

eQuinox™

Personal Ambulatory Oxygen System (PAOS)™

Model 4000

PROVIDER TECHNICAL MANUAL



Table of Contents

General Information	3
Warning and Caution Statements.....	3
Introduction to the eQuinox Oxygen System.....	4
eQuinox Oxygen System Specifications	5
Pulse Dose Mode Specifications	6
Power Accessory Specifications.....	6
Compressor and Compressor Enclosure.....	7
Power Distribution	7
Control Board	7
Continuous Flow Mode	7
Pulse Dose Mode	7
Pulse Profiles	7
Service Mode Functions.....	8
EDAT	8
Power Supplies.....	9
AC Power Supply.....	9
DC Power Cable	9
Battery Pack.....	9
Charging Algorithm	11
Introduction	12
Pre-Delivery Check List.....	12
Adjusting Rise Time	12
Connecting the AC Power Supply.....	12
Monthly Maintenance—Patient	13
Care for the Battery Pack	13
Calibrating the Battery Pack.....	13
eQuinox Monthly Run-Time Procedure	13
Annual Maintenance Procedures	14
Remove and Replace 9-Volt Battery and Compressor intake Filter.....	14
Assembly and Alarm Verification Tests	17
Electrical Safety Test	17
Cleaning the eQuinox	17
Provider Service and Maintenance Record.....	18

Voice Module Operation	19
Voice Module Operational Instructions	19
Enable/Disable the Voice Module	19
Increase/Decrease the Volume of Vocal Notifications	19
Changing Voice Module Language.....	19
eQuinox Voice Message Alert Descriptions Table.....	20
eQuinox Voice Message Alert Descriptions.....	20
Troubleshooting, Service, and Repair Procedures.....	21
Alarm Conditions and Alarm Codes	22
Malfunction Codes.....	23
Servicing the eQuinox	25
I. Removing/Replacing the Back Cover	25
II. Removing/Replacing the Handle and Speaker	26
III. Removing/Replacing the Back Cover Foam and Intake Muffler Section.....	26
IV. Removing/Replacing the Compressor Assembly.....	27
V. Removing/Replacing the ATF.....	29
VI. Removing/Replacing the Product Tank.....	30
VII. Removing/Replacing the Proportional Flow Valve	31
VIII. Removing/Replacing the Rubber Gasket Seal.....	31
IX. Removing/Replacing the Top Cover Foam Section.....	32
X. Removing/Replacing the Control Board, Power Manager Board, Voice System Board, Battery Bridge Board, Membrane Panel and Wire Harness Assemblies	33
Parts List	39
Optional Accessories	40
CAIRE Inc. Customer Service Contact Information.....	41
Authorized European Union Representative:	41


General Information


This technical manual will familiarize you with Provider-specific information regarding the eQuinox Oxygen System. Instructions in this manual are intended to help ensure that:

- Providers are familiar with eQuinox system components and system principles of operation
- Providers are given proper guidance in the use of the eQuinox and its accessories that can be conveyed to patients
- Providers are made aware of the care, diagnostics, maintenance, and repair of the eQuinox

Warning and Caution Statements

Safety instructions are defined as follows:

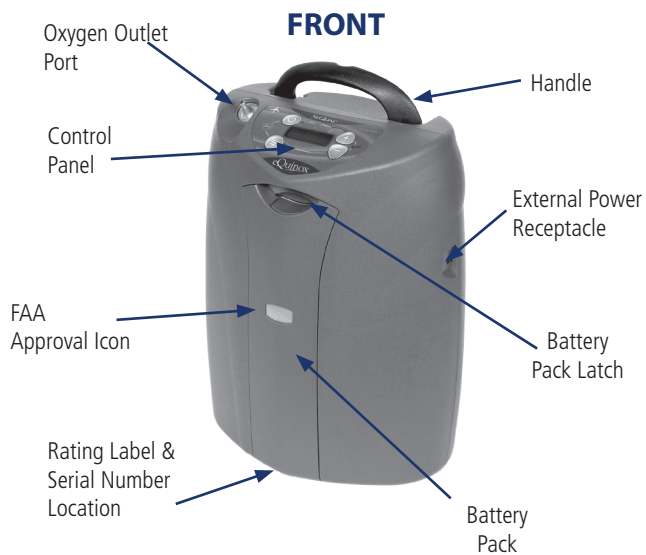
WARNING:	
	Important safety information for hazards that might cause serious injury.

CAUTION	
	Important information for preventing damage to the eQuinox.

Note:	Places emphasis on an operating characteristic or important consideration.
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Introduction to the eQuinox Oxygen System

eQuinox



eQuinox Cart



AC Power Supply



12VDC Cable



Battery Pack



BACK



eQuinox Oxygen System Specifications

Dimensions (H x W X D)	13.6 x 10.6 x 7.4 (inches) (34.5 x 26.9 x 18.8 cm)
Weight eQuinox	12.2 lbs (5.53 kg) unit only 14.0 lb (6.35 kg) w/ 12-cell battery installed
Battery Pack	12 Cell Battery Pack - 1.85 lbs (0.84 kg) 24 Cell Battery Pack - 3.6 lbs (1.63 kg)
Flow Settings Continuous Flow (measured in Liters Per Minute LPM) Pulse Dose (measured in mL)	0.5 to 3.0 LPM (0.5 liter increments) Settings 1.0-6.0: 16-96mL (8mL increments) Settings 7-9: 128mL, 160mL, 192mL
Continuous Flow Accuracy	+/- 10% or 200ml/min, whichever is greater
Oxygen Concentration	90% (+5.5/-3%) for all flow settings
Maximum System Pressure	15 psig (103.5 kPa)
Oxygen Output Pressure	5.0 psig (34.5 kPa) nominal
Oxygen Concentration Status Indicator	Green Light = Normal Operation Yellow Light = Warning or Caution, less than 85% \pm 3% Red Light Flashing = Abnormal Operation, less than 70% \pm 5%
Nominal Sound Level 3.0 LPM Continuous Flow 0.5 LPM Continuous Flow	46 dB(A) 40 dB(A)
Operating Environment Temperature (Unit ONLY, without Battery Pack) Humidity	32° F to 104° F (0° to 40°C) 10% to 95%, Non-condensing, 82.4°F (28°C) Maximum Dew point
Storage Environment Temperature Temperature (Battery Pack) Humidity	-4° F to 140° F (-20° to 60°C) -4°F to 122°F (-20° to 50°C) Up to 95% Non-condensing
Altitude Operating Range	-1254 to 13,130 feet (-382 to 4,000 meters)
Nominal Power 0.5 LPM Continuous flow 3 LPM Continuous Flow 1.0 Pulse Dose Setting 6.0 Pulse Dose Setting Battery Charging	60 Watts 110 Watts 45 Watts 95 Watts Approx. 50 W depending on device setting
Nominal Battery Pack Operating Time	See Battery Duration Chart
Continuous Flow Indication	Expressed in liters per minute (LPM)
Audible Alarm Indicators	See Alarm Condition and Alarm Codes
Back-Up Alarm Power	9V Internal Battery
Filters	Air Inlet, HEPA, Compressor Intake

Pulse Dose Mode Specifications

Pulse Settings	1.0 to 6.0, in 8mL increments up to 96 mL; 7-9 in 32mL increments up to 192 mL
Trigger Sensitivity	Adjustable between settings of 1 (most sensitive) to 3 (least sensitive)
Adjustable Bolus Rise Time	Adjustable settings of Fast(factory setting), Medium, or Slow
Trigger Criteria	<ul style="list-style-type: none"> Cannula pressure has dropped below the trigger point (typically between 0.135—0.37 cm of H₂O of negative pressure) At least 1¼ seconds has passed since the last pulse began
Minimum time between breaths	1.25 seconds (max. 3 consecutive breaths)
Response to Missing Breaths	While in Pulse Dose Mode, the eQuinox is always monitoring for breath detection. After 15 seconds of no breath detected, the eQuinox “delivers” Continuous Flow at the last Continuous Flow setting. After another 15 seconds, the eQuinox stops delivering Continuous Flow and waits 15 seconds for a breath. The eQuinox will stay in this modality until a breath is detected.

Pulse Dose Setting	Bolus Size (± 15%) mL	AC power, DC Power and Battery Pack
		Max Breath Rate
1.0	16	40
2.0	32	40
3.0	48	40
4.0	64	40
5.0	80	37
6.0	96	31
7	128	23
8	160	18
9	192	15

NOTE: Bolus volume decreases as breath rate exceeds published range.

Table 2

Power Accessory Specifications

	AC Power Cable	DC Power Cable	Battery Pack
Input Voltage	100-240VAC, 50-60 Hz	11.5–16VDC	NA
Input Power	170 VA Max	≤ 10 amps average	14.8 VDC
Output Voltage	28 VDC	11.5–16VDC	NA
Output Power	150W	NA	NA
Capacity	NA	NA	24-Cell Battery: Quantity (2) 95 W-Hr Battery Packs 12-Cell Battery: Quantity (1) 89 W-Hr Battery Pack
Nominal Battery Pack Life	NA	NA	80% Capacity after 300 Charge/Discharge cycles
Battery Pack Recharge Time	NA	NA	2.0 to 5.0 hours, dependent on flow setting, to achieve 80% capacity from a fully discharged Battery Pack

Table 3

Compressor and Compressor Enclosure

The eQuinox Compressor is a two-cylinder, variable speed compressor, driven by a highly efficient Brushless DC (BLDC) motor. When air flows into the Compressor enclosure, it passes through an air intake filter/muffler that muffles sound and filters out impurities. Using one cylinder, the compressor takes in filtered air and delivers it to the ATF Module under pressure. The second cylinder draws a vacuum on the ATF module and exhausts nitrogen rich gas to the exhaust vent.

Power Distribution

The Power Manager takes external power that comes into the eQuinox from the power supplies or Battery Pack and monitors and controls power distribution to the rest of the eQuinox system. The Power Manager drives the compressor, ATF module motor, blower, and provides power to the Control Board. In addition, when the unit is connected to an external power source, the power manager monitors and controls the recharging of the Battery Pack.

Control Board

The Control Board is at the center of nearly all eQuinox functions. The board constantly monitors dynamics such as temperatures, pressures, product flow and concentration, and user input. It determines proper compressor and ATF motor speeds needed in order to provide optimum system performance. In addition, this system supports the operation of the Control Panel and its indicators.

The Control Board utilizes a proprietary ultrasonic flow and concentration sensor and a flow control valve to accurately control the flow of oxygen in Continuous Flow and Pulse Dose Modes.

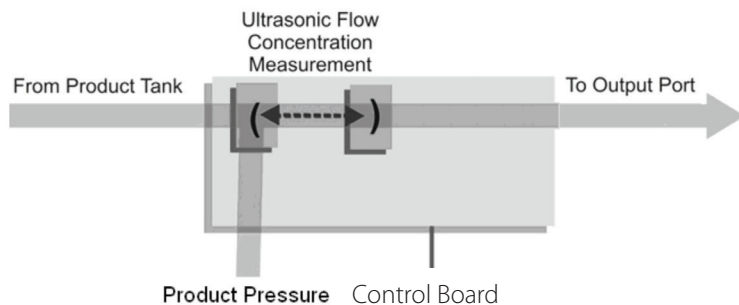


Figure 1: Flow Sensor Board Diagram

Continuous Flow Mode

Continuous Flow Mode delivers a constant flow of oxygen to a patient by means of tubing and a nasal cannula at rates between 0.5 LPM and 3.0 LPM. Within the eQuinox, concentrated oxygen is stored in a 500ml product tank at pressures in the range of 5 to 9 psi. This pressure gives Continuous Flow Mode the capability to deliver the indicated flow rate to the patient even if extension tubing is used, up to 50 feet long. In addition, the eQuinox Continuous Flow Mode is fully compatible with humidifier use, with nasal cannula not exceeding 7 feet.

Pulse Dose Mode

The eQuinox Pulse Dose Mode delivers a measured bolus of oxygen at the very beginning of each inspiration. The approach is based on the manner in which gas is absorbed into a patient's airway. eQuinox users may select pulse dose volume delivery rates. Regardless of setting, the pulse profile is a simple square-wave pulse based on a 16 mL volume. (Refer to "Pulse Profiles" table below). Pulse durations are no less than 100 milliseconds at the beginning of the inspiration. There are three Rise Time settings (Slow, Medium, and Fast). The table below is for the FAST Rise Time setting (factory default is Fast).

