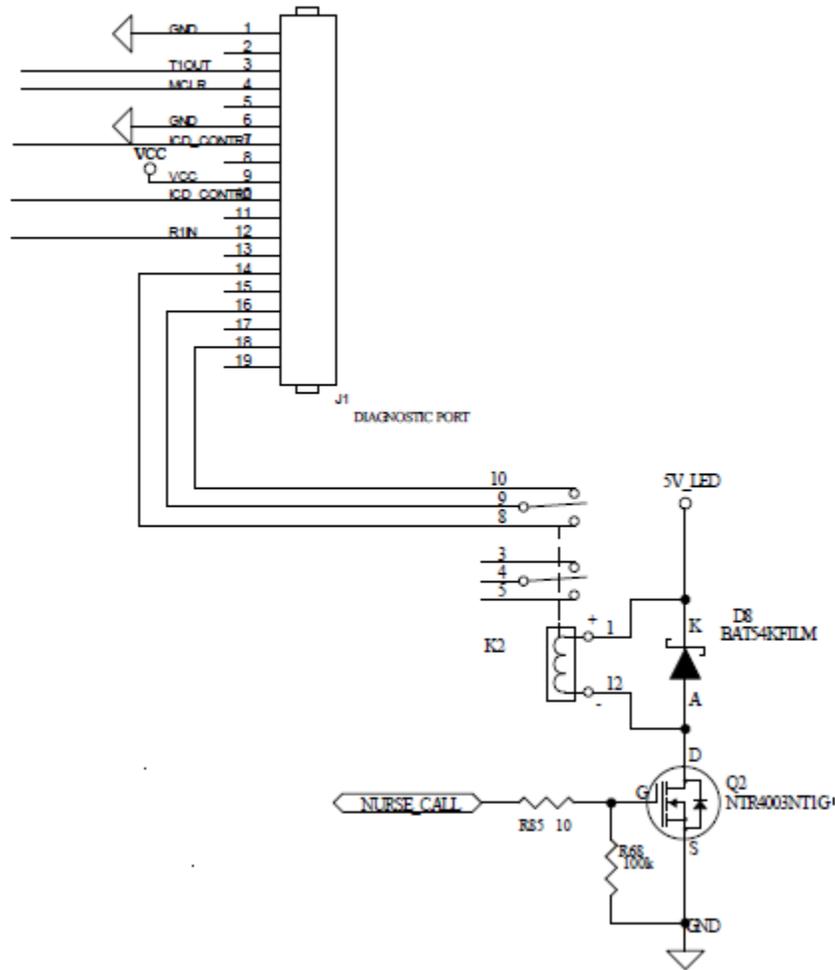
Figure 1-2.2 (System Schematic)

Nurse Call & EMR Installation Instructions

- **Nurse Call:** Remove the silicone plug in the oxygen sensor cover on the back of the Precision Flow® Plus and plug in the connector of 3100897 into the Nurse Call/EMR Port of the Precision Flow® Plus. Connect the other end of the properly terminated cable to the hospital Nurse Call system. Refer to figures 1, 1A and 2 for circuit diagram and schematic reference.
- **EMR:** Remove the silicone plug in the oxygen sensor cover on the back of the Precision Flow® Plus and plug in the connector of 3100897 into the Nurse Call/EMR Port of the Precision Flow® Plus. Precision Flow® Plus Nurse Call and EMR Installation Instructions Revision A Document Number: 3100970 Page 12 of 12 Connect the other end of the properly terminated cable to the hospital EMR System. Refer to figures 1 for circuit diagram and schematic reference.

For further information on Nurse Call & EMR implementation, refer to document **3100970 "Precision Flow® Plus Nurse Call & EMR Installation Instructions"** (Please note that this is the English version).

Presicion Flow® Plus Modes of Operation:
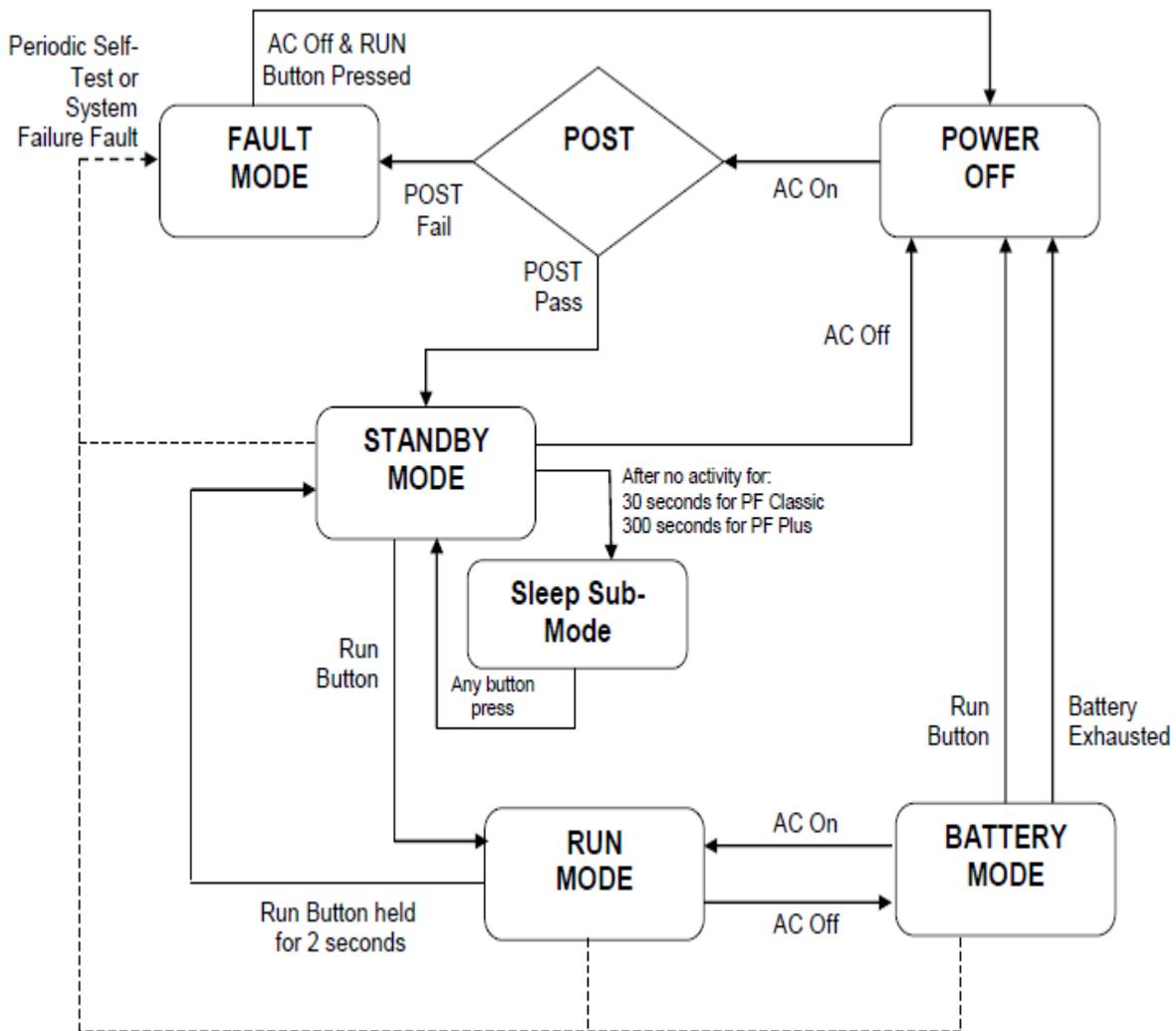
Figure 1-3 Software Mode Diagram

The diagram above illustrates the operating modes for the unit.

- Immediately on connection to AC power a POST (Power-On Self-Test) is run to verify proper function of subsystems, sensors, and actuators in the Precision Flow® Plus·

- On successfully completing the POST the unit enters STANDBY, unless there is a POST failure, in which case it will enter a Fault Mode. The LED display will indicate the particular FAULT Mode in the temperature display using numerical codes ranging from 52 to 84, which are discussed in detail within the Alarm Status Table in this manual.

- The Precision Flow® Plus enters RUN Mode from STANDBY Mode when the RUN/ STANDBY button is pressed. Audible beeps will begin to sound and the DWP alarm icon will display for a brief amount of time – this is normal and just indicates that the unit is ensuring all systems are functioning properly. The water pump, heater, and gas flow proportioning systems start. Flow, temperature, and oxygen percentage can be set once the unit has finished entering Run Mode. Some alarms activate immediately while others are on delay. See table in Troubleshooting.

- To return to STANDBY Mode, the RUN/STANDBY button must be depressed for 2 seconds.

- If AC power is disconnected, only when the unit is in RUN mode, the unit enters BATTERY Mode. If the backup

battery is fully charged, gas mixing and metering continues for at least 15 minutes, but water is not circulated nor heated. When the battery is discharged the unit enters the POWER OFF mode without an alarm.