Flow Setting	Pulse Peak Flow, LPM (volumetric)	Pulse Duration (millisecond)	Bolus Volume (ml)
1.0	8	120	16
2.0	9	213	32
3.0	10	288	48
4.0	11	349	64
5.0	12	400	80
6.0	13	443	96
7	15	512	128
8	17	565	160
9	19	606	192

Table 4

Pulse Profiles

The fundamental approach to triggering and controlling the oxygen bolus in Pulse Dose Mode is as follows:

The User may select a pulse trigger sensitivity in settings ranging from 1-3. Bolus volume should be prescribed by a physician and may range from 16mL up to 192mL. The pulse will be triggered when the system meets all of the following criteria:

- The cannula pressure has dropped below the trigger point (typically between 0.135 and 0.37 cm H2O)
- At least 1¼ seconds has passed since the last pulse began

Service Mode Functions

Factory maintenance or service updates may sometimes be required on the eQuinox. Factory and qualified factory-trained technicians can access service mode software functions by using the Service Port located on the back of the unit. The Service Port is not for patient use.



Figure 2: eQuinox Service Port

EDAT

EDAT is the world's first computer-based data retrieval service tool for oxygen concentrators. EDAT is proprietary to CAIRE Inc., and is comprised of both hardware and software components. EDAT is SeQual's global solution for your service and support needs.

EDAT software is capable of sensing and displaying historical event logs and values of components and sensors within the eQuinox system. This can be used to determine system faults or user errors and communicate data for troubleshooting or documentation related to service and updates. EDAT hardware attaches or Plugs into the eQuinox Service Port, and into a computer's USB port.

The EDAT software set allows a provider to set-up a hub and spoke service center. Field service reps can travel to a patient's home, troubleshoot and transmit the data to either in-house tech support personnel or CAIRE. Support personnel can diagnose, provide solutions and print documentation for equipment records.

EDAT also makes eQuinox software upgrades easy and accessible.

For more information on EDAT, contact CAIRE Inc. Technical Service at 1-800-482-2473.

Power Supplies

The eQuinox may operate from either the AC Power Supply, DC Power Cable or Battery Pack. When power is available from an external supply, the eQuinox will draw from the external source rather than depleting the Battery Pack. Connection to external power is indicated when the External Power Present Indicator located on the Control Panel is illuminated.

AC Power Supply

The AC Power Supply is a universal input type, capable of accepting 100-240VAC, 50/60 Hz. It is capable of delivering up to 150W of 28VDC output. The input cord requires a grounded receptacle. Country specific cords or universal power adapter PN 5591-SEQ may be used with the AC Power Supply, as the power supply is equipped with a universal input receptacle. When used in a medical care facility, international safety standards require the use of hospital grade AC power cord with the eQuinox.



Figure 3: eQuinox AC Power Supply

The eQuinox AC Power Supply does not contain a fan. When in use, the AC Power Supply should be located in a well-ventilated area.

Located near the output cord, there is a green LED that is illuminated when the AC Power Supply is supplying 28VDC power. If the LED is not illuminated, there is no input power available. In addition, the Power Supply contains protection circuits for output over-current, input over-voltage, and internal over-temperature conditions. If any of these conditions exist, output power will be interrupted and the LED turns off. However, these three conditions are self-resetting, such that output power will resume when protection circuits fall back into acceptable operating ranges.

DC Power Cable

The DC Power Cable is intended for use with DC accessory outlets, such as those found in motor vehicles. Input voltage required to power the eQuinox from via the DC Power Cable is 11.5 - 16VDC. The 12 Volt DC Power Cable is sized to compatible with most passenger vehicle electrical systems.

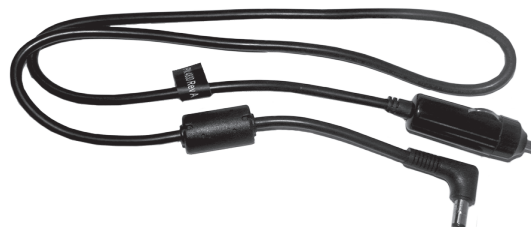


Figure 4: eQuinox DC Power Cable

The eQuinox will run at all flow settings when being operated with the DC Power Cable in a vehicle including 3.0LPM on continuous flow and all pulse settings 1-9. The eQuinox will charge the Battery Pack while being operated with the DC Power Cable, including 3.0LPM continuous flow and 192mL in pulse mode. Some vehicles may not be able to supply enough power to sustain these settings. In the event the vehicle cannot provide enough power to operate at the current setting, the eQuinox will first stop charging the battery. If the vehicle still cannot provide enough power the eQuinox will lower the flow. If the lower flow causes the patient discomfort or is causing patient saturation levels to decrease, removing the Battery Pack may increase the flow.

Battery Pack

The Battery Pack allows operation away from AC or DC power. The Battery Pack used with the eQuinox contains Lithium ion battery cells, similar to those used in laptop computers and cell phones. The standard 12-cell eQuinox Battery Pack contains a single 89 Watt hour battery pack which contains 7.38 grams of equivalent lithium content. The optional 24-cell eQuinox Battery Pack contains a quantity of two 95 Watt hour battery packs. Each battery pack contains 7.92 grams of equivalent lithium content, or 15.82 grams total.



Figure 5: eQuinox Battery Pack

The Battery Pack (Battery) may be charged in two ways: (a) place the Battery Pack in the eQuinox and connect the eQuinox to AC or DC power, or (b) place the Battery Pack in the optional Desktop Charger.

Operating and servicing the Battery Pack will ensure longer life and higher performance. It is important to follow the tips and recommendations when storing and operating the eQuinox on the Battery Pack.

The eQuinox Battery Pack operation time may be affected by several factors such as bolus size, breathing rates, ambient temperature, age of Battery Pack and use over time. The table below describes the typical operating time for a new Battery Pack.

If the eQuinox is used in Pulse Dose Mode, there will be longer operating time. The patient should consult their physician for a prescription for Pulse Dose Mode.

(At nominal temperature of 25°C/77°F)

Typical New Battery Pack Operating Times*		
	Battery Type	
	12-Cell	24-Cell
Continuous Mode		
0.5 LPM	2.48 hrs	5.28 hrs
1 LPM	2.16 hrs	4.84 hrs
2 LPM	1.20 hrs	2.75 hrs
3 LPM	0.80 hrs	1.83 hrs
Pulse Mode (12 BPM)		
Setting 1.0 Bolus 16 mL	2.62 hrs	5.94 hrs
Setting 2.0 Bolus 32 mL	2.50 hrs	5.70 hrs
Setting 3.0 Bolus 48 mL	2.38 hrs	5.39 hrs
Setting 4.0 Bolus 64 mL	2.31 hrs	4.94 hrs
Setting 5.0 Bolus 80 mL	2.22 hrs	4.75 hrs
Setting 6.0 Bolus 96 mL	1.70 hrs	3.85 hrs
Setting 7.0 Bolus 128 mL	1.56 hrs	3.33 hrs
Setting 8.0 Bolus 160 mL	1.28 hrs	2.72 hrs
Setting 9.0 Bolus 192 mL	1.0 hrs	2.15 hrs

Table 5: Battery Consumption Chart

Note:	Battery times will decrease with higher bolus size, breath rate, ambient temperature, Battery age and use over time.
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The Battery Pack packaged with the eQuinox is not fully charged. Before using the eQuinox Oxygen System for the first time, the Battery Pack must be fully charged.

Store the Battery Pack in a cool, dry location. Do not leave the eQuinox or Battery Pack in a vehicle or trunk.

When checking the eQuinox as baggage on a commercial airline flight for international travel, remove the Battery Pack and properly package.


When shipping the eQuinox for any reason, remove the Battery Pack from the eQuinox.

If the Battery Pack gets too warm, charging will not begin until the

Battery Pack sufficiently cools. Consider removing the Battery Pack to allow for faster cooling.

The Battery Pack operating time is longer if the eQuinox is operated in Pulse Dose Mode. (Refer to Battery Consumption Chart above.)

The typical time to recharge the Battery Pack to achieve 80% capacity from a fully discharged Battery Pack is 1.8 hours to 5.0 hours, dependent upon the flow setting.

WARNING:	DO NOT tamper with, disassemble, crush or heat the Battery Pack above 122° F (50° C). The Battery Pack may present a risk of fire or explosion and will void the warranty.
	


CAUTION	Store the Battery Pack in a cool, dry place when not in use.
	DO NOT leave the eQuinox or the Battery Pack in a vehicle or in the trunk during a hot or cold day. The eQuinox system can only work with a SeQual Battery Pack. Use of another Battery Pack or Battery may damage the unit, present a risk of fire or explosion and will void the warranty.



Figure 6: Battery Pack Status Gauge

While the eQuinox Battery Pack allows the concentrator to operate at its full range of capabilities, the primary purpose of the Battery Pack is to allow a patient to ambulate while they are moving between stationary power sources. The eQuinox's Battery Pack, like all lithium ion batteries, is susceptible to permanent damage from excessive heat. Exposure to excessive heat may significantly shorten the service life of the Battery Pack.

Each Battery Pack contains multiple temperature sensors to monitor battery cell temperature. The amount of heat the Battery Pack can safely endure varies depending on how the Battery Pack is being used. During discharge, the eQuinox software will alarm when internal battery cell temperature exceeds 60°C, and will shut the system down if internal battery cell temperature exceeds 75°C. While the Battery Pack is charging, software will interrupt charger operation when the internal battery temperature exceeds 45°C or temperature is less than 0°C. In both of these cases, when internal battery cell temperature falls within these limits, the eQuinox will resume normal operation. Operation near these temperature limits will not damage the Battery Pack, but are in place to ensure that the service life of the Battery Pack is preserved.

Heat in the Battery Pack is generated during discharge, and can also be the result of operating the eQuinox in high ambient temperatures. The amount of internally generated heat varies with the flow setting – higher flows induce greater Battery Pack heating. While high ambient temperatures are typically the result of operation on a hot day, running the eQuinox with inadequate ventilation can also add additional heat. Always ensure that the eQuinox is operated in a well-ventilated space, the air intake filter is clean, and intake and exhaust vents are unobstructed.

Charging Algorithm

The charging algorithm is performed by the Power Manager software and involves three basic decisions:

1. When to start charging
2. How fast to charge
3. When to stop charging

Charging begins when Battery Pack voltage falls below 90% charge.

The charging current is limited by the charger capability and the rated capacity of the Battery Pack. Under certain conditions, the eQuinox may not have enough external power available to charge the batteries at the full rate. In this case, the charging rate will be limited to the available power.

The software will only charge when the Battery Pack temperature is at or below 45°C. The software will always run the cooling fan whenever the charger is enabled. The Battery Pack charger is disabled and the cooling fan is set to maximum whenever the Battery Pack temperature exceeds 45°C. The Battery Pack charger is disabled when temperature is less than 0°C.

All lithium ion batteries self-discharge at very low rates when not in use. eQuinox Battery Packs are shipped from SeQual in a partially charged state (nominally 30%). When stored in a cool, dry location, the Battery Pack can sit unused for up to 12 months without appreciable self-discharge occurring. Nevertheless, CAIRE recommends a first in, first out rotation of Battery Pack inventory for maximum Battery Pack service life.

Introduction

Welcome to the eQuinox, Personal Ambulatory Oxygen System with autoSAT Technology. Setting up and training your patient to use the eQuinox has never been easier! You can expect your patients and care providers to easily learn how to use the device by following the directions in this section. While setting up and training a patient, be sure to point out the advantages of the eQuinox. For example:

- Slim and sleek appearance
- Easy-to-use controls
- Quiet operation
- Lower electric bills
- Self-monitoring alarm system
- More consistent FiO₂ at higher breath rates

After completing each training procedure, ask your patient if he or she has any questions. Proper training of your patients will result in fewer service calls, improved compliance and increased patient satisfaction.

Pre-Delivery Check List

Before delivering the device, check and log the status of the following:

Parts Inventory – Verify that each eQuinox is provided to the patient with the following items:

- Users Manual
- eQuinox Cart
- Cannula
- AC Power Cord
- AC Power Supply
- DC Power Cord
- 12 Cell or 24 Cell Battery Pack
- Air Inlet Filter and Spare

Power Sources – Insert and check the following for proper operation:

- AC Power Supply with Power Cord
- DC Power Cord
- 12-Cell Battery Pack

Electrical System – Use the Control Panel to check and/or adjust the following:

- Pulse Dose Setting
- Continuous Flow Setting
- Hour meter
- Pulse Dose Sensitivity
- 9V Battery Status
- Rise Time
- Software Revision
- Battery Pack Status Gauge

The eQuinox is shipped from CAIRE at default flow settings of 2 LPM Continuous Flow, 2.0 Pulse Dose, and 2 for Pulse Mode Sensitivity Adjustment and Fast Rise Time. You may adjust these settings to your patient's prescription when you deliver and set up the device.


Adjusting Rise Time

The adjustable Rise Time feature on the eQuinox was designed for patient comfort. The Rise Time feature adjusts flow and speed of bolus delivery, and determines how quickly the patient receives their bolus volume while in Pulse Dose Mode. The eQuinox offers delivery settings of FAST, MEDIUM, and SLOW. The factory default setting is FAST. A MEDIUM or SLOW rise time may be appropriate for certain patients, and should be determined and set by a trained clinician. Adjusting the Rise Time will not affect the chosen volume of oxygen delivered to the patient (16-192 mL).

Connecting the AC Power Supply

The eQuinox operates from external power when connected to a power outlet.

To connect the eQuinox to the AC Power Supply, follow these steps:

1. Insert the AC supply plug tip into the eQuinox.
2. Insert the power cord into the AC Power Supply.
3. Plug the power cord into a grounded outlet.
4. The power supply LED displays green to indicate that the AC Power Supply is drawing power. The External Power Present Indicator on the Control Panel illuminates. 

Note:	If the Power Supply Status LED is not illuminated after inserting the plug into a outlet, check to make sure the Power Supply and power cords are securely plugged into the eQuinox.
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WARNING:	<ul style="list-style-type: none"> • Ensure adequate clearance around the AC Power Supply. • The AC Power Supply is universal input, but the AC power cord is appropriate to specific country's electrical service. Ensure that power cord is appropriate to country's electrical service.
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CAUTION	<ul style="list-style-type: none"> • DO NOT connect the eQuinox to an extension cord or electrical outlet controlled by a switch.
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Note:	When removing the AC Power Supply from the eQuinox, remove the plug from the AC outlet before removing the AC Power Supply plug from the eQuinox.
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Monthly Maintenance—Patient

Care for the Battery Pack

The Battery Pack in the eQuinox requires special care to assure a longer life and the highest level of performance. The SeQual Battery Pack is the only approved Battery Pack recommended for use with the eQuinox. The following are generic guidelines for the Battery Pack:

- Avoid high temperatures
- Avoid cold temperatures
- Do not drop Battery Pack
- Do not jab objects into contacts

Battery Pack Cleaning: Use a damp (not soaking wet) cloth or sponge. First spray the cloth or sponge with a mild detergent and then clean the Battery Pack case and the latch.

WARNING:	Exposing the Battery Pack to water or other liquids may cause personal injury or harm.
	DO NOT tamper with or try to repair the Battery Pack. There are no serviceable parts inside.

Battery Pack Storage: The Battery Pack should be stored in a cool and dry location.

Note:	The patient can still use the eQuinox while calibrating the Battery Pack.
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Note:	<ul style="list-style-type: none"> • If the Battery Pack temperature rises above 45°C (113°F), the Battery Pack will not charge. • If the Battery Pack temperature rises above 75C for the 12 Cell battery Pack and 60C for the 24 Cell Battery Pack, the Battery Pack will not discharge.
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eQuinox Monthly Run-Time Procedure

1. Power on eQuinox using AC Power, DC Power, or Battery Pack
2. Allow unit to run for a minimum of 2 hours

Annual Maintenance Procedures

The following section lists procedures that are necessary to maintain the eQuinox. Service should only be performed by a qualified technician. To perform periodic maintenance, the only tools that should be necessary are:

- #1 Phillips Screwdriver
- 3/8" or 10mm Deep Well Socket and Ratchet

WARNING:



Disconnect all power supplies going to the unit prior to performing the following steps

Remove and Replace 9-Voly Battery and Compressor intake Filter

Replace the 9-volt battery when the unit beeps three times at the end of power-on self-test, when voltage is less than 7.0 Volts, or during annual PM. To replace the 9-volt battery, follow these steps:

1. Remove the rear cover by loosening the two Phillips-head screws.
NOTE: The two captive screws will not remove completely from the rear panel.



Figure 7



Figure 8

2. Place finger under recessed area and pull outward.



Figure 9

3. Once the cover is removed, replace the 9-Volt Battery by pushing up slightly on the bottom of the battery and then pulling out.



Figure 10

4. Once the old battery is removed, insert the new 9-Volt battery by following steps 1-3 in reverse.

Note:

The polarity of the 9-Volt battery does not have to be aligned in a certain manner when inserting the new 9-Volt battery.

5. Once the 9-Volt Battery has been replaced, the next step is to replace the Compressor Intake Filter. To remove the Compressor Intake Filter, push the metal tab on the end of the filter inward and pull outward (similar to the process for removing the 9-Volt Battery).



Figure 11



Figure 12

6. To insert the new Compressor Intake Filter, align the end of the filter with the inlet hole with the plastic housing on the eQuinox.



Figure 13

7. Push the filter inward towards the plastic housing and then inward towards the eQuinox, ensuring that the filter is sitting flush against the plastic housing and flat against the rear case of the eQuinox.



Figure 14

8. Replace the back cover and retighten the two captive Phillips-head screws (5.5 in. lb max).
9. To replace the HEPA filter, locate the aluminum oxygen outlet on the front of the unit.



Figure 15

10. Slide a 3/8" or 10mm deep well socket over the aluminum oxygen outlet, ensuring that the socket makes contact with the fitting on the boom of the oxygen outlet.



Figure 16

11. Attach appropriate ratchet to the socket and loosen by rotating the socket counter-clockwise until the oxygen outlet is free and remove. NOTE: Make sure that the black o-ring is removed when taking out the oxygen outlet.



Figure 17

12. Once the oxygen outlet and HEPA filter assembly have been

removed, remove the HEPA filter from the oxygen outlet by unscrewing the HEPA filter from the oxygen outlet.

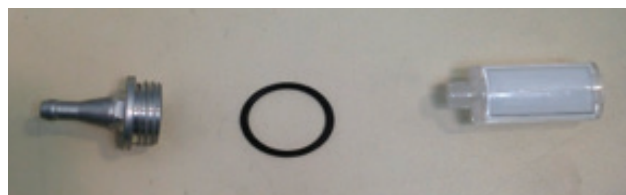


Figure 18

13. Place a new o-ring over the threaded end of the oxygen outlet and tighten in the new HEPA filter.



Figure 19

14. Replace the oxygen outlet assembly by repeating steps 10-11 in reverse.

15. Next locate the Cabinet Inlet Filter and remove.



Figure 20

16. Replace the Cabinet Inlet Filter with a new Cabinet Inlet Filter.

Assembly and Alarm Verification Tests

To ensure proper assembly and functionality of the eQuinox after it has been reassembled, the following steps should be followed.

1. Install the Battery Pack into the Battery Pack compartment of the eQuinox. Plug the AC Power Supply into the wall outlet and connect it to the External Power Connector of the eQuinox.
2. Press the ON button and set the eQuinox to 2 LPM. At initial start-up, the eQuinox will light the Green, Yellow and Red LED's accompanied by a beep. As concentration increases to ~70%, the Red LED turns off and the Yellow and Green remain on. When the concentration reaches normal operating range (above 85%), the Yellow LED will turn off. The Green LED will stay lit indicating normal operation. Table 3 shows the normal start-up operating conditions for eQuinox Oxygen Systems. If LED is not green within 7 minutes there may be a problem with the eQuinox.

Green Indicator	Yellow Indicator	Red Indicator	Audible Alarm	Alarm code	Operating Condition
Off	Off	Blinking	Beeps	0004	Purity < 70%
Off	Blinking	Off	Off	0008	Purity between 70% and 85%
On	Off	Off	Off	0000	Normal Operating Condition

Table 6

3. Verify that the Battery Pack is charging as indicated by the Battery Pack Status Gauge is moving in waterfall fashion (scrolling from bottom to top). If the Battery Pack Status Gauge is not moving, verify that the Battery Pack is properly engaged.
4. Check the Control Panel by pressing each of the Increase/Decrease, Pulse Dose Mode and No Smoking buttons and observe that the eQuinox buttons function normally.
5. Press the Delivery Mode button and set the eQuinox to the patient's normal Pulse Dose setting. Confirm that without breathing from the unit, after 15 seconds of no breath detected, the system changes automatically to Continuous Flow Mode. The green Delivery Mode light is blinking fast, indicating the system is delivering a Continuous Flow. After another 15 seconds, the system stops delivering Continuous Flow and waits 15 seconds trying to detect a breath. The cycle continues until a breath is detected.
6. After 5 minutes of operation, block the Cannula Fitting Outlet with your finger for 2 minutes and confirm that the visual and audible alarm occurs. Unblock the Cannula Outlet Port and let it stabilize until the alarm stops.
7. Disconnect the AC Power Supply and allow the eQuinox to run for about one minute. Set the eQuinox to the patient's normal Continuous Mode setting. Confirm that the Battery Pack Status Gauge is illuminated and External Power Present Indicator is off.
8. Remove the Battery Pack and verify that the eQuinox alarms and

red Alarm Indicator is flashing and the alarm sounds. After about 5 seconds, re-install the Battery Pack and connect the AC Adapter and observe that the eQuinox automatically restarts. Confirm that the External Power Present Indicator is illuminated.

9. Turn off eQuinox and unplug the AC Power Supply.
10. Record results, initial and date the Service and Maintenance Record.
11. EDAT may be utilized to record eQuinox device status and dates of service.

Electrical Safety Test

This is required only for the eQuinox Oxygen System, that is used in a hospital or institutional environment. This is not required for home care use.


To test the basic electrical safety of the eQuinox AC Power Supply, CAIRE recommends using an LKG-601 Electrical Safety Analyzer (Netech Corporation, Hicksville, NY) or equivalent to verify that the current leakage to ground is within appropriate limits.

1. Plug the AC Power Supply into the electrical safety analyzer. Disconnect the AC Power Supply from the eQuinox unit.
2. Plug the electrical safety analyzer into a wall outlet.
3. Follow the analyzer manufacturer's instructions for measuring both the forward and reverse earth leakage current only. Verify that forward and reverse-current leakage to ground is < 250 μ A (100/115VAC applications) and < 500 μ A (220/240VAC applications).
4. Disconnect the AC Power Supply from the electrical safety analyzer.
5. If the AC Power Supply measures leakage current greater than the criteria in step 3, please return it to CAIRE for service.
6. EDAT may be utilized to record eQuinox device status and dates of service.

Cleaning the eQuinox

Clean inside the unit, as needed, using a small vacuum cleaner or brush to remove any accumulation of dust or debris prior to attaching the covers. After reinstalling the cover, verify that the rubber gasket is installed correctly.

Use mild detergent solution to clean the cabinet, Control Panel and power supplies. Turn OFF the eQuinox and disconnect from AC or DC power before any cleaning or disinfection activity. DO NOT spray the cabinet Control Panel or power supplies. Use a damp (not soaking wet) cloth or sponge. Spray the cloth or sponge with a mild detergent solution to clean the cabinet and power supplies. To disinfect the eQuinox, use Lysol® Brand II disinfectant. Proceed as directed by the manufacturer.

WARNING:	Disconnect and Remove ALL power supply connectors before cleaning the exterior cabinet. DO NOT use denatured alcohol or apply liquid spray or aerosol cleaners.
	

Whenever maintenance or service is performed on an eQuinox unit, an entry should be made in the service log for that concentrator or recorded in accordance with your company's standard procedure. Whenever the case of the eQuinox is opened, the flow rate, purity, and alarm status should be verified per the Test Procedures in this manual.

Note:	Use the "Save As" function under the "File" section and save the file as the SN and/or the date serviced (example: 08D0110xxxx 08012000).
--------------	---

Table 7: Sample eQuinox maintenance record

Voice Module Operation

Voice Module Operational Instructions

The eQuinox is equipped with the capability of providing vocal notifications and operational status intended to supplement information displayed to the end user via LED (light emitting diodes) and/or the unit display. The following information provides instructions on how to enable/disable the voice module function, adjust loudness, and change language as preferred by the end user.



Figure 21

Enable/Disable the Voice Module

1. To enable/disable the voice module function, power on the unit by pressing the ON/Standby Key.
2. After the unit has powered on, press the No Smoking Icon and Hidden Key once.
3. Within 1–2 seconds, the SPKR = ON or SPKR = OFF menu item will be present.
4. Press the Increase or Decrease Flow Rate Key to toggle the selection to ON (enable voice module) or OFF (disable voice module).
5. Within 3–5 seconds, the option selected will become active.

Note:

This will only disable the voice module function once. When the device is turned off and device is reset, the voice module function will automatically be enabled.

Increase/Decrease the Volume of Vocal Notifications

1. To increase or decrease the volume of vocal notifications, press the No Smoking Icon & Hidden Key twice.
2. The Volume = # - (Volume Setting Menu) will be present.
3. Press the Increase or Decrease Flow Rate Key to increase or decrease the volume level from 1 to 10.
4. After selecting the desired loudness, the option will become active/set within 3–5 seconds.