- If AC power is disconnected in STANDBY Mode, the unit enters POWER OFF Mode and there is no way for the unit to be powered back on until AC power is reconnected (the backup battery can not power up a unit while the unit is in POWER OFF Mode).

- If the RUN/STANDBY button is pressed when in BATTERY Mode the unit enters POWER OFF Mode and will not re-enter the RUN Mode until AC power is restored.

There is no ON/OFF button.

1.4 Specifications

PHYSICAL CHARACTERISTICS
>Dimensions:
>Height 11.5"(300mm), width 8"(200mm), depth 7"(180mm), excluding IV pole clamp and gas filters.

>Weight:
>10.6lb (4.81Kg) without Disposable Patient Circuit

>Circulating Water Volume:
>400 ml approx. including delivery tube and Vapor Transfer
>Cartridge.

>Mounting:
>Rear mounted clamp fits IV poles up to 1.5"(38mm) in diameter.

>Gas Connections:
>Standard non-interchangeable fittings for medical air and oxygen.

FUSES: (Qty 2) GMA 3A F250 V 5mm x 20mm

SYSTEM REQUIREMENTS
>Power:
>100-240VAC, 50-60Hz, (<350VA) during warm up, approx. 80VA in steady state (depends on flow rate and temperature selected).

>Back-up power:
>4.8V nickel-metal hydride battery pack.

>Gas supply:
>Medical air and oxygen or heliox at inlet pressures between 4 and 85 psi (28-586 KPa).

>$NOTE_1$: the full range of flows and oxygen percentage is available only if both gases are present at inlet pressures of at least 40 psi (~276 kPa). Optimal inlet pressure range is 55 ±10 psi (379 ±35 kPa).

>NOTE: Running unit at maximum or minimum inlet pressures may result in alarms due to minor fluctuations in pressure readings and/or gas source pressure.

>$NOTE_2$: Units with serial numbers from PF-00001001-P to PF00007040-P may have gas supply inlet pressure limits of 4 psi to 75 psi (28 KPa to 517 KPa)

>Water:
>Sterile water for inhalation in pre-filled sealed container.

Recommended water change interval based on flow rate and operation at 37˚C.

Flow Rate	Average water usage per day	Recommended change interval
1-10 L/min	650 ml	500 ml / 12h
10-20 L/min	1300 ml	500 ml / 8h
20-30 L/min	2000 ml	1000 ml / 12h
30-40 L/min	2600 ml	1000 ml / 8h

PERFORMANCE
>Temperature:

Range: 33 to 43°C (33 to 39 °C for Precision Flow Devices
   with serial numbers starting with PFPC) at exit from the
   delivery tube, adjustable Resolution: 1°C
   Accuracy: ± 2°C
Warm up time:
± 2°C of 33°C set point < 5 minutes (at ambient 23°C)
   NOTE: Time required to heat is dependent on the temperature set point, flow rate and ambient temperature. Due to normal system variation, it is possible not all combinations of temperature and flow rate may be achieved, in particular when set to the higher settings.

Humidification:
Minimum of 12 mg/L.

Oxygen percentage:
Range: 21% to 100% O2
   Resolution: 1%
   Accuracy: ± 2% O2
   NOTE: At flow rates less than 3 L/min, for 22% & 23% oxygen blend, the delivered oxygen is 21%. At flow rates less than 3 L/min, for 98% and 99% oxygen blend, the delivered oxygen is 100%.
   NOTE: Oxygen percentage accuracy can not be measured with external instruments due to humidity, in the gasses being delivered, possibly altering the readings of the instruments being used.

Flow rate:
   Resolution: Low Flow 1-8 L/min: 0.5 L/min increments, High Flow 5-40 L/min: 1 L/min increments
   Accuracy (air configuration): 1-8 L/min ± 0.5 L/min or ± 10% L/min whichever is greater, 9-40 L/min ± 10% L/min
   Accuracy (Heliox configuration): 1-8 L/min ± 0.5 L/min or ± 15% L/min whichever is greater, 9-40 L/min ± 10% L/min

STANDARDS
   Designed to conform to the following standards:
   IEC 60601-1
   IEC 60601-1-2:2014 (for Precision Flow Devices with serial numbers starting with PFPC)
   UL60601-01
   CSA C.22.2/No. 60601.1
   AS/NZS 3200.1.2
   EN60601-1
   ISO/IEC 80601-2-74
   ISO 11195
   ISTA-2A

ENVIRONMENTAL
   Operating:
   Ambient temperature: (+)18 – (+)30°C
   Ambient relative humidity: 20-90% RH non-condensing
   Ambient Pressure: 86 kPa to 108 kPa – Not to be used in hyperbaric conditions
   Altitude up to 1,948 m (6,392 ft)

   Storage and Shipping:
   Ambient temperature: (-)10 – (+)50°C
   Ambient relative humidity: 20-90% RH

ALARM SOUND PRESSURE RANGES
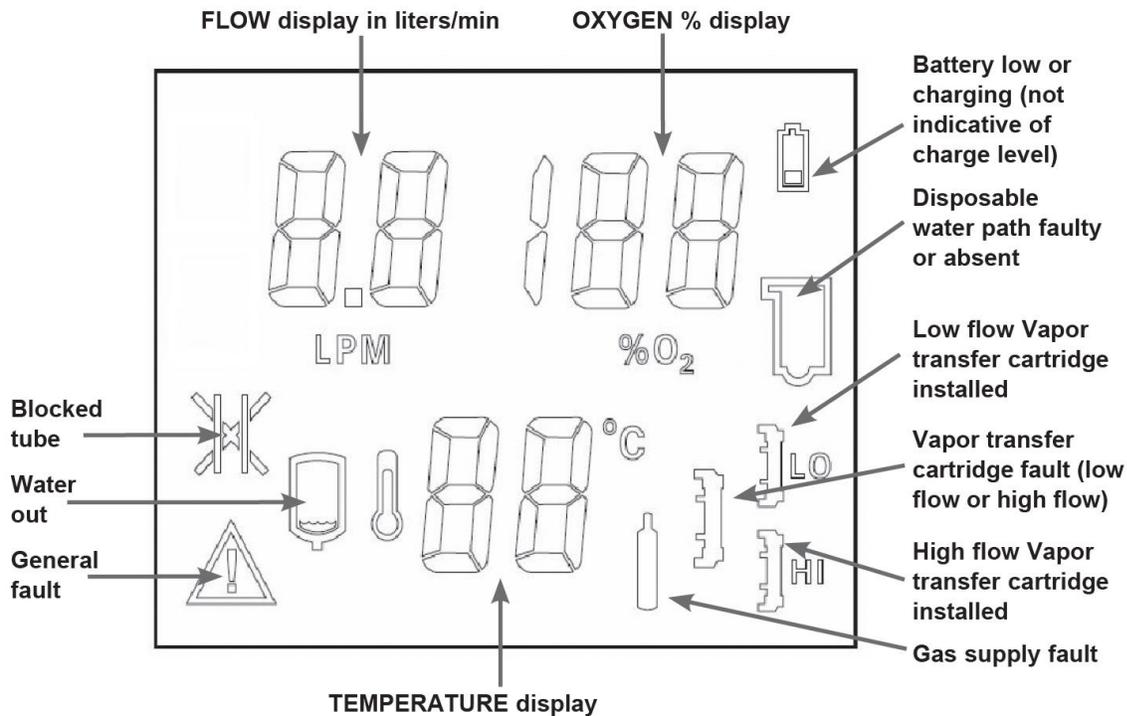   Medium Priority Alarm
   47 dB measured 1m from unit

   Low Priority Alarm
   45 dB measured 1m from unit

2.1 Alarms

Fault conditions are indicated by icons displayed on the front LED panel and by audio signals (see figure below).

- Unless indicated otherwise, alarms will self-clear when the fault condition is corrected.

- The MUTE button will silence low priority alarms for 2 minutes and medium priority alarms for 20 seconds (except for the Blocked Tube alarm, which can only be muted for 5 seconds or less while the alarm resets).

- If gas inlet pressure falls below the pressure needed to deliver the set flow rate, an alarm sounds, the bottle icon illuminates, and flow parameter displays two "dashes" that flash on and off. Certain fault conditions will halt flow; see alarm status table at the end of this section for additional information.

- Note: Gas flow will continue during *some* alarm conditions.

- A yellow LED above the Mute button indicates that one or more alarms are muted.

NOTE: LPM is noted as L/min on all newer Precision Flow devices

ALARM TONE PRIORITIES

- MEDIUM PRIORITY alarms require immediate attention and are indicated by rapid intermittent tones (fast triple beeps).
- LOW PRIORITY alarms require attention as soon as reasonably possible and are indicated by infrequent intermittent tones (slow double beeps).