Changing Voice Module Language

1. To change the voice module language, press the No Smoking Icon & Hidden Key five times to access the language options.
2. The current activated language will be indicated on the display. For example, if the voice module is speaking English when accessing the language options menu, "English" will be the text that appears on the display.
3. Press the Increase or Decrease Flow Rate Key to scroll through the languages available.
4. Once the desired language is displayed, allow the units to sit and the visible language will automatically be set in 3 – 5 seconds.

eQuinox Voice Message Alert Descriptions Table

eQuinox Voice Message Alert Descriptions		
Condition	Standard eQuinox Voice Message	Message Repeat Interval
Flow rate error > +/- 10%	"Low output flow. Check the cannula."	Continuous until condition is removed.
30 minutes runtime remaining on battery	"30 minutes remaining on battery."	One instance
15 minutes runtime remaining on battery	"15 minutes remaining on battery."	One instance
Low battery	"Low on battery. Please plug in external power."	Message played every 29 seconds until loss of power state.
Change in continuous flow setting	"Continuous mode flow xx liter per minute." (xx = [0.5L, 1.0L, 1.5L, 2.0L, 2.5L, 3.0L])	One instance
Change in pulse flow setting	"Pulse dose mode xx milliliter." (xx = [16mL, 32mL, 48mL, 64mL, 80mL, 96mL, 128mL, 160mL, 192mL])	One instance
Patient's breath rate not detected	"Cannot detect breathing."	One instance
Loss of power to unit	"Loss of power. Please plug in external power or battery."	Continuously until condition is removed.
Unit is powered on in Pulse Mode and is using AC power supply.	"The device is running. External power connected. Pulse dose mode xx milliliter." (xx = [16mL, 32mL, 48mL, 64mL, 80mL, 96mL, 128mL, 160mL, 192mL])	After start-up beep, on instance.
Unit is powered on in Continuous Mode and is using AC power supply.	"The device is running. External power connected. Continuous dose mode xx liter per minute." (xx = [0.5L, 1.0L, 1.5L, 2.0L, 2.5L, 3.0L])	After start-up beep, on instance.
Unit is powered on in Continuous Mode and is using battery.	"The device is running. Using battery. Continuous dose mode xx liter per minute." (xx = [0.5L, 1.0L, 1.5L, 2.0L, 2.5L, 3.0L])	After start-up beep, on instance.
Unit is powered on in Pulse Mode and is using battery.	"The device is running. Using battery. Pulse dose mode xx milliliter." (xx = [16mL, 32mL, 48mL, 64mL, 80mL, 96mL, 128mL, 160mL, 192mL])	After start-up beep, on instance.
While unit is running from battery, the AC power supply is connected.	"External power connected."	One instance
While unit is running from AC power with the battery installed and the AC power supply is removed.	"Using battery."	One instance
When powering unit off.	"The device is now turned off."	One instance

Table 8

Troubleshooting, Service, and Repair Procedures

CAUTION

The eQuinox contains electrostatic sensitive components. Do not open or handle except at a static free workstation. Do not remove cover without ESD protection.

Note:

To adequately troubleshoot and repair the product in the field, EDAT is recommended. eQuinox Data Acquisition Tool (EDAT)



Alarm Conditions and Alarm Codes

Use the table below to decode eQuinox alarm conditions. If other alarm codes are displayed by the eQuinox, contact Technical Support for assistance.

Note:	The following table is intended as a guide for the provider, not the user.							
Condition	Alarm Code	Alarm Display	Green Indicator	Yellow Indicator	Red Indicator	Battery Icon	Audible Alarm	What to Do
"9-Volt Battery"	0010	9V Low	N/A	N/A	N/A	N/A	"3 Beeps" at Start-Up only	The internal 9-volt battery needs replaced
Warming Up	0004	O2<70%	On	On	On	Normal	Off	Wait - the system typically take 3-4 minutes to reach specified performance
Warming Up	0008	O2<85%	On	On	Off	Normal	Off	Wait - the system typically take 3-4 minutes to reach specified performance
"3.0" (or flow setting)	0	No Alarm	On	Off	Off	Normal	Off	Nothing. The system is operating properly at the specified flow rate.
"Low Power Cartridge"	1000	LOW BAT	On	Flashing	Off	Flash Outline	2 Beeps	Plug into external power or replace with a Charged Power Cartridge.
"Warm Power Cartridge"	0200	WARM BAT	On	Flashing	Off	Flashing	1 Beeps	Remove Power Cartridge and plug into external power or replace with a charged Power Cartridge
"O2 Concentration - <85%"	0008	O2<85%	Off	Flashing	Off	Normal	Off	Perform Annual Filter PM Maintenance. If condition persists, service is required.
"O2 Concentration - <70%"	0004	O2<70%	Off	Off	Flashing	Normal	3 Beeps	Perform Annual Filter PM Maintenance. If condition persists, service is required.
"Flow Rate Error / Blocked Flow"	0020	FLOWRATE	Off	Flashing	Off	Normal	1 Beep	Check tubing and/or humidifier for obstruction. Check/Clean Air Intake Filter. If condition persists past 10 minutes, service is required
"Cannot Charge Power Cartridge"	0100	CHARGER	Off	On	Off	Flashing	Off	Instruct patient to seek an external power source. Remove Power Cartridge add allow to cool to room temperature, if Power Cartridge malfunction persists, service is required.
"Communication Loss"	0400	BAT COM	Off	Flashing	Off	Flashing	1 BEEP	Check Battery connections
"No Inspiration Detected" (in Pulse Mode only)	0001	P<-->C	On	Flashing	Off	Normal	Off	Make sure tubing does not exceed 7 ft (2.1m) when using Pulse Mode. Unit will switch to continuous mode if no inspiration is detected for 15 seconds. After 15 seconds of continuous flow the unit will switch back to pulse flow and attempt to detect inspiratory effort
"Ambient Pressure Fail"	0002	AMB PRES	Off	ON	Off	Normal	OFF	Instruct the patient to power cycle the unit (i.e. Disconnect from AC Power Supply, DC Power Cable, and remove the Battery Pack if attached), wait for 1 minute, then reconnect to AC or DC power without the Battery Pack engaged. If this does not correct, service is required.
"Reduced Flow Due to Excess Power Drain"	0800	FLOWRATE	Off	ON	Off	Normal	OFF	When connected to DC power, disconnect all other electronic devices connected to power circuit (GPS, Cell Phone Charger, etc). If not the case, remove the Battery Pack from the device.
"DC Power Fail (DC On and Off 3 Times)"	2000	BAD DC	Off	ON	Off	Normal	OFF	Ensure that the DC Power Cable is connected firmly into both the power receptacle in the vehicle as well as the eQuinox. Also, disconnect all other electronic devices connected to power circuit (GPS, Cell Phone Charger, etc). If no success, Instruct patient to seek an alternative oxygen supply until external power is restored
"Loss of External Power" *NOTE: Stars will be flashing in the LCD *****	4000	***** Flashing	Off	Off	Flashing	Normal	Constant	Instruct patient to seek an alternative oxygen supply until external power is restored or install a charged Power Cartridge.
"System Fault"	0080	FAIL XX	Off	Off	On	Normal	Constant	10 seconds then silent, Instruct patient to use back up oxygen supply. Service is required.

Table 9

Malfunction Codes

If a malfunction occurs in the eQuinox, the device will stop, the Red LED on the front panel will light and the buzzer will sound for 10 seconds and then silence. The LCD will display one of the following Malfunction Codes:

Malfunction	FAIL code	Recommended Action
Invalid RESET	FAIL 80	Check for secure communication cables, Verify functionality of PM and CS PCB
I/O Port Failure	FAIL 81	Check for secure communication cables, Verify functionality of PM and CS PCB
RAM Failure	FAIL 82	Check for secure communication cables, Verify functionality of PM and CS PCB
FLASH Failure	FAIL 83	Check for secure communication cables, Verify functionality of PM and CS PCB
EEPROM Failure	FAIL 84	Check for secure communication cables, Verify functionality of CS PCB
IPC Watchdog Timeout	FAIL 90	Check for secure communication cables, Verify functionality of PM and CS PCB
Compressor Motor Temperature Sensor Failure	FAIL 91	Allow eQuinox to Cool for 30 Minutes. Check compressor fan functionality. Check to ensure vents are not obstructed. Verify functionality of the Compressor Assy. Check cable connections between the compressor and the PM PCB
PCB Temperature Sensor Failure	FAIL 92	Allow eQuinox to cool for 30 Minutes. Verify functionality of PM fan. Check to ensure vents are not obstructed. Verify functionality of PM PCB
No Power to Compressor	FAIL 93	Check Compressor wires for damage. Verify functionality of PM PCB. Verify functionality of the Compressor Assy
Compressor Motor Stalled	FAIL 94	Check Compressor wires for damage. Verify functionality of PM PCB. Verify functionality of the Compressor Assy
Battery Communication Failure	FAIL 95	Verify functionality of the Battery Bridge PCB. Check Battery and Battery Bridge PCB for pin damage. Verify functionality of battery. Verify functionality of PM PCB
PSS failure	FAIL 96	Power Failure
Boost Converter Failure	FAIL 97	Verify Functionality of PM PCB
Compressor motor too hot	FAIL 9A	Allow eQuinox to Cool for 30 Minutes. Check compressor fan functionality. Check to ensure vents are not obstructed. Verify functionality of the Compressor Assy.
PCB too hot	FAIL 9B	Allow eQuinox to Cool for 30 Minutes. Check compressor fan functionality. Check to ensure vents are not obstructed.
IPC Failure	FAIL A0	Verify functionality of PM PCB
Breath Pressure Sensor Failure	FAIL A2	Verify functionality of CS PCB
Ultrasonic Failure	FAIL A3	Verify functionality of CS PCB. Check for water intrusion from humidifier
Product Temperature Sensor Failure	FAIL A4	Verify functionality of DB9 cable harness. Verify functionality of CS PCB
Loss of Product Tank Pressure	FAIL A5	Check for leaking, cracked HEPA filter or damaged tubing. Verify ATF motor is turning
Purity Calibration Data Failure	FAIL A6	Check for leaking, cracked HEPA filter or damaged tubing. Verify functionality of CS PCB
Flow Calibration Data Failure	FAIL A7	Verify functionality of Proportional Valve. Verify functionality of CS PCB
Breath Sensitivity Data Failure	FAIL A8	Check for damaged tubing. Verify functionality of CS PCB
Over Current Failure	FAIL AB	Check power supply for sufficient current

Table 10

Step 1: Remove all power sources; battery and external power. Wait 20 seconds. Reconnect power to the eQuinox. Turn the device to the ON position. If resolved, continue use.

Step 2: If unresolved, call Technical Support for assistance.