In addition to the medium and low alarms, the Precision Flow® Plus emits the following audio signals:

- single dull tone that sounds when the unit switches from run to standby mode
- single high pitched beep whenever the control setting knob is pressed
- low pitched buzz when attempting to change a setting that cannot be changed or when alarm conditions prevent entering the run mode
- slowly repeating single beep during Disposable Water Path testing (entering Run Mode from Standby Mode)

Audio Tone Characteristics

Tone Type	Fo (Hz)	Pulses per Burst	Pulse Spacing (ms)	Pulse Duration (ms)	Inter-Burst Interval (s)
Medium Priority	660	3	200	200	2.5
Low Priority	660	2	200	200	22

Run/Standby Transition	440	1	-	30	-
Encoder Know Press	880	1	-	30	-
User Interface Error	220	1	-	100	-
Self Test	660	5	1000	50	-
DWP Detecting	660	1	-	100	0.9

Alarm/Icons Table

Alarm icon	Audio Signal	Indicates	Cause	Action
General fault (flashing)	Medium Priority Cannot be muted	Malfunction of sensor or control system	Internal component failure	First take note of any other icons shown on screen. Most of the time, this icon will not appear by itself. Then, unplug AC power, press and hold Run/Standby button for 3 seconds to clear the alarm.. If alarm does not clear, disconnect patient. Shut off unit, send unit in for service.
General fault (flashing) % O2 displays dashes (- -)	Medium Priority Cannot be muted	O2 sensor fault	Depleted or defective O2 sensor, bad 3-way solenoid valve or bad O2 sensor wire harness.	Reset by shutting off unit. Replace O2 sensor. Restart unit. Replace solenoid valve. Replace O2 sensor wire harness.
General fault (flashing) % O2 & L/min display dashes (--) Temp Displays between 52 & 84	Medium Priority Cannot be muted	General Fault Error Code	System Control Failure detected	See Table 2-5 General Fault Codes
Blocked tube (flashing)	Medium Priority Mutes only during brief reset period	High gas pressure at inlet to delivery tube	Obstructed or kinked cannula or delivery tube, or incorrect cannula fitted for flow rate selected. Issue may be caused by not fully seated DPC. *	Clear obstruction, reseat DPC, and/or check cannula type and flow rate pairing**.
Water out (flashing)	Medium Priority	No water in Disposable Water Path. Gas flow continues without heating or water circulation.	Sterile water empty, obstructed inlet tube, faulty DPC water float, and/or obstructed/faulty water level sensor.	Replace water bag, straighten inlet tube, replace DPC, and/or clean off water level sensor. Restart unit before continuing use.
Disposable Water Path (flashing)	Medium Priority	Disposable Water Path faulty or not detected. Unit will not run.	DPC not assembled correctly, defective, not properly seated, or not installed. Could also indicate faulty stator motor (water pump).	Replace or reseat DPC. If this does not resolve the fault, send the unit in for repair.
Battery charging (continuous)	None	The internal backup battery is not fully charged. The unit may not run on battery power for the full rated time in the event of a power failure. No action is necessary.		
Battery charging (flashing)	Medium Priority	Unit running in BATTERY MODE. Gas flow & blending continue without heat or water circulation.	AC power disconnected.	Reconnect AC power.

* The "Air-in Port" is the white nozzle located near the top of the DWP chamber and has a blue poppet in the middle that is pushed downward by the DPC's connector. If the connection between the DPC and the Air-in Port is not secure, high flow rates may be restricted and cause excess pressure within the unit, which could set off the Blocked Tube alarm.
** Only use Vapotherm approved cannulas and confirm flow rate is within acceptable range per the cannula's labeling.

Alarm/Icons Table

Alarm icon	Audio Signal	Indicates	Cause	Action
Cartridge fault: (cartridge alarm icon flashes)	Medium Priority	Cartridge not detected. Unit will not run	RUN mode: faulty sensor or cartridge not detected.	Remove Disposable Patient Circuit. Check cartridge installation. Check reflective label on cartridge. Check sensor windows are clean. Ensure DPC was allowed to fill with water for no less than 3 minutes. Restart the PF+ unit and reseat the DPC.
Cartridge fault (continuous)	Low Priority	Gas bubbles in water circulation. Unit continues to operate.	Excessive gas diffusion through cartridge fibers or DPC not fully primed prior to use.	Disconnect patient. Shut off unit. Replace Disposable Patient Circuit (water path, cartridge & delivery tube).
	None	Cartridge not detected.	STANDBY MODE: missing cartridge.	Remove Disposable Patient Circuit. Check cartridge installation and reflective labeling on both the DWP and VTC.
Cartridge type (LO or HI)	None	Indicates type of cartridge installed (low or high flow). Not an alarm. If unit is reading a high flow circuit as a low flow, it may be caused by slow insertion of the DPC – reseat DPC and check if issue is resolved. If not, contact Vapotherm.		
Gas supply (flashing)	Medium Priority	Gas supply pressure outside 4-85 psi (28-586 kPa) range.	Gas supply is disconnected or exhausted.	Ensure supply gas pressure is between 40 & 85 psi for full device flow range. Optimal pressure range is 55 ±10 psi
Gas supply (continuous and flow rate parameter display, flashes and lowers in value)	Medium Priority	Selected flow can not be provided from current gas supply.	Inlet gas pressure too low for selected flow rate.	Ensure supply gas pressure is between 40 & 85 psi 55 ±10 PSI for full device flow range. Optimal pressure range is 55 ±10 psi.
Temperature display shows two dashes flashing, & General Fault icon	Medium Priority Cannot be muted	Temperature out of range. Unit will not operate.	Overheating or temperature sensor malfunction.	Remove DPC and check for water leakage. Remove any water in DWP chamber **(warning: heater-plate may still be hot)** and clean temperature sensors. If issue continues, replace DPC.
Temperature parameter display flashes	None	Temperature is at least 2° > set point	User enters set point much lower than previous temperature.	Silence alarm and wait for temperature to drop.
		Temperature is at least 2° < set point	Low water temperature. May be caused by very low temperature water in a new water bag.	Silence alarm and wait for temperature to rise. The DPC should be up to temperature before therapy is applied to the patient.

System Display Icons

System Display or Alarm	Icon	Detection	Reset Process
Amber Run/Standby LED light		Standby Mode	
Green Run/Standby LED Blinking		Run / has not reached set point	
Green Run/Standby LED Solid		Run / has reached set point	
DWP Icon blinking	DWP	Detecting the sensors	Sensor detection clears
No battery Icon		Fully charged	
Battery Mode & discharged		No Alarms	Restore AC power

GENERAL FAULT ALARMS: Failures in the control or measurement systems for temperature, gas flow, and/or oxygen percentage will cause a General Fault alarm indicated by the icon shown to the left, Unit will continue gas delivery in a fault condition until placed in Standby. To reset: first disconnect the unit from AC power and then press the Run/Standby button. Once unit is fully powered off, re-connect AC power.

Alarm Status Table

For all Error Codes listed below, the General Fault Alarm icon is displayed and two dashes are displayed in the flow rate and oxygen percentage parameter readouts.

Error Code #	Detection	Reset Process
52	Pressure sensor 1 (AIR) out of range	Ensure gas pressure is below 85 PSI
53	Pressure sensor 2 (O2) out of range	Ensure gas pressure is below 85 PSI
54	Mass flow sensor 1 (AIR) out of range	Possible water ingress through gas supply.
55	Mass flow sensor 2 (O2) out of range	Possible water ingress through gas supply.
57	PS4 back pressure out of range	Contact Vapotherm Technical Support.
58	O2 sensor disconnect – unit will not start.	Disconnect power & press RUN button, ensure O2 sensor is connected/present and/or replace O2 sensor.
59	Pump tachometer out of range	Contact Vapotherm Technical Support.
61	Battery voltage below range	Ensure back up battery is not older than 2 years of age.
63	POST test failure	Contact Vapotherm Technical Support.
64	Spurious reset; Battery Voltage below range	Ensure back up battery is not older than 2 years of age.
65	Watchdog timer failed	Contact Vapotherm Technical Support.
67	Post RAM test failed	Contact Vapotherm Technical Support.
68	Flash memory corrupt	Contact Vapotherm Technical Support.
77	Heater thermocouple failure	Disconnect power & press RUN button. Restart the unit. If error code persists, contact Vapotherm Technical Support.
78	IR sensor TS1 failure or disconnected	Contact Vapotherm Technical Support.
79	IR sensor TS2 failure or disconnected	Contact Vapotherm Technical Support.
84	SW or hardware inconsistency	Contact Vapotherm Technical Support.

Use a static strap and/or a static control work station to ensure that static charges are safely conducted to ground and not through static sensitive devices.

Whenever opening the Precision Flow® Plus unit, ensure to take appropriate electrostatic discharge control precautions!

3.1 Removing the Front Cover

The semi-transparent Plexiglas display cover snaps into place without any hardware and conceals the front cover mounting screws.

1.   Gently pry up the bottom edge of the cover with a flat blade screwdriver, ensuring to take care not to crack the Plexiglass display. When there is a small gap between the bottom of the cover and raised edge above the control knob, push the smoked cover upward and it will pop free from the unit (Figure 3-1). **Note**: If removing the cover pushes the pliable gasket around the display out of position, place it back into the gasket groove.