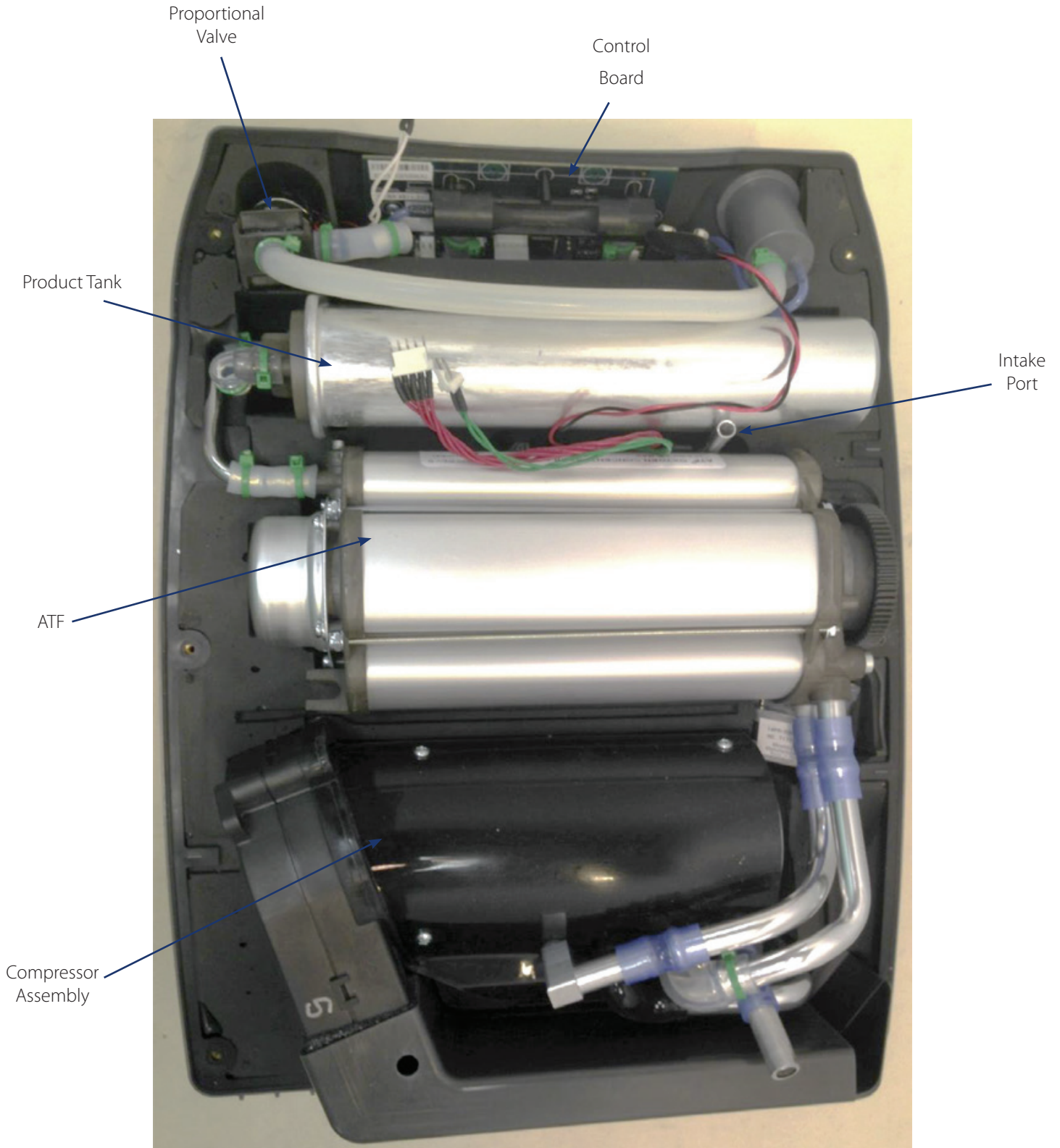


Figure 22: eQuinox Internal Components

Servicing the eQuinox

Note:

Prior to performing the following procedures, ESD protection must be ensured. Do not touch exposed circuits during maintenance without ESD protection.

Service should only be performed by a qualified technician. To perform the following procedures, the only tools that should be necessary are:

- #1 Phillips Screwdriver
- Wire-cutting pliers
- Small cable ties
- ESD Mat or approved ESD system

I. Removing/Replacing the Back Cover

1. Disconnect power supplies and remove Battery Pack before removing the unit cover.
2. Place the unit horizontally on the front cover.
3. Perform Steps 1-3 of the "Preventative Maintenance" Section.
4. After removing the compressor intake filter, remove the clear rubber fitting that the filter would slide into by pulling upward.
NOTE: When replacing this rubber fitting, ensure that the rubber fitting slides over the intake tube and fits properly.



Figure 23

5. Using a Phillips #1 screwdriver, remove a total of 6 screws (M3x12 Phillips Head SEM Screw, P/N 6974-312-SEQ) from the back of the unit.



Qty 6 Phillips Head Screws

Figure 24

6. Gently lift the back cover upwards from the bottom of the unit,

sliding the top of the back cover over the top of the unit as pictured below.



Figure 25

7. Disconnect the 9-Volt Battery Cable, the 2 service port connectors and the speaker connector.

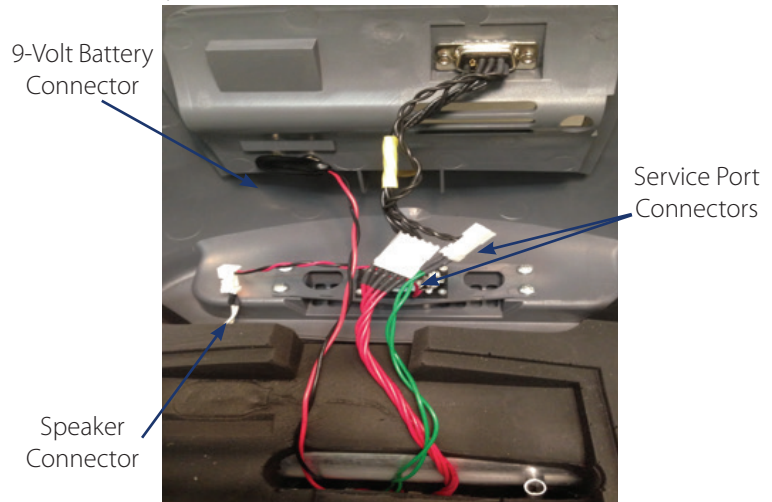


Figure 26

8. The back cover is now completely disconnected from the unit. To replace, repeat steps 1-5 in reverse order.

II. Removing/Replacing the Handle and Speaker

1. To remove the speaker, after performing the “Removing/Replacing the Back Cover” section, loosen the four allen-head screws securing the speaker to the back cover.



Figure 27

2. Remove the speaker and replace.
3. To remove/replace the top handle, locate the four Phillips Head screws securing the handle housing to the back cover and using a #1 Phillips Screwdriver, loosen by turning the screwdriver counter clockwise until the four screws are released.



Figure 28

4. After removing the four Phillips Head screws, pull up on the handle. This will remove the Top Handle housing from the back cover.



Figure 29

5. Flip the top handle housing over and pull up on the handle to remove/replace.



Figure 30

6. To reinstall the top handle housing and speaker to the back cover, repeat steps 3-5 in reverse order.

III. Removing/Replacing the Back Cover Foam and Intake Muffler Section

1. Locate the Intake Muffler.



Figure 31

2. Gently pull upward on the aluminum tubing that feed into the foam cover.

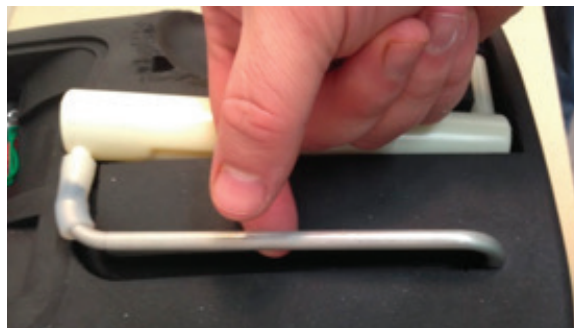


Figure 32

3. Gently remove the rubber elbow from the muffler tube.



Figure 33

4. Remove the Intake muffler from the foam section.
5. Gently lift up the foam section, while feeding the protruding wires through the foam, and remove.



Figure 34

6. To replace the foam section and intake muffler, repeat steps 1-5 in reverse order.

IV. Removing/Replacing the Compressor Assembly

1. Remove the Top Exhaust Port by gently pulling upward.

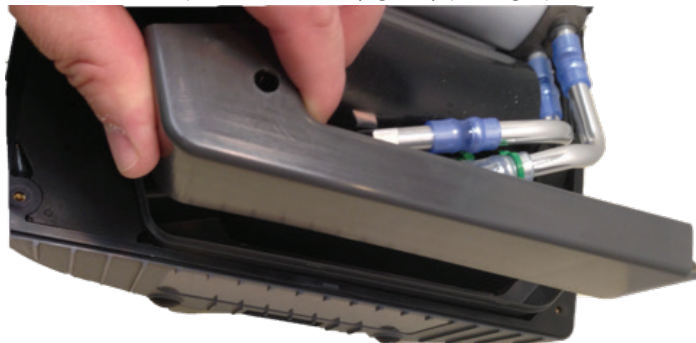


Figure 35

2. Remove the Bottom Exhaust Port by slightly lifting up on the Exhaust Blower Outlet and pulling up the Bottom Exhaust Port.



Figure 36

3. Disconnect the Compressor Assembly power connections circled below.

Note:

Using tweezers or small pliers to grab the connector is recommended.

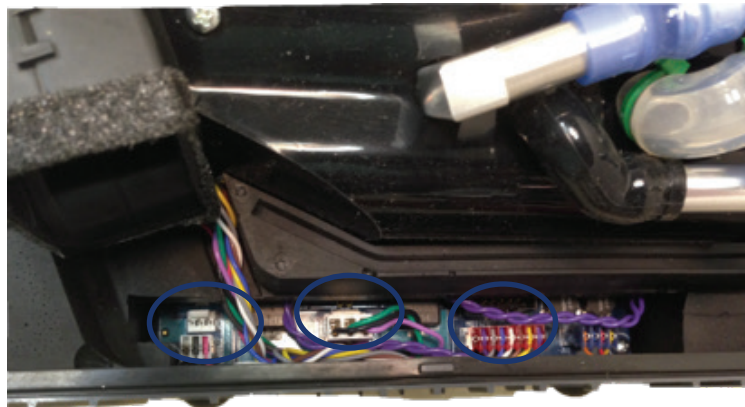


Figure 37

4. Remove the aluminum intake tube from the black rubber elbow.



Figure 38

5. Using a small utility knife, cut the two blue tubing pieces connected to the ATF pictured below in Figures 38 and 39 and discard.

Note:

Ensure that after the tubing has been removed that the intake and vacuum ports on the ATF are immediately capped to prevent damaging the ATF.



Figure 39

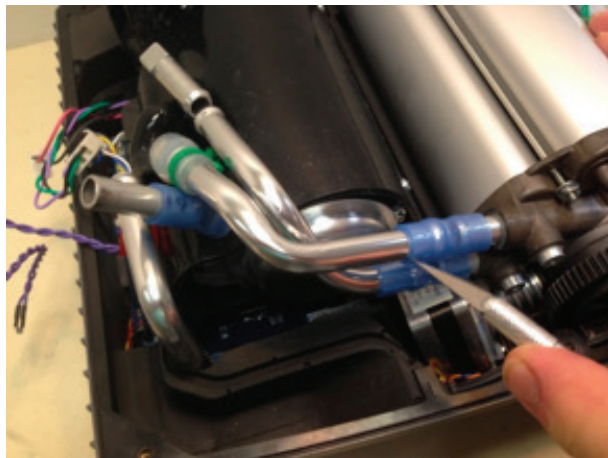


Figure 40

6. The Compressor Assembly can now be removed/replaced. To replace the Compressor Assembly, repeat steps 1-5 in reverse order.

Note:

When installing the new Compressor Assembly, prior to attaching the blue tubing to connect to the ATF, use a cotton swab saturated with Isopropyl Alcohol to swab the internal diameter of the blue tubing. This will allow the blue rubber tubing to slide over the aluminum tubing easier.

V. Removing/Replacing the ATF

1. To replace the ATF, Using a small utility knife, cut the two blue tubing pieces connecting the ATF to the compressor as pictured below in Figures 40 and 41 and discard.



Figure 41

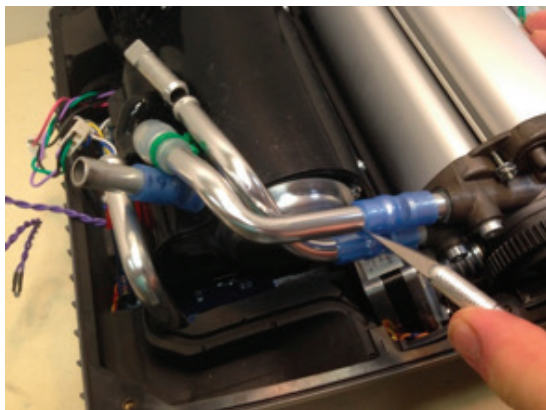


Figure 42

2. Gently lift the ATF so as to allow access to the Drive Motor power connector. Disconnect the Drive Motor power connector.



Figure 43

3. Using a pair of small cutters, snip the end of the tie-wrap on the soft tubing that connects the ATF to the Product Tank and discard the tie-wrap.

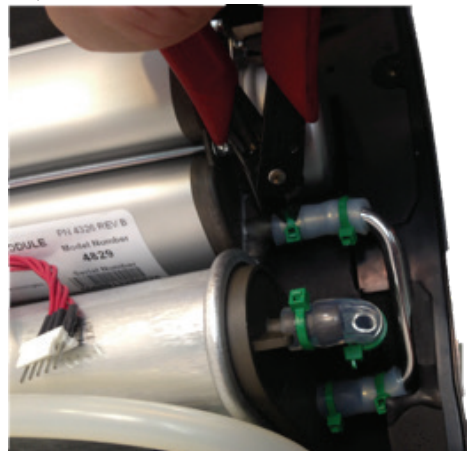


Figure 44

4. Gently pull the soft tubing from the oxygen port on the ATF.

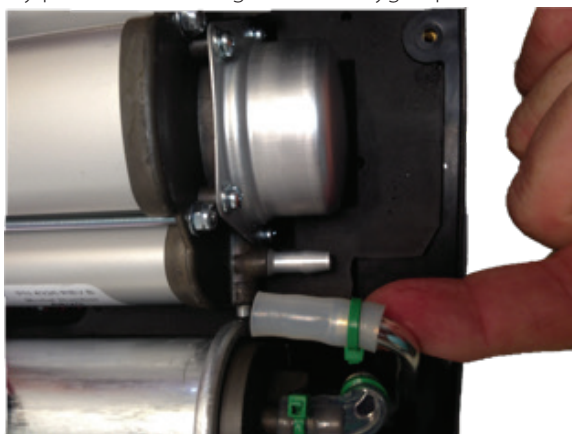


Figure 45

5. The ATF can now be removed from the unit by gently lifting upward. To install a new ATF, follow steps 1-4 in reverse order.