2.   Remove the two black nylon screws, located by the speaker and fan vents in the bottom of the unit (Figure 3-3) with a flat blade screwdriver. Be careful not to cross thread the screws during reassembly.

3.   Remove the five mounting screws that secure the front panel with a Torx® T-15 screwdriver (Figure 3-2).

4.   Disconnect the display/control wire harness from the main PCB (Figure 3-4), and remove the front panel. Note: Ensure the wire harness is secured back to the main PCB during reassembly.
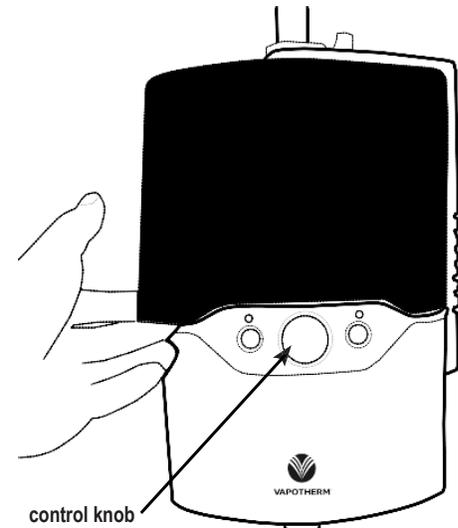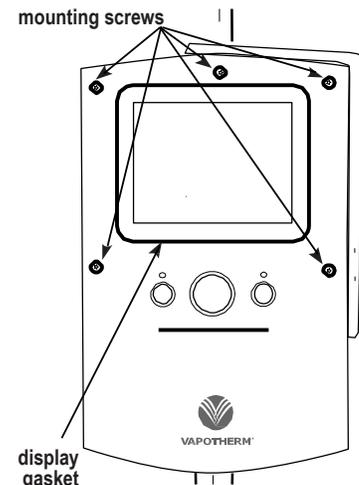
Figure 3-4 display / control wire harnes

control knob

Figure 3-1 smoked display cover

mounting screws

display gasket

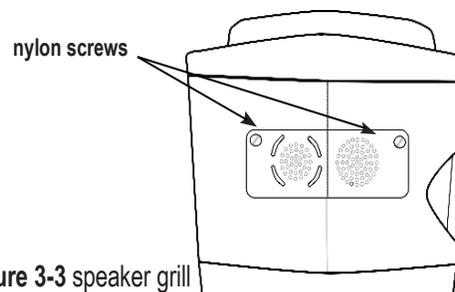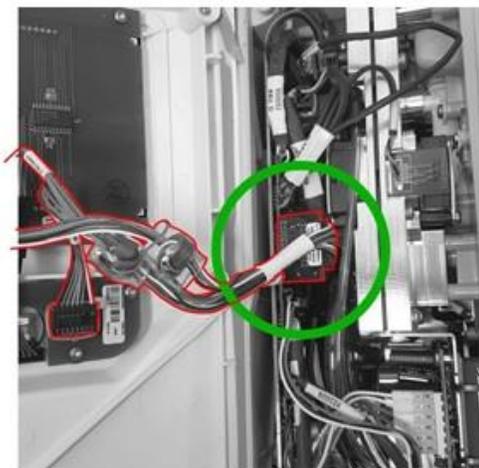**Figure 3-2** front cover

nylon screws

Figure 3-3 speaker grill

3.2 Removing the back cover

1. Remove the two screws that secure the pole clamp to the rear of the unit (Figure 3-5) with a Phillip's or T-20 Torx screwdriver (depending on manufacturing date of unit), and remove the clamp. Loosen the three screws that secure the O2 sensor door with a Phillips screwdriver and remove the door.

2. Remove the eight mounting screws that secure the rear cover to the back plate with a Torx T-15 screwdriver, and remove the rear cover. Ensure these screws are only used in the rear housing. These screws are too long to be used anywhere else. Figure 3-5.
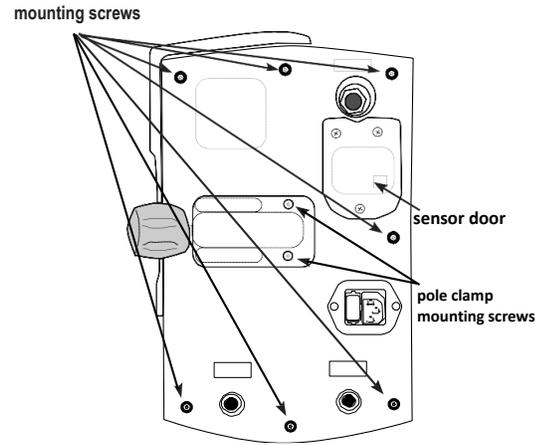
3.3 Removing the side cover

1. Remove the front cover as described in section 3.1, and the rear cover as described in 3.2.

2. Use a T-15 Torx or Phillips screwdriver (depending on manufacturing date of unit) to loosen the screw in the fan/speaker bracket at the bottom of the side cover (Figure 3-6).
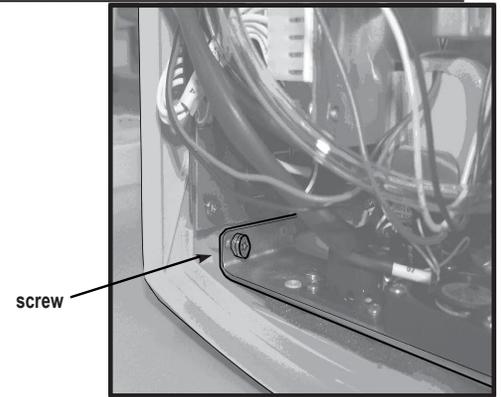
3. Remove the side cover (Figure 3-7).

3.4 Replacing the batteries

1. Backup battery packs are to be replaced every 2 years. Use the following date code legend to determine the age of the battery pack.
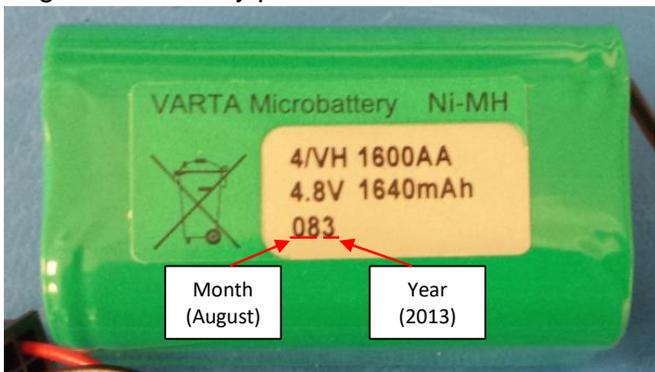
2. Remove the front housing as described in sections 3.1. If you own an older unit, you may have to remove the rear and side housings in addition to the front housing, to remove the backup battery.

3. **Do not disconnect green, yellow, or blue tubing or else the unit will have to be returned to Vapotherm for recalibration.**

4. Remove the battery from the power supply by cutting the two plastic cable ties securing it and disconnect it from the electrical connector, (J11). (Figure 3-9).

Figure 3-5 rear cover

Figure 3-6 fan/speaker bracket screw

Figure 3-7 removing the side cover

Figure 3-8 back plate

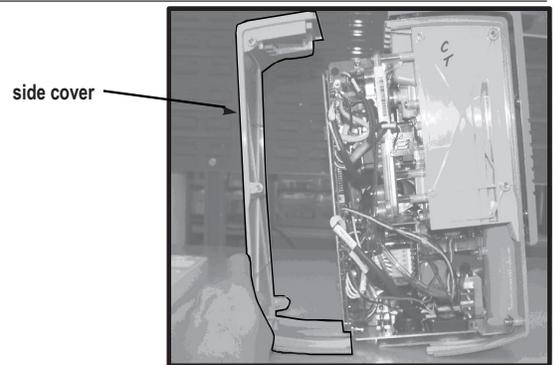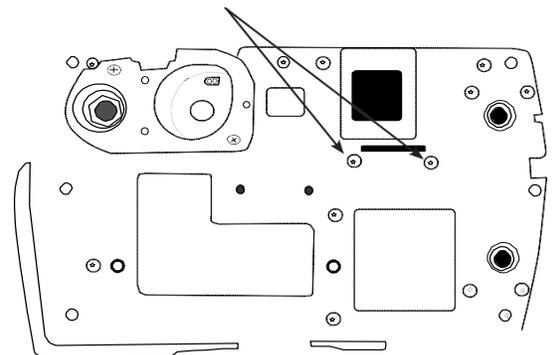5. Install the replacement battery pack (and power supply assembly, if removed) and reassemble the unit by reversing disassembly steps and ensuring the battery is securely fastened by a pair of new plastic cable ties.

Battery Connector (J11)

Power Supply

Plastic Cable Ties
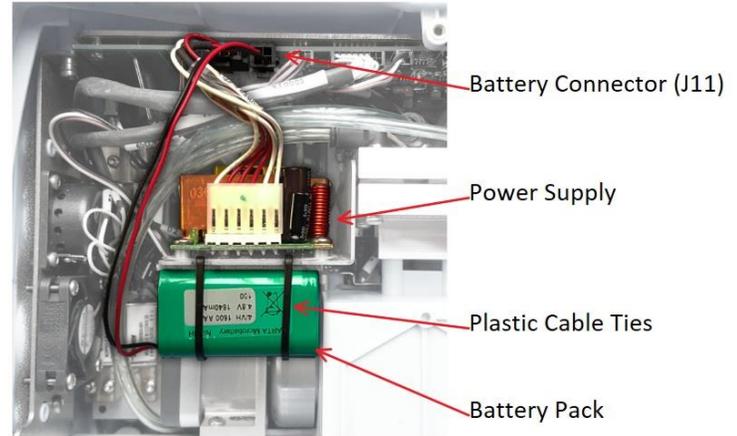
Battery Pack

Figure 3-9 Power Supply/Battery Pack

3.5 Replacing the hinged door

1. To remove the door, first remove the retaining clips from the grooved clevis pins, and then remove the pins from the rear housing assembly (Figures 3-10 & 3-11).

2. Attach the new door to the rear housing assembly by inserting the two grooved clevis pins in the hinges.

3. Secure the clevis pins by attaching the retaining clips to them.

4. Verify the door closes completely.
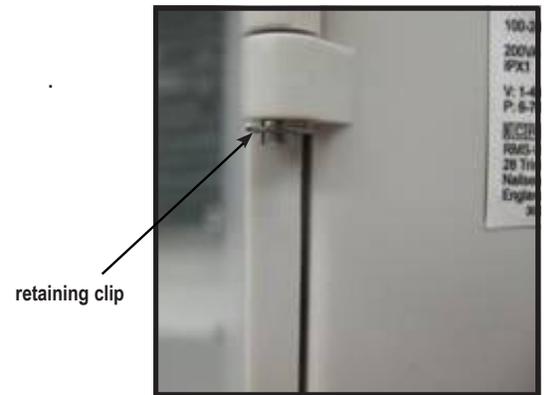
retaining clip

Figure 3-10 door retaining clip
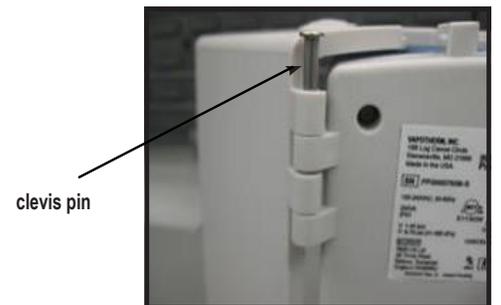
clevis pin

Figure 3-11 clevis pin

3.6 Replacing the fan, fan filter or speaker

1. Remove the front , rear and side covers as described in sections 3.1, 3.2.& 3.3

2. Use a T-15 Torx or Phillips (depending on manufacturing date of unit) screwdriver to loosen the screw that secures the fan/speaker bracket (Figure 3-12) and remove the assembly.

3. To access the filter, remove the four screws that secure fan bracket to the plastic grill panel. Clean or replace the filter.
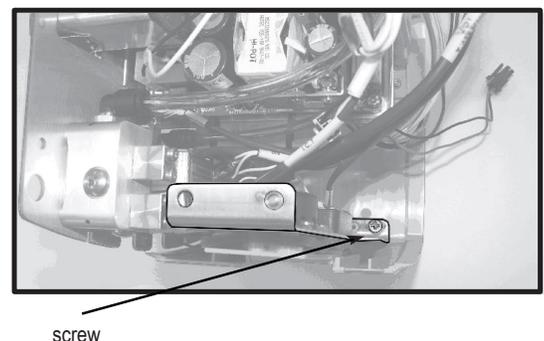
screw

Figure 3-12 fan speaker bracket

3.7 Front panel control repairs

1. Remove the front cover as described in section 3.1

2. To remove the display PCB, remove its four mounting screws with a Torx T-10 screwdriver.

3. To remove the control knob, slide the rubber knob off the stem, then use a deep socket wrench to remove the nut on the outside of the front panel that holds the encoder in place (Figure 3-14). Disconnect the 6 pin connector from the control board wire harness and remove the encoder.

4. To remove the membrane PCB assembly, remove its four mounting screws with a Torx T-10 screwdriver and disconnect the front panel wire harness from the membrane board (Figure 3-15). The membrane and encoder assembly can be separated and replaced. Take care to fully seat the gasket in the cut outs in the front panel before reassembling the Precision Flow® Plus unit.
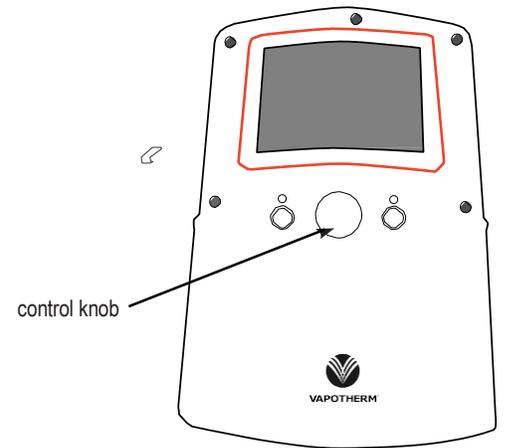
Figure 3-13 front panel with display cover removed

Figure 3-14 front panel with control knob removed

Figure 3-15 front panel- rear view

4.1 Regular Maintenance

4.1.1 Semi-annual preventive maintenance

It is recommended that the in-line filters within both O_2 and Air gas filter assemblies be replaced every 6 months or in accordance with your hospital maintenance records/ trends. The part number for orders is 3003034.

4.1.2 Annual preventive maintenance

The oxygen sensor should be replaced annually. The part number for the oxygen sensor is 3003011.

4.1.3 Biennial preventive maintenance
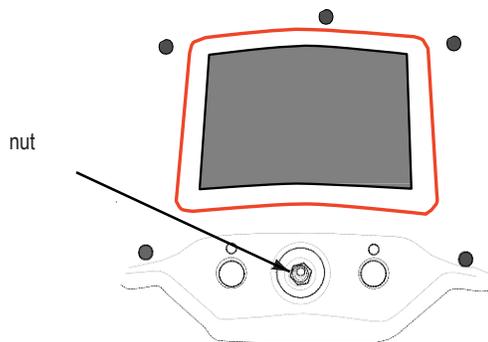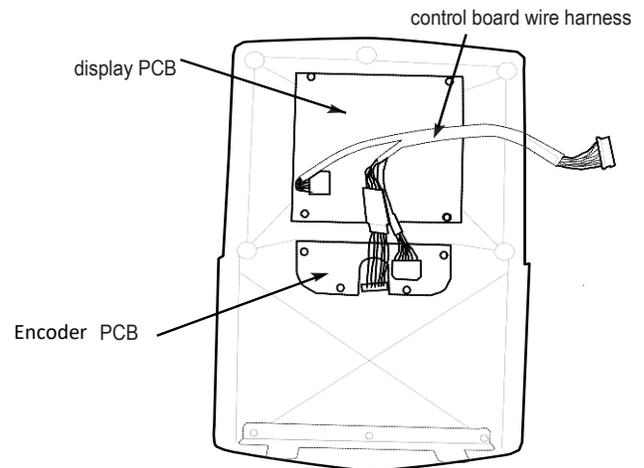
The internal battery pack should be replaced every 2 years, as described in this manual in section 3.4: Replacing the batteries. Perform the checkout procedure in section 5 before placing the unit back into service. The part number for the battery pack is 3000064.

NOTE: The function of the battery pack is to bridge therapy for a short period of time in case of a loss of power to the unit. It is NOT to be used to maintain unit function during patient transport. Internal battery backup maintains flow and oxygen percentage for at least 15 minutes if AC power is cut off and battery is fully charged. Battery recharges in 2 hours if fully depleted.

4.1.4 Ordering PM parts

You can order the above PM parts by contacting Vapotherm's Total Customer Care Department at <u>cs@vtherm.com</u> or Fax to (603) 218-6111.
NOTE: Vapotherm Preventative Maintenance Kits include all parts require for annual (PM Kit P/N 3100904) and bi-annual (PM Kit P/N 3100906) routine maintenance.

4.2 Maintenance Procedures

4.2.1 Inlet Gas Filter Replacement

1.   Unscrew trap bowl to expose filter element.

2.   Unscrew black retaining core to release filter assembly.

3.   Pull off and discard old filter element. Install new element by pressing it on to the black plastic retaining core. Fit the aluminum washer over the threaded end of the core.