Note:

Ensure to reinstall the tie-wrap on the soft tubing connecting the ATF to the Product Tank. Also, prior to attaching the blue tubing to connect to the Compressor Assembly, use a cotton swab saturated with Isopropyl Alcohol to swab the internal diameter of the blue tubing. This will allow the blue rubber tubing to slide over the aluminum tubing easier.

VI. Removing/Replacing the Product Tank

1. Using a pair of small cutters, snip the end of the tie-wrap on the soft tubing that connects the ATF to the Product Tank and discard the tie-wrap.

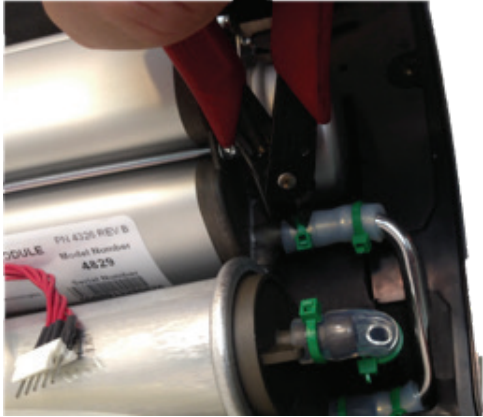


Figure 46

2. Gently pull the soft tubing from the oxygen port on the ATF.

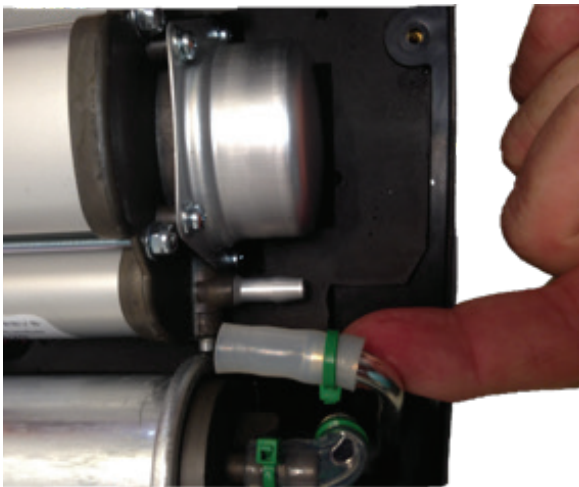


Figure 47

3. Using a pair of small cutters, snip the end of the tie-wrap on the bottom of the clear rubber elbow that connects the Product Tank to the aluminum tubing going to the flow tube on the Control Board.

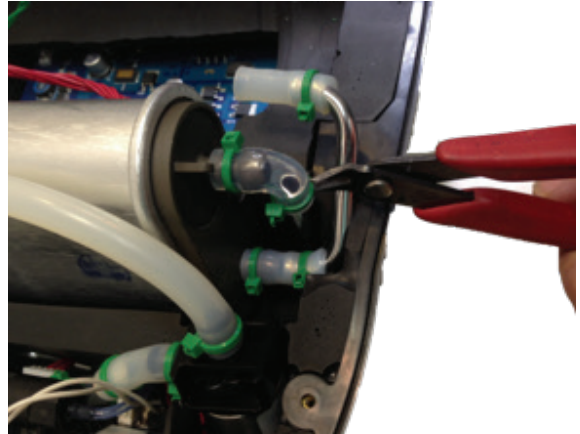


Figure 48

4. The Product Tank can now be removed by gently pulling upward. To install a new Product Tank, repeat steps 1-3 in reverse.

Note:

Ensure to reinstall the tie-wrap on the soft tubing connecting the ATF to the Product Tank as well as the clear rubber elbow that connects to the aluminum tubing going to the flow tube on the Control Board.

VII. Removing/Replacing the Proportional Flow Valve

1. Using a pair of small cutters, snip the end of the tie-wrap on the soft tubing connecting the Proportional Valve to the Oxygen Outlet/HEPA Filter housing and gently pull on the tubing to disconnect the tubing from the barb fitting.

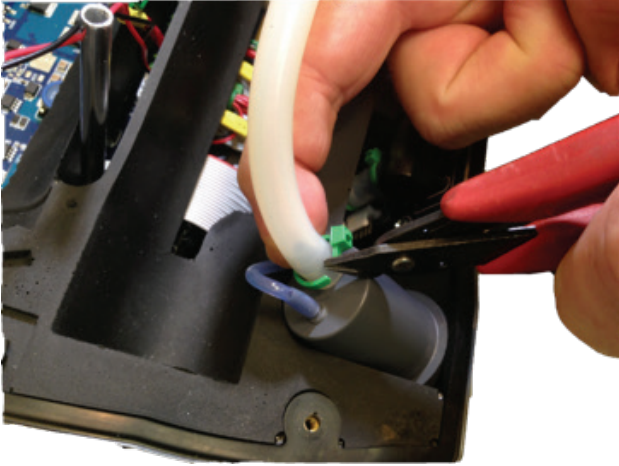


Figure 49

2. Using a pair of small cutters, snip the end of the tie-wrap on the soft tubing connecting the aluminum tubing to the Proportional Valve. Gently pull on the soft tubing to remove from the Proportional Valve.

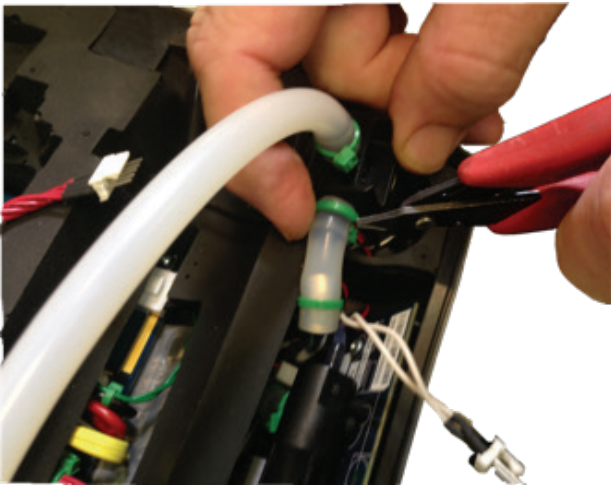


Figure 50

3. Disconnect the Proportional Valve electrical connector from the control board.

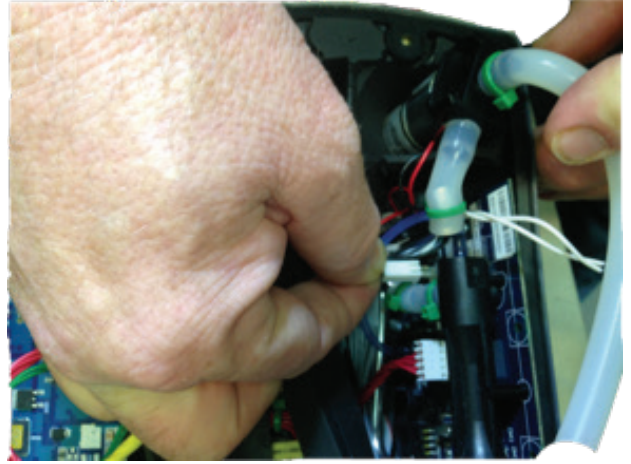


Figure 51

4. The Proportional Valve can now be removed by gently pulling upward. To install a new Proportional Valve, follow steps 1-3 in reverse order.

VIII. Removing/Replacing the Rubber Gasket Seal

1. To remove the Rubber Gasket Seal that separates the Top Cover and Bottom Cover, gently pull upward on the gasket seal and work free from the unit.

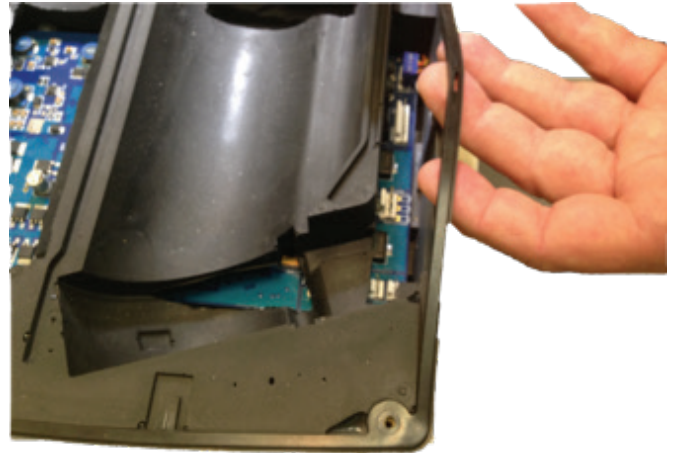


Figure 52

2. When removing the Rubber Gasket Seal, the square tab that fits over the AC Power connection will have a small amount of adhesive applied at the factory. When removing this portion, lift up with pressure but carefully not to damage the gasket.

Note:

When reinstalling the Rubber Gasket Seal, use a small amount of sealant on this area to prevent the seal from breaking free.

IX. Removing/Replacing the Top Cover Foam Section

1. Carefully lift the Top Cover Foam Section upward at different locations around the unit, ensuring that all harness wires, cables and tubing are not damaged. This may require tilting, adjusting, turning, etc., the Top Cover Foam section to free from the unit.

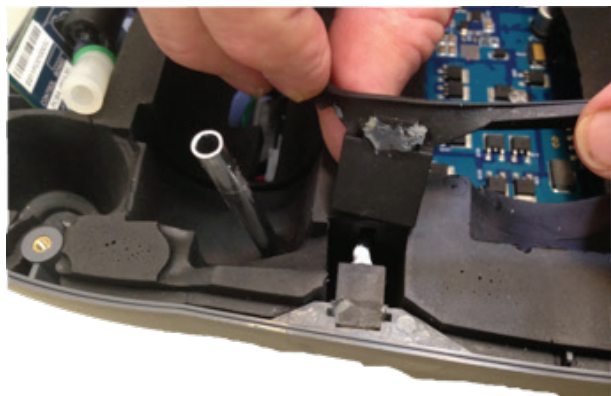


Figure 53

3. To reinstall, or install a new, Rubber Gasket Seal, align the tabs on the gasket with the correct tabs on the Front Cover and press down firmly.



Figure 54



Figure 55



Figure 56

2. Once all of the harness wires, cables and tubing are free of the Top Cover Foam Section, the section can be removed.
3. To replace the Top Cover Foam Section, ensure that all harness wires, cables and tubing are fed through the Top Cover Foam Section without binding, kinking or damaging, press firmly down on the section ensuring that the section is aligned properly and is flush with the Top Cover.

X. Removing/Replacing the Control Board, Power Manager Board, Voice System Board, Battery Bridge Board, Membrane Panel and Wire Harness Assemblies

1. Once the Top Cover Foam Section has been removed, the Control Board, Power Manager Board, and Wire Harness Assemblies are now accessible.