4.   Screw the assembled filter element into the housing. Replace the clear plastic trap bowl.
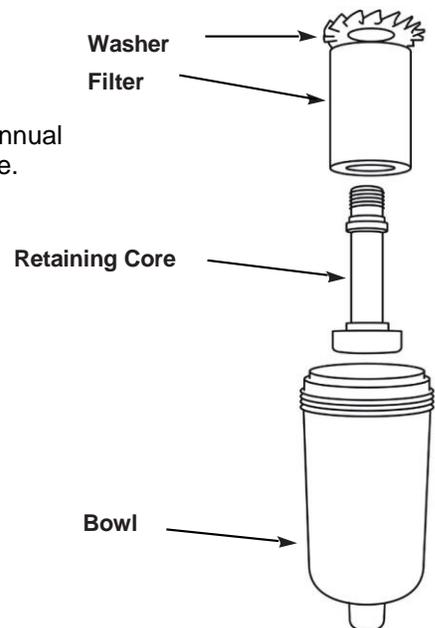
 CAUTION: The trap bowl must be screwed tightly into the

Washer
Filter

Retaining Core

Bowl

Figure 4-1 filter assembly

housing to prevent gas leaks

5. The inlet gas filter must be installed in the unit with the filter bowl down.

4.2.2 Oxygen Sensor Replacement

The oxygen sensor should be replaced annually. It is accessible by removing the panel at the back of the unit.

1. Remove three (3) securing screws from the access panel. Pull the panel away from the unit.

2. Disconnect the cable connector: grasp with needle nose pliers and pull straight back.

3. Unscrew the sensor body from its housing. Insert new sensor and screw in.

   CAUTION: Sensor should be hand-tight only. Do not use tools.

4. Plug in cable and replace cover. Do not over tighten screws.

5. Apply label to indicate when replacement is due.

6. Use the following charts to determine the age of the O2 sensor.

Access panel
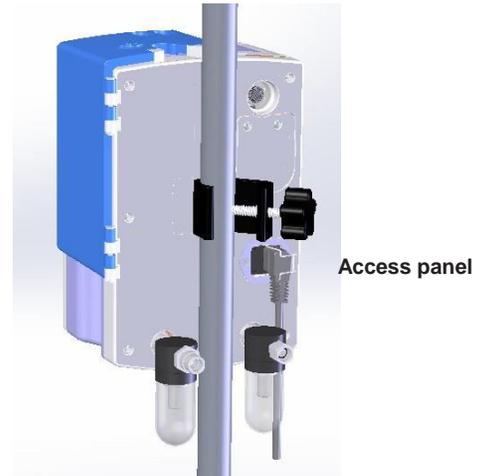
Figure 4-2 sensor panel

Analytical Industries Inc. Serial Number Definition
First digit indicates Year of Manufacture
Second and third digits indicate Month of Manufacture

| 6 | 0 | 4 | 4 | 7 | 6 | 5 | 8 | 9 |

6 - 2016   01 - Jan   Unique sequential serial numbers
7 - 2017   02 - Feb
8 - 2018   03 - Mar
9 - 2019   04 - Apr
            05 - May
            06 - Jun
            07 - Jul
            08 - Aug
            09 - Sep
            10 - Oct
            11 - Nov
            12 - Dec

Maxtec Serial Number Definition

LOT NUMBER   LINE ITEM NUMBER

| Z | B | 1 | 5 | 0 | X | X | 0 | 4 | 2 |

JOB NUMBER
(LAST 3 DIGITS)

SENSOR NUMBER IN THE LOT
ARE SEQUENTIAL NUMBERS
STARTING FROM 1

YEAR IN WHICH THE
LOT WAS STARTED

V - 2010
W - 2011
X - 2012
Y - 2013
Z - 2014
A - 2015
B - 2016
C - 2017
D - 2018
E - 2019

MONTH IN WHICH THE
LOT WAS STARTED

A - JAN
B - FEB
C - MAR
D - APR
E - MAY
F - JUN
G - JUL
H - AUG
J - SEP
K - OCT
L - NOV
M - DEC
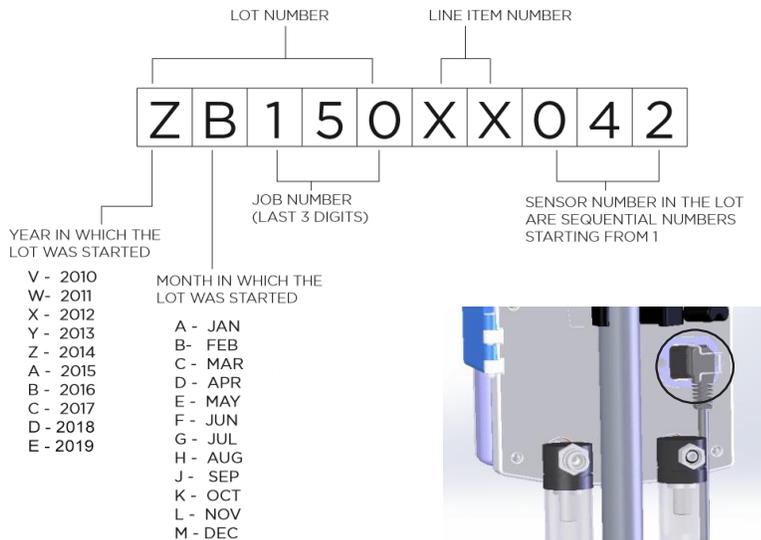
4.2.3 Fuse Replacement

The mains fuses (two GMA – 3A F250 V 250V, 5 x 20mm) are located next to the power cord inlet. Use two small flat blade screwdrivers to push the release clips on either end of the fuse block toward each other and release the fuse block to access the fuses. Figures 4-3 and 4-4.

Fuses
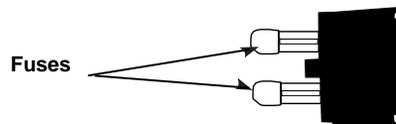
Figure 4-4 fuse block

Fuse block

Tabs
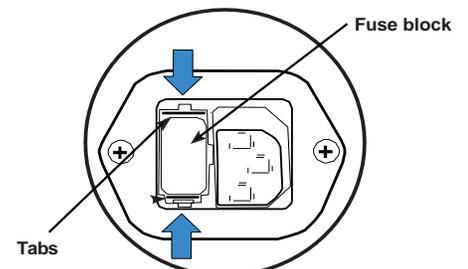
Figure 4-3 power cord inlet

4.2.4 Cleaning and disinfection

The entire disposable patient circuit is disposable and no disinfection is required. The main unit, including the docking station for the disposable water path should be wiped down with Super Sani-Cloth®. Unplug the Precision Flow® Plus while cleaning and disinfecting. The Precision Flow® Plus must always be cleaned and disinfected between patients. Follow the steps below to ensure a clean and disinfected device.

-        Wipe down the main unit with Super Sani-Cloth®.
-        Examine for visible soil. If visible soil is present, use a brush (e.g. Spectrum M16 brush) to remove visible soil.
-   Wet the main unit with another Super Sani-Cloth®. Keep the surface wet for at least six minutes. Use additional Super Sani-Cloth® if needed.

The Precision Flow® Plus must be cleaned and disinfected with Super Sani-Cloth®. In addition, if hospital procedures require, the following may be used: 70-90% isopropyl alcohol, 2% (maximum) Chlorine cleaning solution (Sodium Hypochlorite), 6% (maximum) Hydrogen Peroxide cleaning solution, Caviwipes TM, AF3 Germicidal, Incidin® OxyWipe, Bacillol® 30 Tissues, Clinell® Alcohol Wipes, or Tuffie Disinfectant Wipes-Cloth®.

NOTE: The transparent sensor ports in the docking station must be clean. Refer to Section 4 for a drawing of the docking station with arrows pointing to the location of the sensor ports. Visually examine the sensor ports for a transparent finish to confirm cleaning has been effective. The unit will not operate if the sensors do not receive a clear signal.

CAUTION: Do not use organic solvents or abrasive cleaners. Hypochlorite solutions liberate toxic gases such as chlorine when acidified or heated. The reaction with ammonia or with substances that can generate ammonia can produce chloramines which are also toxic and have explosive potential. Do not expose the surface of the heater plate on the Precision Flow® Plus unit to concentrations of Chlorine solution (Sodium Hypochlorite) for a prolonged period of time, as this may cause surface damage to the metal plating.

⚠ If not cleaned properly with approved cleaners, the Precision Flow® Plus unit will fail
   to operate correctly.

VAPOTHERM PRECISION FLOW® PLUS - PRE-USE CHECKLIST		Check (√) if complete & performance is acceptable
Unit Serial Number:	Date:	
Completed By:	Initials:	
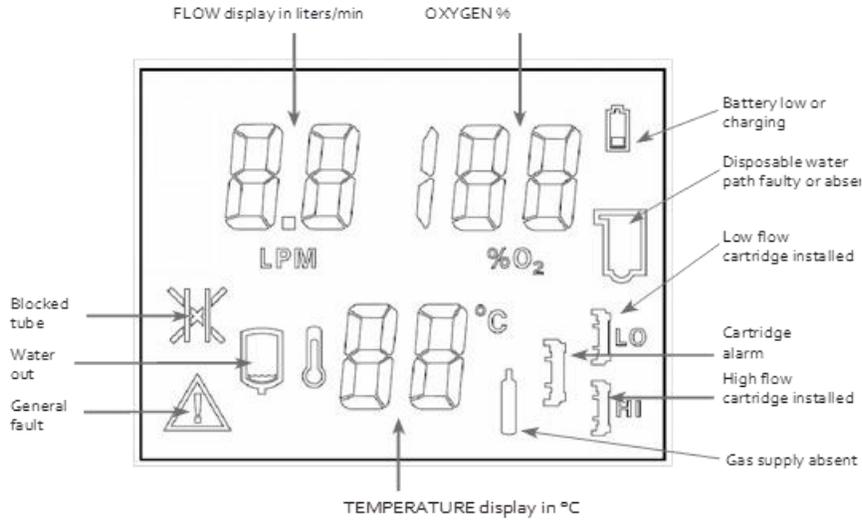
FIGURE 5.1

NOTE: LPM is noted as L/min on all newer Precision Flow devices

1. Set-up and Power On Test: Duration - Approximately 5 minutes	
1.1 Install an oxygen sensor into the Precision Flow® Plus unit (if one is not already installed). *See the Precision Flow® Plus Operating Instructions Manual: Section 6a, 'Oxygen Sensor Installation' for additional information.*	
1.2 Affix the Precision Flow® Plus unit to an IV pole or test rack. Do NOT install a Disposable Patient Circuit (DPC) at this time.	
1.3 Insert the air and oxygen gas filter assemblies, with hoses attached, into the ports at the rear of the unit.	
1.4 Connect the air and oxygen hoses to a pressurized source of 55 psi (+/- 10) psi).	
1.5 Connect the power cord to the rear of the Precision Flow® Plus Unit.	
1.6 Connect the other end of the power cord into AC power.	
1.7 Verify that ALL pixels on the LED display illuminate. *The LED pixel check is automatically initiated when the Precision Flow® Plus is connected to AC power and lasts approximately 3 seconds.*	

1.8 Verify that the LED above the run/stop button on the front panel turns amber.		
1.9 Verify that the following is displayed on the LED display:		

2. Low Flow DPC Recognition Test: Duration – Approximately 5 minutes	
2.1 Install a Low Flow DPC into the Precision Flow® Plus. *See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.*	
2.2 Verify that: - The DWP icon is not illuminated - The General Cartridge Icon is not illuminated - The Low Flow Cartridge Icon is illuminated See Figure 5.1 for Icon Legend	
2.3 Using the control knob, verify: - The gas flow is adjustable from 1 L/min to 8 L/min (0.5 L/min Resolution). - The oxygen percentage is adjustable from 21% to 100% (1% Resolution). - The temperature range is adjustable from 33° to 43° C (33° to 39° C for Precision Flow Devices with serial numbers starting with PFPC) (1°C Resolution).	
2.4 Test Complete - Remove the Low Flow DPC.	
3. High Flow DPC Recognition Test: Duration – Approximately 5 minutes	
3.1 Install a High Flow DPC into the Precision Flow® Plus. *See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.*	
3.2 Verify that: - The DWP icon is not illuminated - The General Cartridge Icon is not illuminated - The High Flow Cartridge Icon is illuminated See Figure 5.1 for Icon Legend	
3.3 Using the control knob, verify: - The gas flow is adjustable from 5 L/min to 40 L/min (1 L/min Resolution). - The oxygen percentage is adjustable from 21% to 100% (1% Resolution). - The temperature range is adjustable from 33° to 43° C (33° to 39° C for Precision Flow Devices with serial numbers starting with PFPC) (1°C Resolution).	

3.4 Test Complete - Remove the High Flow DPC. If continuing on to step 4, leave the High Flow DPC inserted.	

4. Air and Oxygen Inlet Pressure Recognition Test. Duration: Approximately 20 Minutes	
4.1 Install a High Flow DPC into the Precision Flow® Plus. *See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.*	
4.2 Attach a sterile water bag to the spiked tube of the DPC and unclamp the spike tube clamp to allow the DPC to fill with water. *The Water Out Icon may blink until the DPC has completely filled with water.*	
4.3 Verify that the water bag icon goes dark. *It may take up to **90 seconds** for the DPC to fill completely with water and the Water Out Icon to clear.*	
4.4 Adjust settings to 25 L/min, 33°C, 21% O_2 and press the RUN button. *See the Precision Flow® Plus Operating Instructions Manual: Section 8 'Adjustments', for additional information.*	
4.5 Wait 30 seconds to allow flow to stabilize.	

4.6 Turn off the Air inlet pressure.	
4.7 Verify: - Flow stops - O_2% displays - - - L/min displays 0.5 L/min - Medium priority alarm sounds - The gas tank icon flashes. *The Precision Flow® Plus may not immediately alarm due to residual pressure in the supply line.*	
4.8 Test Mute Button function: Depress Alarm Mute Button. Ensure audible alarm silences. 4.9 Restore Air inlet pressure.	
4.10 Verify: - The alarm clears - Flow and O_2% are restored - The gas tank icon goes dark See Figure 5.1 for icon legend	
4.11 Adjust settings to 25 L/min, 33^0 C, **100%** O_2.	
4.12 Wait 30 seconds to allow flow to stabilize.	
4.13 Turn off the Oxygen inlet pressure.	
4.14 Verify: - Flow stops - O_2% displays - - - L/min displays 0.5 L/min - Medium priority alarm sounds - The gas tank icon flashes. - *See image in 4.7. and Figure 5.1 for icon legend*	

4.15 Restore Oxygen inlet pressure.	
4.16 Verify: - The alarm clears - Flow and O_2% are restored - The gas tank icon goes dark See Figure 5.1 for icon legend	
4.17 Test Complete - Remove the High Flow DPC. If continuing on to step 5, leave the High Flow DPC inserted.	

5. Occlusion Test: Duration - Approximately 5 minutes	
5.1 Install a High Flow DPC into the Precision Flow® Plus. *See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.*	
5.2 Attach a sterile water bag to the spiked tube of the DPC and allow the DPC to fill with water. *The Water Out Icon may blink until the DPC has completely filled with water.*	
5.3 Verify that the water bag icon goes dark. *It may take up to 90 seconds for the DPC to completely fill with water and the Water Out Icon to clear.*	
5.4 Adjust settings to 25 L/min, 33°C, 21% O_2 and press the RUN button. *See the Precision Flow® Plus Operating Instructions Manual: Section 8 'Adjustments', for additional information.*	
5.5 Wait 30 seconds to allow flow to stabilize.	
5.6 Occlude the delivery tube by placing your thumb over the distal end of the delivery tube. *The Precision Flow® Plus will attempt to restore flow every 3 seconds after an occlusion is detected. Remove the occlusion to avoid consecutive alarms.*	
5.7 Verify: - Flow stops - The Medium priority alarm sounds - The occluded tube icon flashes. See Figure 5.1 for icon legend *The Precision Flow® Plus will attempt to restore flow every 3 seconds after an occlusion is detected. Remove the occlusion to avoid consecutive alarms.*	
5.8 Stop occluding the delivery tube by removing your thumb.	
5.9 Verify that the alarm clears and that flow is restored.	
5.10 Test Complete - Remove the High Flow DPC. If continuing on to step 6, leave the High Flow DPC inserted.	

6. Battery Backup Test: Duration - Approximately 10 minutes	
6.1 Install a High Flow DPC into the Precision Flow® Plus. *See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.*	
6.2 Attach a sterile water bag to the spiked tube of the DPC and allow the DPC to fill with water. *The Water Out Icon may blink until the DPC has completely filled with water.*	

6.3 Verify that the water bag icon goes dark. *It may take up to 90 seconds for the DPC to completely fill with water and the Water Out Icon to clear.*	
6.4 Adjust settings to 25 L/min, 33°C, 21% O$_2$ and press the RUN button. *See the Precision Flow® Plus Operating Instructions Manual: Section 8 'Adjustments', for additional information.*	
6.5 Wait 30 seconds to allow flow to stabilize.	
6.6 Verify the Battery Icon is NOT illuminated. *The Battery Icon, when illuminated, signifies that the battery is not fully charged. Please allow a minimum of 2 hours to fully charge the battery. Disconnecting AC power while the Battery Icon is illuminated may cause the Precision Flow® Plus to power down.*	
6.7 Disconnect AC power. *Failure to reconnect AC power within 15 minutes may result in shutdown of the Precision Flow® Plus.*	
6.8 Verify: - Gas flow continues. - The Medium priority alarm is sounded. - The Battery Icon Flashes. - The light above the run/stop button turns amber (green for Precision Flow Devices with serial numbers starting with PFPC) and flashes.	
6.9 Reconnect AC power.	
6.10 Verify: - The light above the run/stop button turns green and stops flashing. - The Medium priority alarm is silenced. *The battery Icon may remain illuminated indicating that the battery is charging.*	
6.11 Test Complete - Remove the High Flow DPC. If continuing on to step 7, leave the High Flow DPC inserted.	