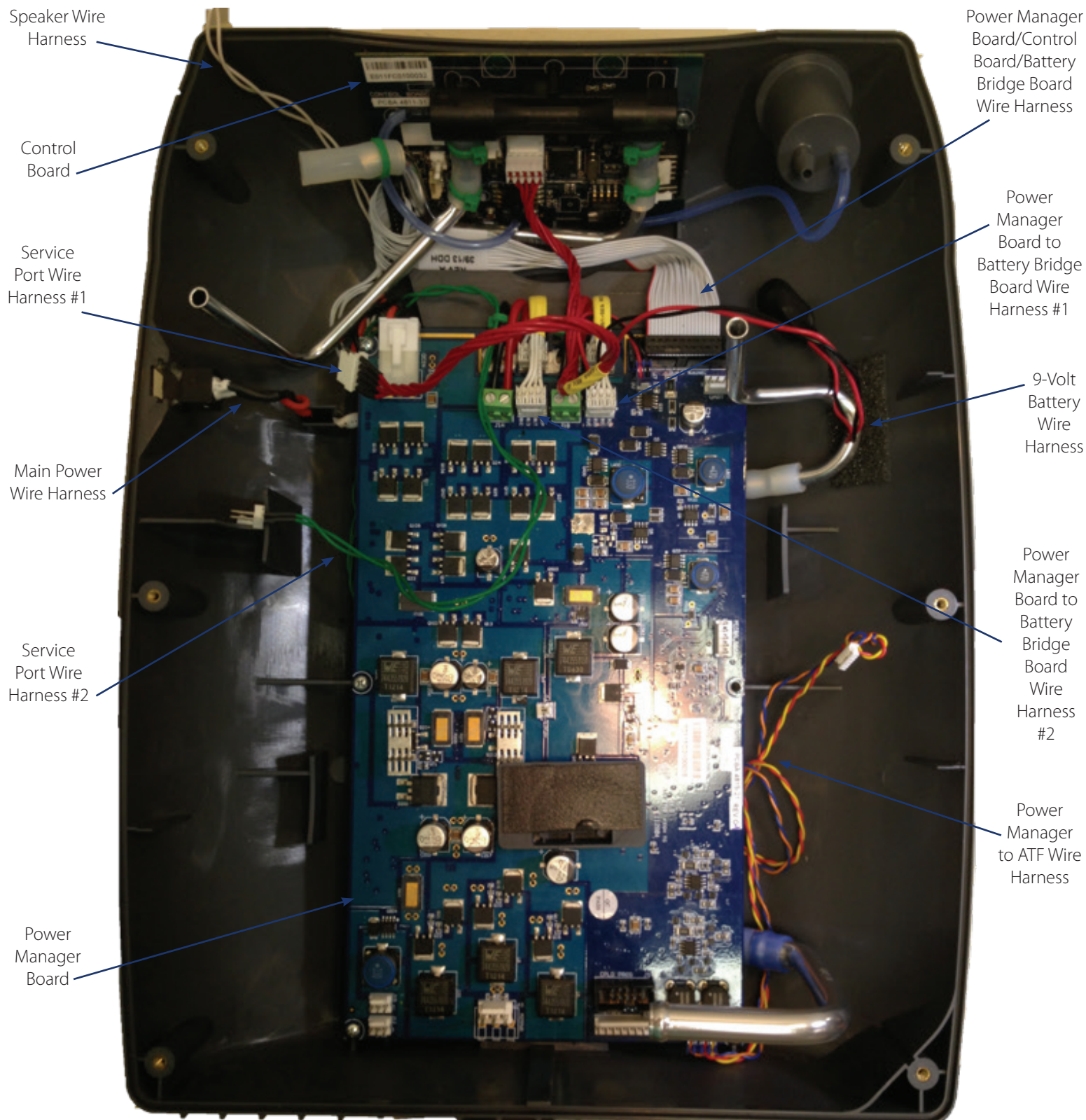


Figure 57

2. To remove the Power Manager Board, the first step is to cut the tie-wraps that are attaching the two Service Port Wire Harnesses and 9-Volt Wire Harness to the Power Manager Board. Using a pair of small cutters, snip the end of the two tie-wraps.

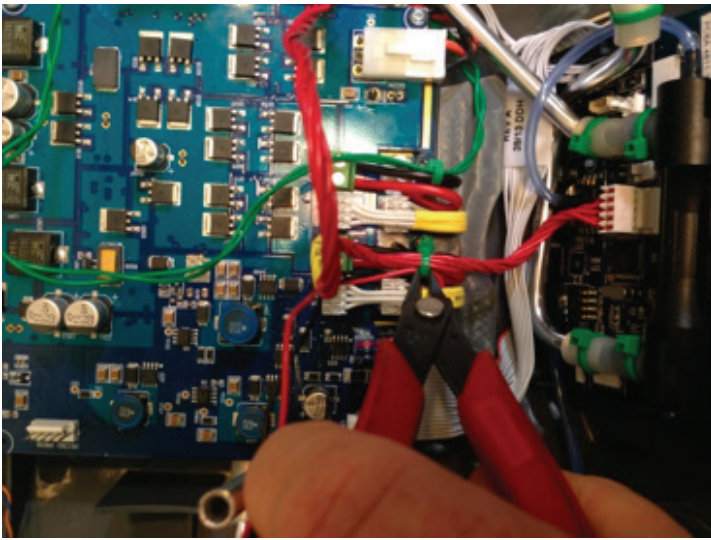


Figure 58

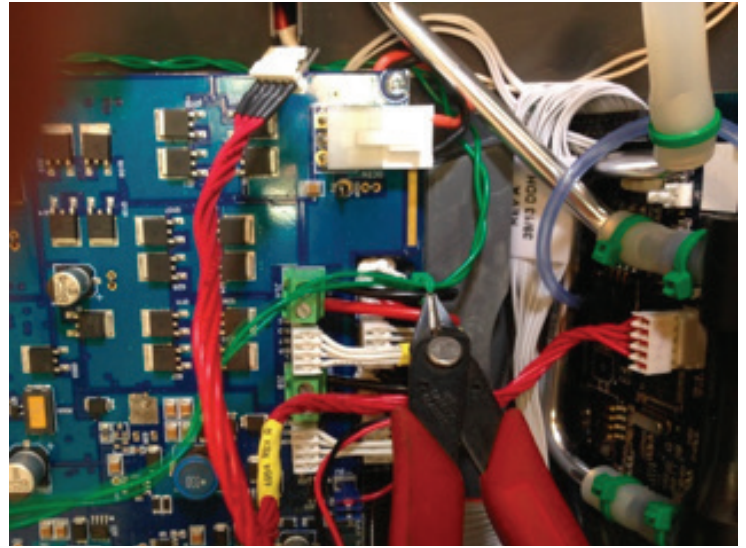


Figure 59

3. Next, disconnect all Wire Harness Assemblies that are attached to the Power Manager Board. These Harness Assemblies are circled below. The Power Manager Board to ATF Wire Harness will also need to be removed if replacing the Power Manager Board.

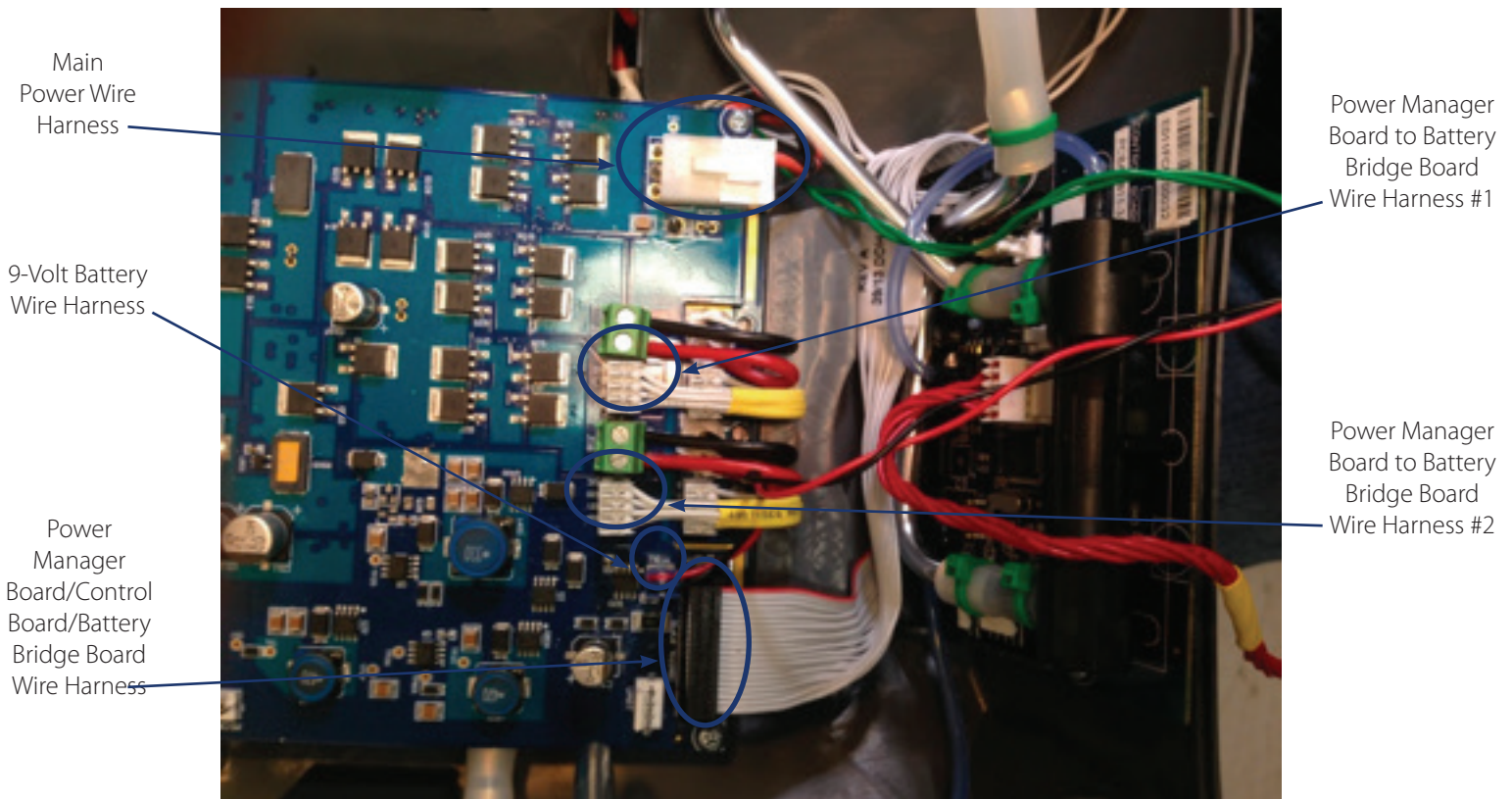


Figure 60

4. Once the Wire Harnesses have been disconnected, the next step is to loosen the two sets of Jumper Wires that attach from the Battery Bridge Board to the Power Manager Board. To do this, use a small Flat-Head screwdriver, loosen the four fastening screws pictured below and gently pull the four wires free of the connector slots.

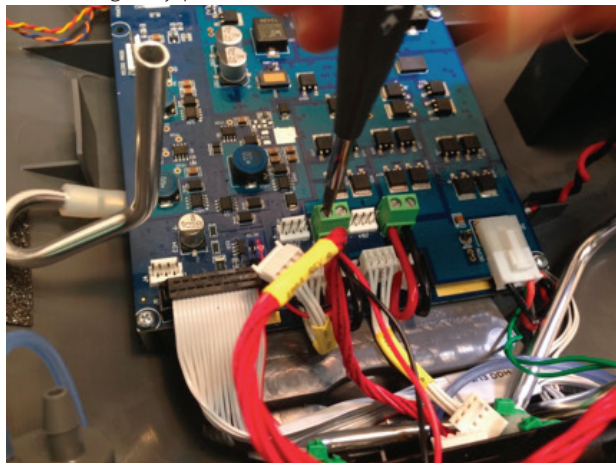


Figure 61

5. Once the Wire Harnesses and Jumper Wires have been disconnected, the next step is to remove the 5 Phillips Head Screws that attach the Power Manager Board to the Front Cover.

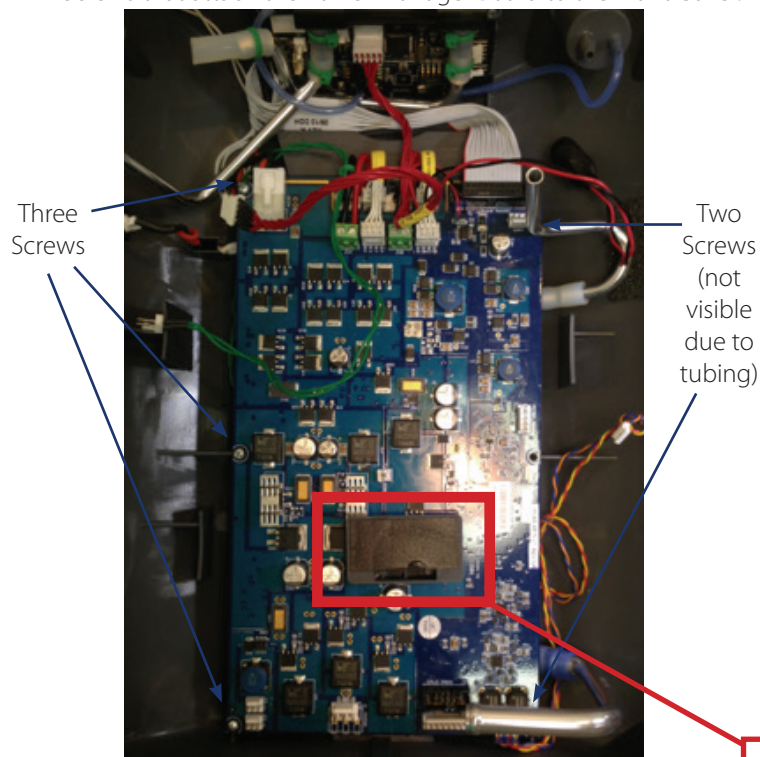


Figure 62

6. The Power Manager Board can now be removed by gently lifting the Power Manager Board upward away from the unit. To replace the Power Manager Board, repeat steps 1-5 in reverse order making sure connections are properly seated and that Bump Stop has been reinstalled.