7. Temperature Stability Check. Duration: Approximately 15 Minutes	
Equipment Required: • RECOMMENDED: Calibrated Omega HH 42 Digital Thermometer with an Omega Series 400 Thermistor Probe (Omega PN# ON-402-PP) (Accuracy of equipment may vary, listed thermometer and thermistor have an accuracy of 0.015°C. If using a different model, you must consider the accuracy of the thermometer and thermocouple/thermistor used.) • For optimal results verify that the ambient temperature is 23°C +/- 2°C.	
7.1 Clean the Precision Flow® Plus's sensor windows and heater plate with an alcohol swab. CAUTION: HEATER PLATE MAY BE EXTRMELY HOT! *Foreign matter on the heater plate surface or the sensor windows may impact the ability of the Precision Flow® Plus to reach set temperature.* *See the Precision Flow® Plus Operating Instructions Manual: Section 15 'Cleaning and Disinfection', for additional information.* 	

7.2 Install a High Flow DPC into the Precision Flow® Plus. Verify the DPC heater plate is clean and free of blemishes and scratches. *Ensure the Delivery Tube does not rest against metallic or cold surfaces.* Foreign matter or scratches on the DPC heater plate may impact the ability of the Precision Flow® Plus to reach set temperature. See the Precision Flow® Plus Operating Instructions Manual: Section 7.5, for additional information.	
7.3 Attach a sterile water bag to the DPC by inserting the spike into the spike part of the bag and allow the DPC to fill with water. *The Water Out Icon may blink until the DPC has completely filled*	
7.4 Verify that the water bag icon goes dark. *It may take up to 90 seconds for the DPC to completely fill with water and the Water Out Icon to clear.*	
7.5 Adjust settings to 5 L/min, 33°C, 21% O_2 and press the RUN button.	
7.6 Wait until temperature displayed on the LED reaches 33°C. *This may take up to 5 minutes when testing at an ambient temperature of 23°C.* *The temperature display will flash the temperature of the water in the DPC and the green light above the run/stop button will flash until the unit reaches set point.* *The unit is at 33°C when the temperature display is no longer flashing and the green light above the run/stop button stops flashing.*	
7.7 Insert a calibrated thermistor/thermometer 2 to 3 inches into the distal end of the delivery tube. *Placing large instruments into the flow path may trigger an occluded tube alarm. If an occluded tube alarm is triggered, leave the thermistor/thermocouple inserted into the delivery tube and allow the Precision Flow® Plus to attempt to clear the alarm. If unsuccessful, try a smaller diameter thermistor/thermocouple.*	
7.8 Adjust settings to 25.0 L/min, 37°C, and 21% O_2.	
7.9 When the temperature reaches 37C on the LED, wait 5 minutes to allow temperature to stabilize and record temperature. *The unit is at 37°C when the temperature display is no longer flashing and the green light above the run/stop button stops flashing.*	
7.10 Actual temperature is to be 37°C (-4°C/+2°C). RECORD READING ___ ___ **.** °C When testing high temperatures outside of tightly controlled ambient conditions and/or when using equipment with an accuracy less than what is recommended, it is common to see measurements within the range indicated above. The acceptance criteria for this test (37°C -4°C/+2°C) varies from the Precision Flow® Plus temperature performance specification of ±2°C to account for variability in ambient conditions and test equipment.	
7.11 Test Complete - Remove the High Flow DPC.	

6.1: Tools & Equipment.

Tools include the following:

Torx Drivers: T-20
                T-15
                T-10
Small blade flat head screw driver set
Small Philips screw driver set.
Diagonal Cutters
Socket for encoder (11mm)

Equipment

Electrical Safety Testing Equipment
Thermometer with thermocouple.

7.1 **Rear panel parts**

1   Screw, Phillips.. ……...…...…......3000172
2   Cover, O2 Sensor 3100919
3   Plug, O2 Sensor Cover NC/EMR Port" ……3100920
4   Label, O2 3003002
       Label, O2 (PFPC)……………………3101433
5   Label, Air.....................................3003001
       Label, Air (PFPC)…...……………..3101434
6   Label, Do Not Block 3003003
7   "C" clamp 3003456
8   3/8-16 Knob screw......................3003458
9   Screw, T-20 Skt Hd 3010308
10   Retainer, Power Cord 3000059
11   Fuse Drawer 3000137
12   Fuse...3000135
13   Screw, T-15 Skt Hd 3010324
14   Screw, black nylon 3000178
15   1/8" trap assy, DISS O2..............3000138
       1/8" trap assy NIST O2 3000139
16   1/4" trap assy DISS AIR..............3000140
       1/4" trap assy NIST AIR..............3000141
17   NIST Body adapter O2, (CA)……3000142
18   NIST Body adapter Air, (CA)……3000143
19   Technical Support Line Label……3100399
20   MR Unsafe Label (PFPC)……….3101237
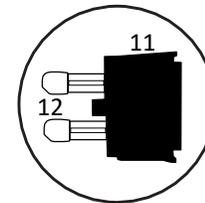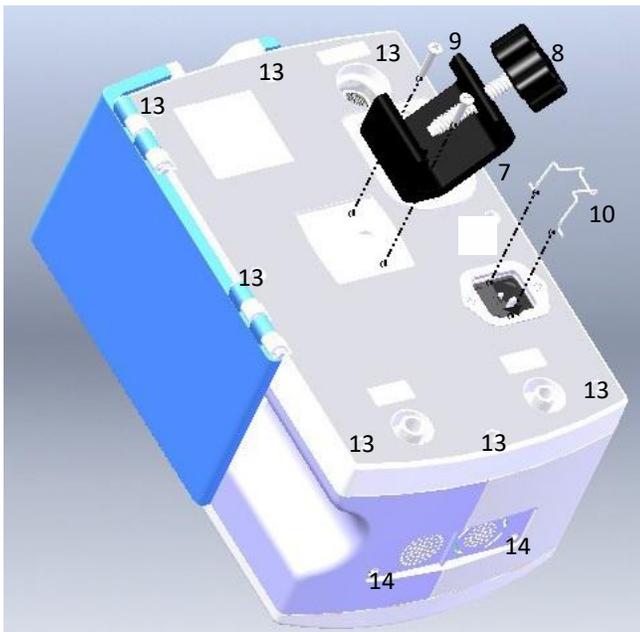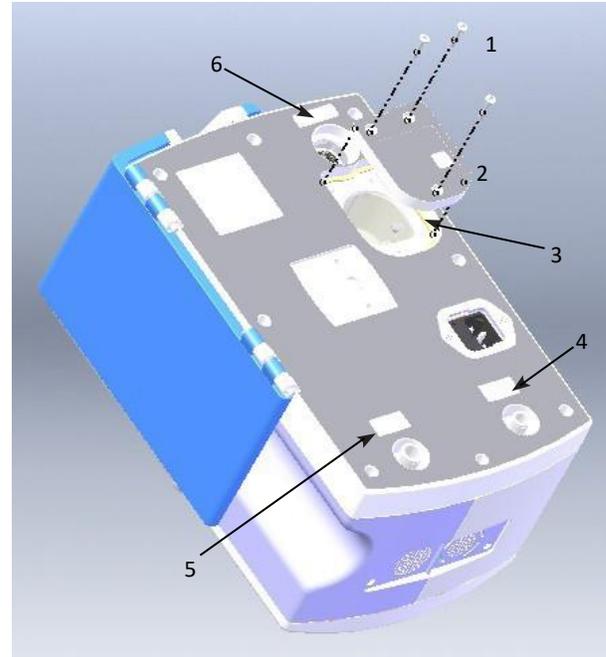
Parts not shown

       O2 sensor cell..............................3003011
       Nurse Call/EMR Cable……………3100897
       U.S. power cord 3003019
       U.K. power cord 3003018
       E.U. power cord 3003017
       Australia power cord 3003024
       Japan power cord 3003026
       Korean power cord 3003325
       Israel power cord 3010182
       Air hose assy (yellow).................. 3000035
       O2 hose assy (green).................. 3000036
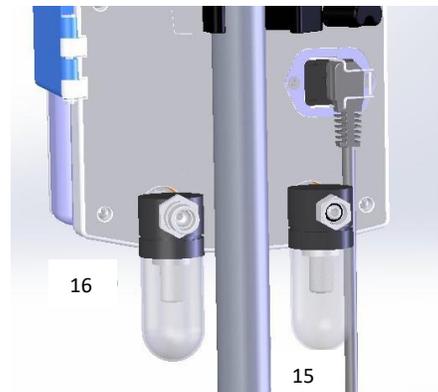
Heliox hose assy., DISS 3200028
Smoked plex display cover........... 3000022

Parts not shown

Front panel

      Control Knob 3000081
      Control Knob Encoder 3000133
      Mute button.. 3000011
      Run/Standby button 3003082

Door

      Precision Flow® Plus, Hinged Door Kit.............3010417

Internal

      Fan Filter...3000094
      Wire Harness, Speaker Fan Assy......... 3000076
      Precision Flow® Plus, Power Supply Insulator.3000177