7. To remove the Control Board, the first step is to disconnect the soft tubing that is connected to the Oxygen Outlet/HEPA Filter housing by gently pulling the tubing free.



Figure 63

8. After removing the soft tubing, the next step is to disconnect the Battery Bridge Board to Control Board Wire Harness by gently pulling the connector from the Control Board.

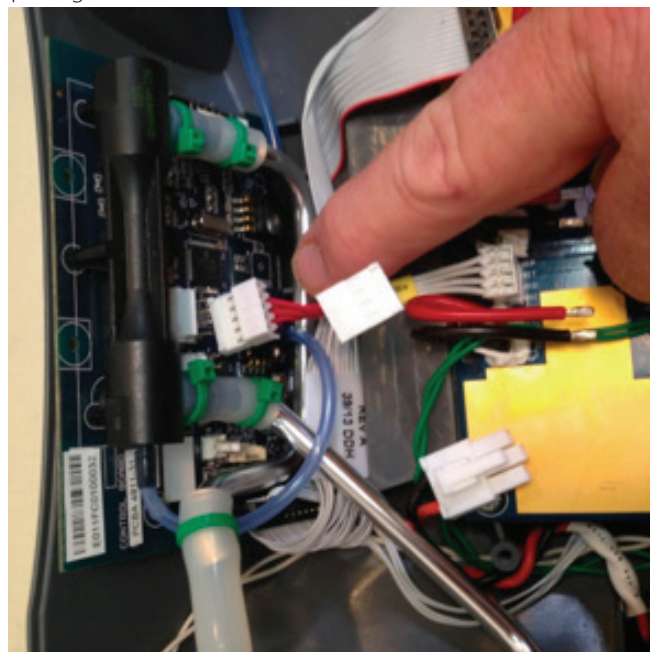


Figure 64

9. Next, Disconnect the Power Manager Board/Control Board/Battery Bridge Board Wire Harness from the Control Board by gently pulling the connector from the Control Board.

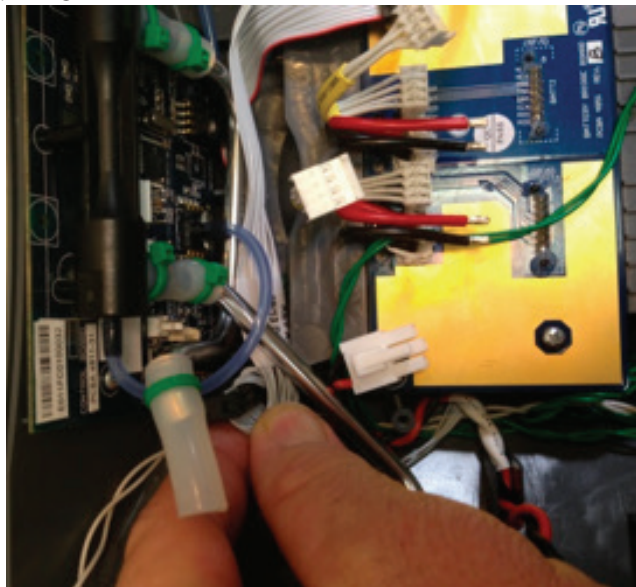


Figure 65

10. Next, remove the two Phillips Head Screws that attach the Control Board to the Top Cover.



Figure 66

11. Next, gently lift the Control Board upward and disconnect the Membrane Panel Connector.



FIGURE XX

12. The Control Panel can now be removed by gently lifting upward on the Control Board. To replace the Control Board, repeat steps 7-11 in reverse order.
13. In order to remove/replace the Membrane Panel, the Control Board must be removed. Once the Control Board has been removed, rotated the Front Cover over so as to have access to the Membrane Panel.
14. Insert a small Flat Head screwdriver under the Membrane Panel, prying upward, and work around the outer edge of the panel to break away the adhesive that secures the panel to the Front Cover.



Figure 67

15. Pull the Membrane Panel upward, making sure that the connector is fed through the opening on the Top Cover.
16. Once the Membrane Panel is removed, use Isopropyl Alcohol to clean any residual adhesive remaining on the Front Panel and allow to dry completely.
17. Obtain a new Membrane Panel and peel off the protective cover off of the backside of the Membrane Panel, exposing the adhesive.



Figure 68

18. Once the protective has been removed, feed the connector through the slot in the Top Cover and align the Membrane Panel with the recess on the Top Cover and press down firmly.

Note:

Anytime that the Membrane Panel is removed, it must be replaced with a new Membrane Panel.

19. Reconnect the Membrane Panel connector to the Control Board.

20. To remove the Battery Bridge Board, the Power Manager Board, first loosen the four Phillips-Head Screws that attach the Battery Bridge Board to the Front Cover.

Note:

In order to remove the Battery Bridge Board, the Power Manager Board must be removed.

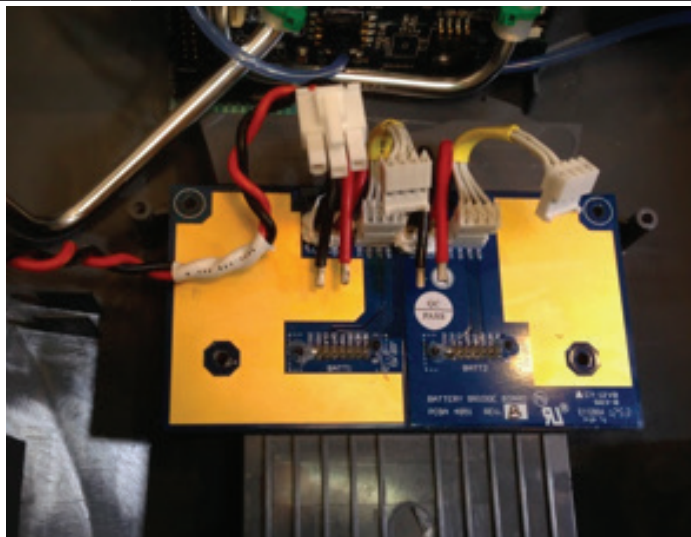


Figure 69

21. Once the four screws have been removed, the Battery Bridge Board can be removed by gently lifting the Battery Bridge Board upward.

22. To install a Battery Bridge Board, the Battery Bridge Board Installation Fixture must be used.

23. Place the Battery Bridge Board Installation Fixture into the front cover, just as if a battery pack was being installed.



Figure 70

24. Once the Battery Bridge Board Installation Fixture has been inserted into the Battery pack slot in the Front Cover, install the two "shims" that are provided with the Battery Bridge Board Installation Fixture.

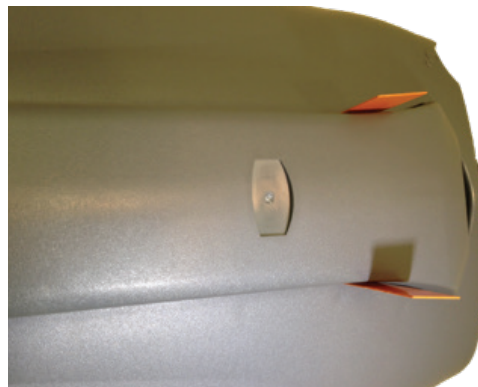


Figure 71

25. Once the "shims" for the Battery Bridge Board Installation Fixture have been installed, rotate the front cover back over and install the Battery Bridge Board. Ensure that the Male connectors on the Battery Bridge Board are aligned properly with the Female connectors on the Battery Bridge Board Installation Fixture for proper alignment after installation.

26. Insert the four Phillips Head screws into the Battery Bridge Board and Tighten to 5.5 in. lbs.

27. To remove the Voice System Board, disconnect the Service Port Wire Harness #2 and the Speaker Wire Harness from the Voice System Board.

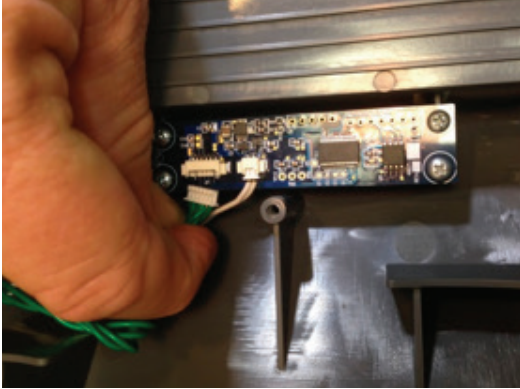


Figure 72

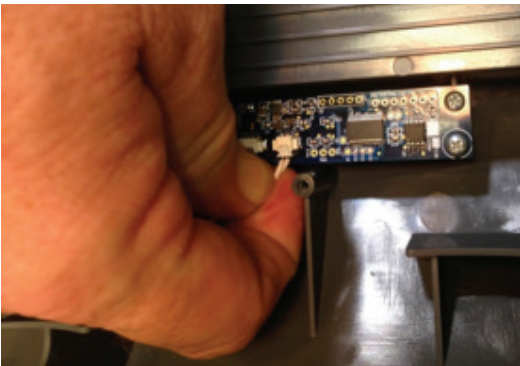


Figure 73

28. Remove the four Phillips Head screws that are used to attach the Voice System Board to the Front Cover.

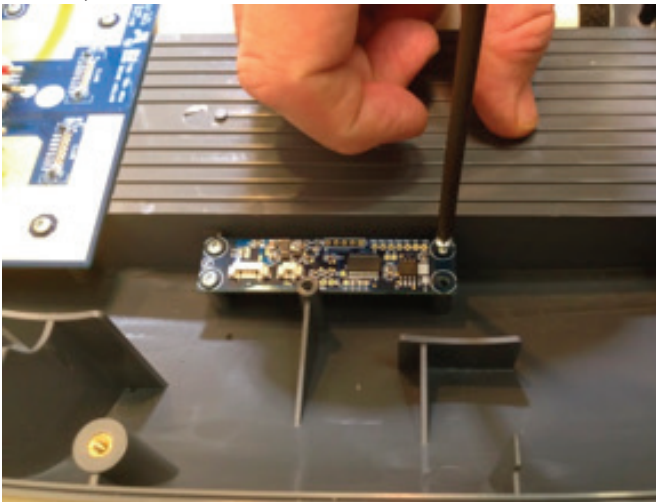


Figure 74

29. Once the four screws are removed, the Voice System Board can be removed by gently lifting upward on the Voice System Board.
30. To reinstall, or install a new Voice System Board, follow steps 27-28 in reverse order.

Parts List

Contact Customer Service or visit
www.cairemedical.com
to obtain your parts list.

Optional Accessories

Visit us at www.CAIREmedical.com for more information about optional accessories. There are many different types of oxygen tubing, cannula, and humidifiers. The following items are recommended by CAIRE Inc. for use with the eQuinox.

Salter Labs® Humidifier, Part Number HU003-1, or equivalent:

If your physician has prescribed an optional humidifier, follow the manufacturer's instructions for use. Attach the humidifier to the oxygen outlet port of the eQuinox. Use of optional humidifiers not recommended for the eQuinox may impair performance of the device and may void the warranty.

DO NOT use a humidifier in the Pulse Flow Mode. The eQuinox will not detect inspiratory effort. The device will alarm and default to the Continuous Flow Mode for continuing operation after 15 seconds.

CAIRE Humidifier Adapter – Part Number 7116-SEQ: If your physician has prescribed an optional humidifier, you may need to use the CAIRE Humidifier Adapter. Follow the instructions for use. Attach the Humidifier Adapter to the oxygen outlet port of the eQuinox and then to the humidifier. Attach the cannula, or oxygen tubing to the humidifier outlet.

Salter Labs Oxygen Supply Tubing, Part Number Series 2000, or

equivalent: The internal diameter should be no less than 3/16" (0.48 cm). Connect the oxygen tubing to the outlet port of the humidifier, or directly to the oxygen outlet port of the eQuinox if you do not use a humidifier. Connect the other end of the tube to the nasal cannula, if oxygen supply tubing is not already attached to the cannula. Tubing not specified for use with this eQuinox may impair the performance of the device.

Salter Labs Oxygen Cannula, Part Number 1600 Series, or

equivalent: Your physician will have prescribed a cannula to deliver oxygen. In most cases they are already attached to the oxygen tubing. If not, follow the instructions included with the cannula to attach it to the oxygen tubing. Use of an oxygen cannula not specified for use with this eQuinox may impair the performance of the device.

CAIRE Inc. Customer Service Contact Information

If you need any additional assistance, contact CAIRE Inc:



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